



SELF STUDY REPORT FOR ACCREDITATION

2018-19 to 2022-23



Punjab Agricultural University

Ludhiana





March, 2024

Photography
Manjit Singh

Printed and Published by
Additional Director of Communication,
for Punjab Agricultural University,
Ludhiana.

PAU: At the Service of Farmers
Available on every Social Media Platform

Kindly Scan 

 PAU WEBSITE	 FACEBOOK	 TWITTER
 PAU KISAN APP	 INSTAGRAM	 YOUTUBE

 2401960-79 (Ext. 373,475) PAU Portal  

Lets connect with PAU via Social Media



FOREWORD

Comprising just 1.53% of India's vast expanse, Punjab emerges as an agricultural powerhouse, yielding a staggering 16 % of the nation's wheat, 11.7% of its rice, and 3% of its cotton. The verdant fields owe much to Punjab Agricultural University (PAU), a beacon of agricultural innovation. Since its inception in 1962, PAU has not only transformed Punjab's agrarian landscape but has also left an indelible mark on the nation's agricultural narrative. During the 1960s and 70s, PAU spearheaded a revolution, introducing cutting-edge technologies and high-yielding crop varieties that catapulted Punjab's productivity and fortified India's food security. Termed as the "Green Revolution Matriarch," PAU continues to pioneer sustainable agricultural practices, cementing its stature as India's premier institution for agricultural advancement.



PAU's impactful contributions to the nation earned it prestigious accolades, clinching the coveted "Best Institution Award" from the Indian Council of Agricultural Research in both 1995 and 2017. Undeterred in its pursuit of excellence, PAU was shortlisted as an "Institution of Excellence" under the esteemed "Institution of Eminence" scheme by the Ministry of Human Resource Development in 2018. Adding to its laurels, PAU soared to the top rank in the National Institute Ranking Framework's maiden assessment for agriculture and allied sectors in 2023. This resounding achievement further solidifies PAU's position as an agricultural education and research leader.

The university is dedicated to enhancing agricultural research, education, and outreach by leveraging its skilled faculty, infrastructure, global partnerships, and alumni network. Over the past five years, research efforts have yielded effective agro-technological solutions such as enhanced crop varieties, advanced production and protection methods, farm mechanization, post-harvest techniques, and food processing innovations. Quality human resource remains indispensable to the overall agricultural development of any region. Regional Research Station, Ballawal Saunkhri, set up during 1982 to cater to the sub-mountainous region was academically reinforced by setting up the College of Agriculture during 2021.

Considering the evolving challenges in global agriculture, PAU consistently leads efforts to adapt its research, education, and outreach programs in consultation with stakeholders, particularly farmers. Innovative initiatives encompass speed breeding, sensor-based precision agriculture, climate-resilient practices, artificial intelligence, internet of things, etc. Entrepreneurial development and skill oriented programmes for the rural youth continue to receive a special attention. Additionally, there's a focus on entrepreneurial development and skill-oriented programmes tailored for rural youth, reflecting PAU's commitment to addressing contemporary agricultural needs.

Every emerging challenge represents an opportunity to achieve professional excellence and deliver solutions. The compilation of the Self-Study Report for accreditation serves as a reflection on our achievements and a roadmap for the future. I am confident that the dedicated efforts of the PAU team, led by Institutional Coordinator, Dr. M.I.S. Gill, Dean of Postgraduate Studies, have produced a report that meets all guidelines. I appreciate the Deans, Directors, Registrar, Officers, faculty, and staff of PAU for their invaluable input. Besides fulfilling accreditation requirements, I trust that this report will also serve as a valuable resource for academics, administrators, and policymakers alike.

S S Gosal
Vice Chancellor

Ludhiana
March 18, 2024



PREFACE

The Diamond Jubilee celebration of Punjab Agricultural University (PAU), Ludhiana in 2022 have witnessed the years of its tremendous contribution towards agriculture since its inception in 1962. Keeping the pace with time, PAU has imparted quality teaching, research and extension education in agriculture and its allied fields during the current assessment period 2018-19 to 2022-23 for Accreditation. The PAU has acquired top most position amongst State Agricultural Universities and 3rd among Agriculture and Allied Sector category as per the NIRF ranking 2023. PAU has exemplary relationship with all the stakeholders including students, farmers and industry which help to align its academic, research and outreach programmes as per need of the state. PAU holds an enviable record of producing outstanding alumni as eminent scientists, academicians, administrations, sports person and their presence is across the globe.



The university presently has 6 colleges, 35 departments (including three schools), 10 undergraduate, 46 M.Sc. and 30 Ph.D programmes, besides two diploma courses. The total student strength is about 4000 with an ideal gender balance of 1:1 boys and girls. The student teacher ratio is nearly 5:1 with the current faculty strength at Punjab Agricultural University.

The PAU was accredited by ICAR for a period of five years in 2019. Now, the Self Study Report of the university on its activities and accomplishments is compiled for the last five years i.e 2018-19 to 2022-23 as per the guidelines. The document provides comprehensive information about research, teaching and extension activities of PAU. The annexures have been added to support this document, wherever necessary. The detailed list of faculty publications along with NAAS rating is also annexed in the document. During the period under report, 600 publications have been published in high impact research journals having NAAS rating > 9.00.

I, as convenor of the Self Study Report for accreditation of the university, express my gratitude to the hon'ble Vice Chancellor of PAU, Dr Satbir Singh Gosal for his valuable inputs and guidance to prepare this quality document. For the compilation of this report, lot of information and inputs have been received from the colleges, directorates and various sections/ units of the university. It is my pleasure to place on record the valuable cooperation and support extended by the university Deans, Directors, Registrar and Officers of PAU for the preparation of this report. I am thankful to all the Heads of Departments, Section in charges, Faculty and Staff for responding to every request made to supply desired information. My special acknowledgements are due to the working team members of the Task Force, who have worked hard to secure accurate information from across the colleges and timely compilation of this report. I hope the efforts made by PAU team for preparing this document would be meaningful and rewarding in the process of accreditation.

M I S Gill

Dean, Postgraduate Studies

Ludhiana

March 18, 2024



CONTENTS

Chapter	Title	Page
1. 6.6.1.	University Governance	1-20
6.6.1.1.	Vision, Mission and Goals	2-5
6.6.1.2.	Statutes and Regulations	6
6.6.1.3.	University Statutory Officers and their Selection Process	7-8
6.6.1.4.	Decentralization of Power	8-13
6.6.1.5.	Supporting Units	13-15
6.6.1.6.	Technology Support	15-16
6.6.1.7.	Institutional Data Base and Website Update	16-18
6.6.1.8.	Interdepartmental linkages	18-19
6.6.1.9.	Monitoring Mechanism	19-20
6.6.1.10.	Institute Quality Assurance Cell/PME Cell	20
6.6.1.11.	Collaboration with Academic Institutions and Industry	20
2. 6.6.2.	Academic Support	21-33
6.6.2.1.	Academic Council	21-22
6.6.2.2.	Innovation and Best Practices	22-23
6.6.2.3.	Library	23-26
6.6.2.4.	Center for Excellence/Advance Studies/Center for Advanced Faculty Training	26-29
6.6.2.5.	Incubation Center/Start-Up Units/Venture Capital	29-30
6.6.2.6.	Technology Enabled Learning Resources	30-31
6.6.2.7.	Integrated Learning Systems (Experiential Learning)	31
6.6.2.8.	Academic Industry Interface	31-32
6.6.2.9.	National Ranking (ICAR/MHRD)	32
3. 6.6.3.	Research Support	34-96
6.6.3.1.	Research Council	34-35
6.6.3.2.	Directorate of Research	35-38
6.6.3.3.	Technology Developed and its Adoption	38-85
6.6.3.4.	Research Publication	85
6.6.3.5.	Innovation and Best Practices	85-88
6.6.3.6.	IPR Cell/ITMU	89-94
6.6.3.7.	Central Instrumentation Unit	94-96
6.6.3.8.	Global Support	96
4. 6.6.4.	Extension Support	97-115
6.6.4.1.	Extension Council	97
6.6.4.2.	Directorate of Extension Education	97-105
6.6.4.3.	Extension Planning and Technological Impact	105
6.6.4.4.	Implementation of National Initiatives	105-111
6.6.4.5.	Innovation and Best Practices	111-114
6.6.4.6.	Consultancy/Certification/Testing	114-115
5. 6.6.5.	Faculty and Staff Development	116-126
6.6.5.1.	Recruitment and Promotional Avenue	116-123
6.6.5.2.	Participation of Faculty in Symposia/Workshops	123

6.6.5.3.	Incentives for Excellence/Faculty Recognition	123-125
6.6.5.4.	Capacity Building and Training	125-126
6.	6.6.6. Student Development	127-142
6.6.6.1.	Scholarships/Stipend	127-129
6.6.6.2.	Extra and Co-curricular Activities	129-132
6.6.6.3.	Health Facilities	132
6.6.6.4.	Sports and Cultural Facilities	133-140
6.6.6.5.	Student Counselling and Placement Cell	140-142
6.6.6.6.	Disabled Friendly Facilities	142
7.	6.6.7. Infrastructure	143-151
6.6.7.1.	Physical Facilities including Administrative Building and Lands	143-149
6.6.7.2.	IT Infrastructure	149
6.6.7.3.	Students and Staff Amenities	149-151
8.	6.6.8. Financial Resource Management	152-155
6.6.8.1.	Budget Allocation	152-153
6.6.8.2.	Finance Committee	153
6.6.8.3.	Internal Resources Generation	153-154
6.6.8.4.	External Funding	154
6.6.8.5.	Financial Powers Delegation to Deans/Heads	154
6.6.8.6.	Finance Utilization	154-155
9.	6.6.9. Accomplishments	156-166
6.6.9.1.	Awards for the University	156-158
6.6.9.2.	Accreditation Report from ICAR/Other Agencies	158
6.6.9.3.	Inter Institutional Standings	158-160
6.6.9.4.	Socio-economic Impact	160-162
6.6.9.5.	International Collaboration	162-64
6.6.9.6.	Fund Raising through CSR	164
6.6.9.7.	Alumni Support	164-166
6.6.6.10.	Certificate	166

Annexures

I.	Details of Statutes and Regulations: Chapters and Sections	167-168
II.	Details of Collaborative Schemes with Industries/Organizations	169-172
III.	List of Publications	173-343
IV.	List of Testing Schemes	344-361
V.	Faculty Participation in Trainings and International Visits	362-386
VI.	Important Events Organized at PAU	387-401
VII.	List of Competitive Research Projects Sanctioned	402-407
VIII.	Delegation of Financial Powers by the Board of Management	408-418
IX.	List of Faculty Awards	419-426
X.	Action Taken Report	427-438
XI.	List of MoUs between PAU and other Universities/Institutions	439-440
XII.	List of International Collaborative Projects	441-442

6.6.1. University Governance

Punjab Agricultural University (PAU) was established in 1962 on the pattern of the U.S. Land Grant System. It has its origin in the Punjab Agriculture College and Research Institute, Lyallpur (now Faisalabad) in Pakistan, which was established in 1906. After the partition of the country in August 1947, the college was re-established in a building belonging to Khalsa College, Amritsar. In March 1949, the Government Agricultural College (Affiliated to Panjab University) was shifted to Malwa Khalsa High School at Ludhiana. This college was later on shifted to its present site in 1957 and upgraded as a university in 1962 through the Punjab Agricultural University Act passed by the Punjab Legislature on October 17, 1961. Originally, the university had three campuses, one each at Ludhiana, Hisar and Palampur. On the re-organization of Punjab State in November 1966, the PAU was bifurcated by an Act of Parliament on February 02, 1970, to establish the Punjab Agricultural University at Ludhiana and the Haryana Agricultural University (now Chaudhary Charan Singh Haryana Agricultural University) at Hisar. In July 1970, the Himachal Pradesh Agricultural University (now Chaudhry Sarwan Kumar Himachal Pradesh Krishi Vishav Vidyalyaya) was formed at Palampur. In the year 2006, a new university i.e. Guru Angad

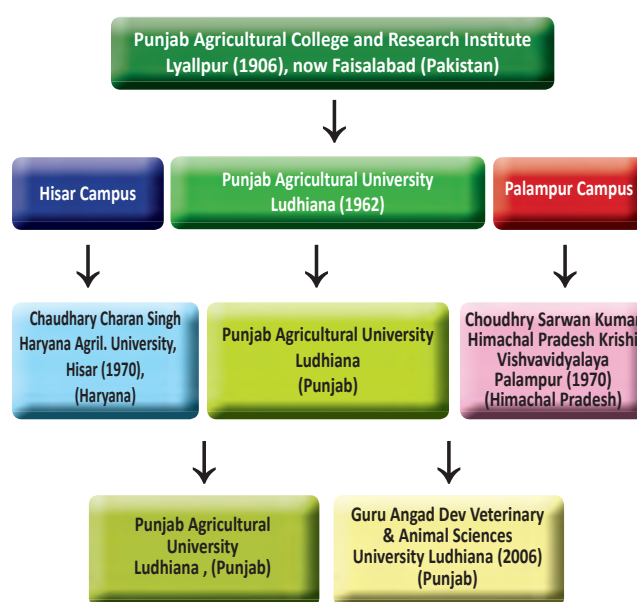


Fig. 1: Genesis and evolution of Punjab Agricultural University

Dev Veterinary and Animal Sciences University (GADVASU) was carved out of the PAU (Fig. 1).

At present the Punjab Agricultural University has six constituent colleges with 35 departments and three schools (Fig. 2). The University is spread over an area of 1221 acres at Ludhiana and about 5557 acres at various Regional Research Stations (7), Fruit Research Stations (3), Krishi Vigyan Kendra (KVK) (18) and Seed Farms (5) located in different agro-climatic zones of the state.

Organization Chart (Colleges)

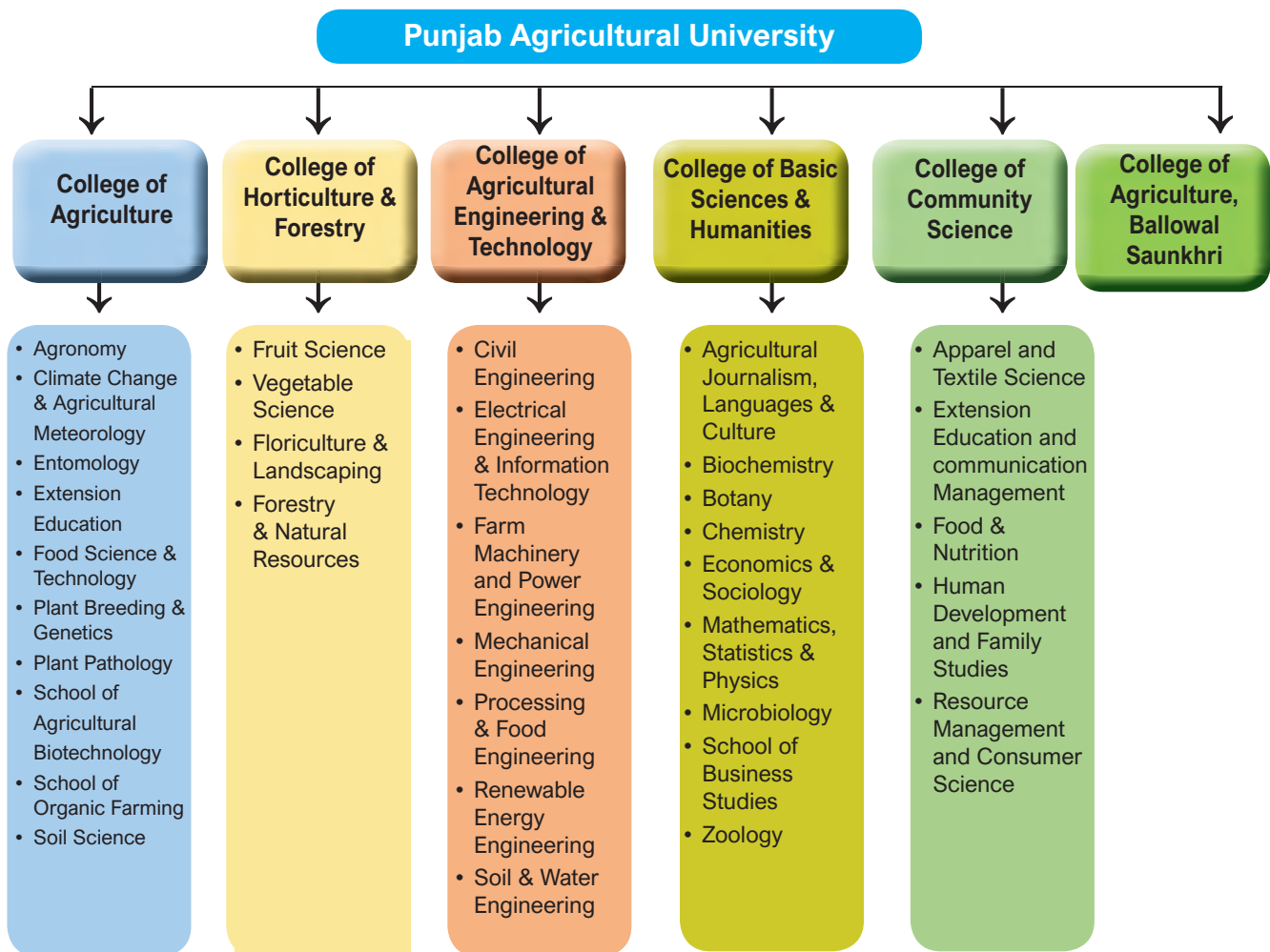


Fig. 2 : Colleges, Department and Schools of PAU

6.6.1.1. Vision, Mission and Goals

The University was established in the year 1962 to make provisions for imparting education, conducting research and providing extension services in agriculture, horticulture, agricultural engineering, community science and other allied sciences.

Vision

PAU visualizes the teaching, research and extension concepts to develop and promote innovative and need- based scientific technological approaches which are expected to be helpful to the scientists, policy makers and other stakeholders in addressing the future needs for growth and development of agriculture in the state and sustaining national food security. Pursuing a dynamic path leading

to institutional vision, PAU published “Vision 2040” document in the year 2012 to execute its envisioned programmes.

The University has re-oriented its programmes to focus on the challenges that have emerged over time. Its initial thrust was on crop productivity enhancement, whereas, the current focus is on sustainable development of agriculture i.e. productivity enhancement, input use efficiency, natural resource conservation, agro-processing, mechanization and allied enterprises. The University has expanded its teaching programmes and has revised the curricula in tune with the emerging educational needs. It has exemplary strong linkages with farmers and line departments which are being continuously nurtured to meet new challenges in transfer of technology.



Mission

Punjab Agricultural University aspires to become a premier agricultural university with teaching, research and extension programmes that serve the people, the state, the nation and the world. It is committed to continuous improvement in agricultural and allied fields by developing quality manpower, providing relevant technological solutions, piloting their field use and supporting other related activities.

Goals and Objectives

Goals: For achieving the stated mission of the University, the goals are:

- i. To provide quality education in the areas of agriculture, horticulture, agricultural engineering, community science and allied fields.
- ii. To undertake basic, applied and adaptive research to seek appropriate solutions to emerging problems in agriculture and develop relevant technologies to improve socio-economic conditions of the farming community.
- iii. To develop effective mechanisms for the transfer of technology to the farmers and agricultural organizations through different extension programmes with a view to improve agricultural productivity and economic condition of rural population.
- iv. To develop appropriate technology for supporting the growth of agro-based industries and generate self-employment opportunities for the educated youth.

With its high standards of academic performance, creditable research achievements and efficient system of agricultural technology transfer, the Punjab Agricultural University has aimed to provide leadership at state, national and international level for the development of agriculture. Since 1962, the University with its effective coordination with the state, development departments and enterprising farmers coupled with appropriate government policies, has played a pivotal role in making Punjab state the bread basket of the country. Now that the country has become self-sufficient in food grains, the

University has consistently expanded the focus of its efforts to address the issues of:

- Sustainability of agriculture.
- Conservation agriculture.
- Environmental conservation.
- Social responsibility.
- Human resource development in emerging areas.

To ensure acceptable quality institutional products or services, the University has been maintaining its quality management system as per the requirements of International standards ISO 9001: 2015.

Objectives: The objectives of the University in consonance with its mandate/mission for quality teaching, research and extension are as follows:

Teaching

- To provide quality education in the areas of agriculture, horticulture, agricultural engineering, community science and allied fields.
- To develop globally competitive human resource to address emerging challenges in agriculture.
- To modify agricultural education according to the changing scenario and needs.
- To provide better counselling services and extra-curricular facilities for overall personality development of students.
- To assist students in suitable placement.

The University has six constituent colleges with 32 departments and 3 schools; College of Agriculture (8 departments and 2 schools); College of Agricultural Engineering and Technology (7 departments); College of Basic Sciences & Humanities (8 departments 1 school); College of Community Science (5 departments); College of Horticulture & Forestry (4 departments) and College of Agriculture in Ballawal Saunkhri.

At present, the University offers 10 undergraduate, 46 Masters and 30 Doctoral programmes in its six colleges. In addition, two Diploma/Certificate courses are also offered by the University (Table 1.1).

Table 1.1: Teaching programmes presently offered by the University
Undergraduate programmes
(10 degree programmes + 2 Diploma/Certificate courses)

College of Agriculture	College of Horticulture & Forestry	College of Agricultural Engineering & Technology	College of Basic Sciences & Humanities	College of Community Science	College of Agriculture Ballawal Saunkhri
1. B.Sc. (Hons.) Agriculture - 4 year 2. B.Tech. (Biotechnology) - 4 year 3. B.Tech. (Food Technology) - 4 year 4. B.Sc. (Hons.) Agriculture 2+4 year 5. Diploma in Agriculture - 2 year 6. Diploma Course in Hybrid Seed Production Technology - 2 year	1. B.Sc. (Hons.) Horticulture - 4 year	1. B.Tech. (Agricultural Engineering) - 4 year	1. B.Sc. (Hons.) Agribusiness Management - 4 year 2. 5-year Integrated M.Sc. (Hons.) * programme in Biochemistry, Botany, Chemistry, Microbiology, Physics and Zoology Candidates of 5-year integrated programme may opt for B.Sc. degree after 3 years, subject to the fulfilment of requirement of the degree.	1. B.Sc. (Hons.) Community Science - 4 year 2. B.Sc. (Hons.) Nutrition & Dietetics - 4 year	1. B.Sc. (Hons.) Agriculture - 4 year

Postgraduate Programmes (Masters')

College of Agriculture	College of Horticulture & Forestry	College of Agricultural Engineering & Technology	College of Basic Sciences & Humanities	College of Community Science
1. Agricultural Meteorology 2. Agricultural Extension Education 3. Agronomy 4. Biotechnology 5. Entomology 6. Food Technology (Processing Technology) 7. Genetics & Plant Breeding 8. Molecular Biology & Biotechnology 9. Plant Pathology 10. Soil Science	1. Horticulture (Fruit Science) 2. Horticulture (Vegetable Science) 3. Horticulture (Floriculture & Landscaping) 4. Forestry (Silviculture & Agroforestry)	1. Civil Engineering (Hydrology & Water Resources Engineering/ Structural Engineering) 2. Computer Applications 2-year 3. Computer Science & Engineering 4. Farm Machinery & Power Engineering 5. Irrigation & Drainage Engineering 6. Processing & Food Engineering 7. Remote Sensing & Geographic Information System 8. Soil & Water Conservation Engineering	1. Agricultural Economics 2. Business Administration (Agribusiness) 3. Business Administration 4. Biochemistry 5. Botany 6. Chemistry 7. Journalism & Mass Communication 8. Microbiology 9. Mathematics 10. Physics 11. Sociology 12. Statistics 13. Zoology 5-year Integrated M.Sc. (Hons) in 14. Biochemistry 15. Botany	1. Apparel & Textile Science 2. Extension Education & Communication Management 3. Food & Nutrition 4. Human Development & Family Studies 5. Resource Management & Consumer Science



			16. Chemistry 17. Microbiology 18. Physics 19. Zoology	
Postgraduate Programmes (Doctorate)				
1. Agricultural Meteorology 2. Agricultural Extension Education 3. Agronomy 4. Entomology 5. Food Technology (Processing Technology) 6. Genetics & Plant Breeding 7. Molecular Biology & Biotechnology 8. Plant Pathology 9. Soil Science	1. Horticulture (Fruit Science) 2. Horticulture (Vegetable Science) 3. Horticulture (Floriculture & Landscaping)	1. Farm Machinery & Power Engineering 2. Irrigation & Drainage Engineering 3. Processing & Food Engineering 4. Renewable energy Engineering 5. Soil & Water Conservation Engineering	1. Agricultural Economics 2. Biochemistry 3. Botany 4. Business Administration 5. Chemistry 6. Microbiology 7. Sociology 8. Zoology	1. Apparel & Textile Science 2. Food & Nutrition 3. Extension Education & Communication Management 4. Human Development & Family Studies 5. Resource Management & Consumer Science

Research

- To undertake basic and applied research in agriculture and allied sciences.
- To develop appropriate agricultural production technologies relevant to the agro-climatic and socio-economic conditions in Punjab.
- To develop sustainable cropping and farming systems for providing livelihood security and better living standards to the farmers and rural population in different agro-ecological regions of Punjab.
- To develop technologies for supporting the growth of subsidiary occupations, agro-based industries and generating self-employment opportunities to rural people.
- To develop technologies for emergent challenges such as climate change and natural resource depletion.

Research efforts during the last five years have resulted in successful agro-technological packages including crop varieties, production and protection technologies in addition to technologies related to post-harvest handling, processing and value addition. Further, the pursuit of productivity is being combined with the natural resource conservation and

integrated disease and pest management to generate sustainable and eco-friendly practices.

Extension Education

- To develop and conduct appropriate programmes for transfer of technologies for agricultural and rural development in the region.
- To provide consultancy services to farmers, livestock producers, agricultural input suppliers, agro-industry and all those engaged in production, processing, marketing and management in the wider profession of agriculture and allied activities.
- To test new technologies and popularize the recommended ones.

The extension education programmes of PAU play a key role in the dissemination of latest recommendations of research to the farmers so as to enhance the production quality and post-harvest management of various field and horticultural crops in the state. The Training Units, 18 Krishi Vigyan Kendras, 15 Farm Advisory Service Centres in different districts of the state are entrusted with responsibility of implementing various extension education programmes for unemployed youth, farmers,

farm women and field extension functionaries of the state.

6.6.1.2. Statutes and Regulations

The Statutes and Regulations implemented by

the University are notified within the University for its Administration and Planning. PAU Act and Statutes is available on the official web portal of the University. The various chapters (Table 1.2) along with the sections and sub-sections are annexed (Annexure I):

Table 1.2 List of statutes and Regulations

Chapter	Title
I	The Haryana and Punjab Agricultural Universities Act, 1970
II	Powers and Duties of the Authorities of the University
III	The Designation, the Manner of Appointment, Powers and Duties of the Officers of the University
IV	Classification, the Manner of Appointments, Powers and Duties of the Teachers of the University
IV-A	Appointment of Teachers by Promotion Based on Merit
IV-B	Career Advancement of Teachers
IV-C	Career Advancement of Teachers w.e.f. 27-7-1998
V	Appointments of Employees of The University other than Officers and Teachers
VI	Number, Qualifications, Emoluments and Other Conditions of Service of Officers and Other Employees of The University Not Being Teachers and The Preparation and Maintenance of Record of their Service and Activities. (Part-A)
VII	Number, Qualifications, Emoluments and other Conditions of Service of Teachers of the University and the Preparation and Maintenance of Record of their Service and Activities (Part-B)
VIII	Pension and Provident Fund
IX	Institution of Degrees and Diplomas and Conferment of Honorary Degrees
X	The Courses of Study to be Laid Down for Degrees and Diplomas of University
XI	The Institution of Fellowships, Scholarships, Medals and Prizes
XII	The Conditions for the Award of Fellowships, Scholarships, Medals and Prizes, Stipends and Fee Concessions
XIII	The Admission of Students to the University and their Enrolment and Continuance as such
XIV	The Conditions under which Students shall be Admitted to the Degree, Diploma or other Courses and the Manner in which the Examinations are to be held and the Eligibility for the Award of the Degrees and Diplomas
XV	The Conditions of Residence of the Students of the University and the Levying of Fees for Residence in Hostels Maintained by the University
XVI	The Establishment and the Abolition of Hostels Maintained by the University
XVII	The Recognition and Supervision of Hostels not Maintained by the University
XVIII	The Establishment, Amalgamation, Sub-Division and Abolition of Departments
XIX	Levying of Fees by the University for any Purpose Excluding Hostel Fees Governed by the Statutes (Chapter XV)
XX	Remuneration and Allowances, Including Travelling and Daily Allowances to be Paid to Persons Employed on the Business of the University
XXI	Persons who are Declared as Officers of the University
XXII	The Exercise of Financial and Administrative Powers by the Officers, Teachers and Other Employees of the University
XXIII	Administrative and Financial Powers by the Board of Management to the Officers/ Employees of the University
XXIV	Statement showing delegation of administrative and financial powers by the Vice-Chancellor in exercise of powers conferred on him vide clause 4 of the Statues issued under section 31(u) of the Haryana and Punjab Agricultural Universities Act, 1970 and relating to the delegation of administrative and financial powers by the Board of Management to the officers/employees of the University (Issued vide Notification No. Acad-II (AU)-66-9333 dated 29 March, 1966 and amended from time to time).
XXV	The Conferment of Emeritus Professorship, Payment of Honorarium to Emeritus Professors and Other Conditions of Appointment
XXVI	The Grant of Travelling and Daily Allowances to Members of the Board of Management

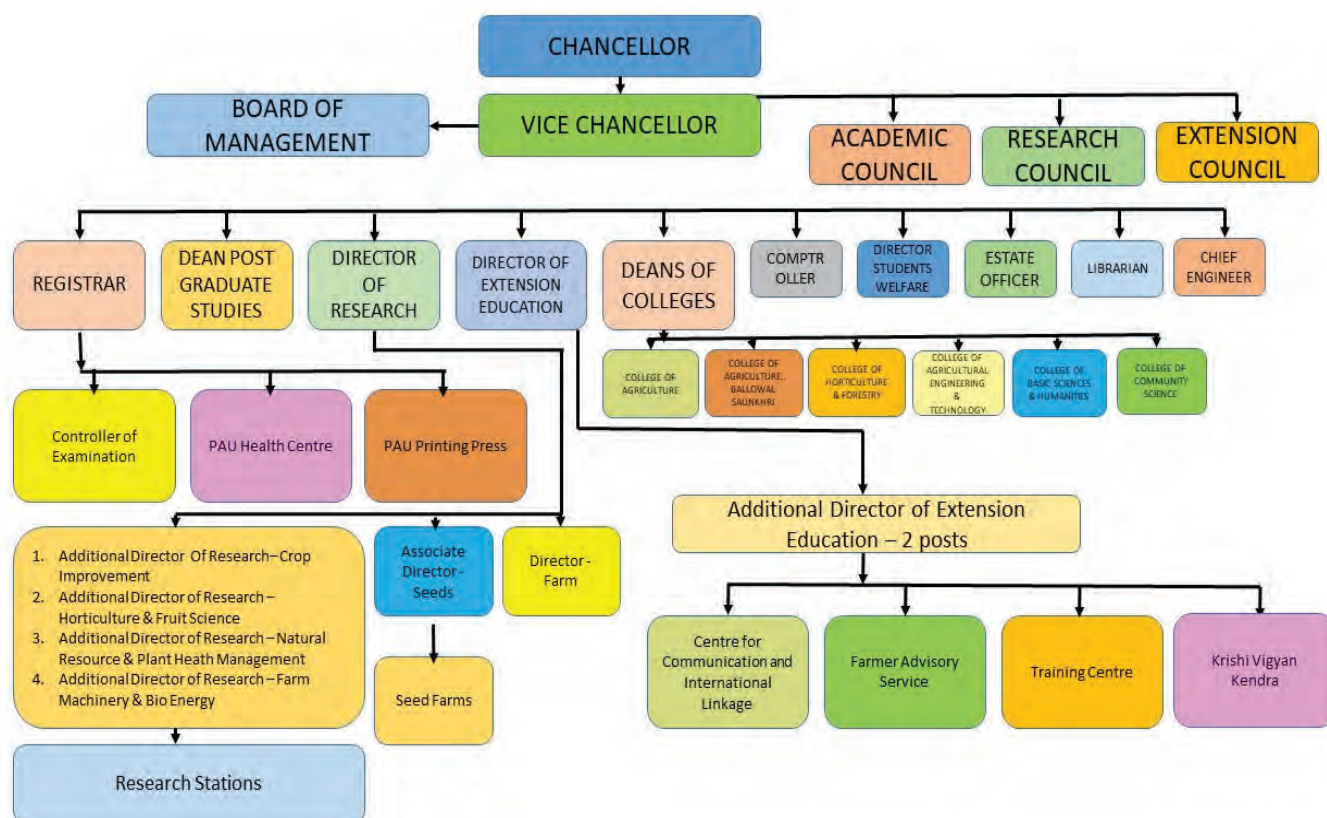


Fig. 3: Organizational Structure of Punjab Agricultural University

6.6.1.3. University Statutory Officers and their Selection Process

The activities of PAU are broadly categorised into teaching, research and dedicated positions of statutory Officers/Deans/ Directors have been established in the organisation who report to the Vice-Chancellor. Academic affairs are taken care of

by the respective Deans of the constituent colleges of PAU. However, the Dean, Postgraduate Studies at University level coordinates the postgraduate (Master and Ph.D) programmes. The research and extension projects/programmes are executed by the Director of Research and Director of Extension, respectively. The Director Students Welfare works

Table 1.3: Status and details of statutory officers in Punjab Agricultural University

Sr. No.	Statutory Officer sanctioned in the Act	Name of the Officer in position	Joining date	Tenure	Appointment type
1.	Vice Chancellor	Dr Satbir Singh Gosal	19.8.2022	4 year	Appointed
2.	Registrar	Dr Rishi Pal Singh, IAS	18.11.2023	4 year	Appointed
3.	Dean, Postgraduate Studies	Dr Manav Indra Singh Gill	14.12.2023	4 year	Appointed
4.	Dean, College of Agriculture	Dr Charanjit Singh Aulakh	6.11.2023	4 year	Appointed
5.	Dean, College of Agriculture, Ballowal Saunkhri	Dr Manmohanjit Singh	6.11.2023	4 year	Appointed
6.	Dean, College of Horticulture and Forestry	Dr Manav Indra Singh Gill	29.8.2023	4 year	Nominated
7.	Dean, College of Agril. Engg. & Technology	Dr Manjeet Singh	6.11.2023	4 year	Appointed
8.	Dean, College of Basic Sciences & Humanities	Dr Shammi Kapoor	29.8.2023	4 year	Nominated
9.	Dean, College of Community Science	Dr (Ms) Kiran Bains	6.11.2023	4 year	Appointed
10.	Director of Research	Dr Ajmer Singh Dhatt	14.12.2023	4 year	Appointed

11.	Director of Extension Education	Dr Makhan Singh Bhullar	14.12.2023	4 year	Appointed
12.	Director of Students' Welfare	Dr Nirmal Singh Jaura	17.1.2023	4 year	Appointed
13.	Comptroller	Dr Shammi Kapoor	14.02.2023	4 year	Nominated
14.	University Librarian	Dr (Ms) Yogita Sharma	02-11-2023	4 year	Nominated
15.	Estate Officer	Dr Rishi Indra Singh Gill	02-09-2023	4 year	Nominated

for conducting sports, cultural and other welfare activities for the students. The present status and details of these statutory officers in PAU are mentioned below (Table 1.3; Fig. 3).

Mode of Appointment of Statutory Officers

The following procedure shall be adopted for the appointment of all the Deans, Director of Research, Director of Extension Education, Registrar, Comptroller, Estate Officer, Librarian and Student Welfare officer.

- The Vice-Chancellor may have the post advertised with such qualifications as may be prescribed by the competent authority.
- On the expiry of the last date for the receipt of applications so received along with the bio-data, they shall be compiled and placed before the screening committee constituted for the purpose by the Vice-Chancellor. The screening committee after screening the qualifications of the applicants and excluding those not falling in the eligibility criteria shall prepare a list of candidates recommended to be called for interview or considered in absentia and place it before the Vice-Chancellor for his approval. The Vice-Chancellor while according such approval shall have the power to include in such a list name(s) of person(s) who may not have applied, provided they fulfil the requisite qualifications on the last date prescribed for receipt of applications.
- After interviewing the candidates or considering them in absentia, as the case may be, the committee shall make recommendations, as far as possible, of three persons in order of preference for each post separately.
- The Vice-Chancellor shall then submit the recommendations of the Selection Committee for approval of the Board of Management. However, the Board of Management may

also approve the panel recommended for appointment which shall be valid for a period of six months from the date of interview.

- The posts of Deans of the Colleges, Dean, Postgraduate Studies, Director of Research and Director of Extension Education shall be on whole-time basis for a tenure of four years or till superannuation, whichever is earlier. A person selected shall not be eligible for appointment for more than two terms. The appointment of Dean/Director can be terminated by the Board of Management on the recommendations of the Vice-Chancellor even before the completion of his/her tenure for reasons to be recorded and a new Dean/Director shall be appointed according to the procedure prescribed in the Statutes.
- The posts of Student Welfare Officer, Estate Officer and Librarian shall be on whole-time basis for a tenure of four years or till superannuation, whichever is earlier. A person selected shall not be eligible for appointment for more than two terms. The appointment of Student Welfare Officer, Estate Officer and Librarian can be terminated by the Board of Management on the recommendations of the Vice-Chancellor even before the completion of his/her tenure for reasons to be recorded and a new Dean/ Director shall be appointed according to the procedure prescribed in the Statutes.

6.6.1.4. Decentralization of Powers

The Board of Management of PAU through Chapter XXIII of Act & Statutes of PAU provides decentralization of power by delegation of administrative and financial powers to the officers/ employees of the University.

The administrative powers delegated to the officers of the University have been detailed in the Statutes of PAU and are given below.



ADMINISTRATIVE POWERS

Vice-Chancellor

- a. The Vice Chancellor shall be the principal executive and academic officer of the corresponding University and the Chairman of the Academic Council and shall, in the absence of the Chancellor, preside at the convocation of the corresponding University and shall confer degrees on persons entitled to receive them.
- b. The Vice Chancellor shall exercise control over the affairs of the corresponding University and shall be responsible for the due maintenance of discipline at that University.
- c. The Vice Chancellor shall convene meetings of the Academic Council unless he temporarily delegates this power to some other officer of the corresponding University.
- d. Without prejudice to the powers conferred by this Act on the appropriate Government, the Vice Chancellor shall ensure the faithful observance of the provisions of this Act and the Statutes and shall exercise all such powers as may be necessary in that behalf.
- e. The Vice Chancellor shall be responsible for the presentation of the budget and the statement of accounts to the Board.
- f. In any emergency, which, in the opinion of the Vice-Chancellor, requires immediate action to be taken, he shall take such action as he deems necessary and shall, at the earliest opportunity report the action taken to the officer, authority or other body for confirmation, who or which in the ordinary course would have dealt with the matter, but nothing in this sub-section shall be deemed to empower the Vice Chancellor to incur any expenditure not duly authorised and provided for in the budget.
- g. Where any action by the Vice Chancellor under sub-section (6) affects any person in the service of the corresponding University to his disadvantage, such action shall not be taken unless the person concerned has been given a reasonable opportunity of being heard, and the person against whom any action is proposed to be taken may prefer an appeal to the Board within thirty days of the date on which the action proposed to be taken against him is communicated to him.
- h. Subject as aforesaid, the Vice Chancellor shall give effect to the orders of the Board regarding the appointment, suspension and dismissal of officers, teachers and other employees of the corresponding University.
- i. The Vice Chancellor shall be responsible for the close co-ordination and integration of teaching, research and extension education.
- j. The Vice Chancellor shall exercise such other powers as may be prescribed.
- k. The salary and allowances payable to the officers, teachers and other employees of the corresponding University shall be determined by the Vice Chancellor with the approval of the Board.

Registrar

In exercise of his duties under Section 17 of the Act, the Registrar shall :-

- a. Issue notices and maintain the minutes of all meetings of the Academic Council and the Board of Management and of Committees appointed by them;
- b. Conduct the official correspondence of the Academic Council and the Board;
- c. Be responsible for admission of students to the University, including the supervision of the entrance examination, if any;
- d. Be responsible for registration of students of the University;
- e. Be responsible for maintaining a register of all degrees/diplomas conferred by the University;
- f. Be responsible for maintaining all students' records;
- g. Obtain the grades of the students from the instructors and issue trimester/semester reports and transcripts;
- h. Perform such other duties and functions as are assigned to him by the Vice-Chancellor.

Dean Post Graduate Studies

The Dean Post Graduate Studies shall be responsible for the organisation and conduct of postgraduate teaching in all the constituent colleges of the Punjab Agricultural University and for that purpose, shall pass such orders as may be necessary in consultation with the Deans of the constituent colleges and the Directors of Research and Extension Education, where such consultation is considered necessary.

- a. He shall in collaboration with the Director of Research, be responsible for the coordination of research of the postgraduate students and its integration with the general research programme of the University.
- b. He shall preside over the meetings of the postgraduate committee.
- c. He shall formulate and present policies to the postgraduate committee for its consideration without prejudice to the right of any member to present any matter to the postgraduate committee.
- d. He shall forward the recommendations of the postgraduate committee, to the Vice - Chancellor or the Academic Council as the case may be.
- e. He shall maintain record of the postgraduate students in the Punjab Agricultural University and also supervise their progress.
- f. He shall be responsible for the maintenance of proper standards of postgraduate instructions.
- g. He shall, in consultation with the Heads of Departments, exercise control over the teaching load of the members of the postgraduate faculty.
- h. He shall provide, in consultation with the Heads of Departments, guidance and leadership in the development of periodic evaluation of effective curricula within each subject-matter and integration of the said curricula into appropriate instruction programme designed to prepare students for effective careers in research, teaching and extension.
- i. He shall be a member of the Advisory Committee for Resident Instruction, Research

Advisory Committee and Extension Education Advisory Committee.

- j. He shall prepare budget for the postgraduate programme of the University which shall be incorporated in the budget of the constituent colleges by the concerned Deans.
- k. He shall perform such other duties as may be entrusted to him by the Vice-Chancellor from time to time for effective co-ordination of postgraduate teaching in the University.

Deans of Colleges

There are six colleges in Punjab Agricultural University and each college is headed by the concerned Dean.

- a. He/she shall be responsible for the organisation and conduct of teaching in the Departments comprising the College and for that purpose shall pass such orders as may be necessary in consultation with the Heads of Departments concerned.
- b. He/she shall be responsible for the due observance of the Statutes and Rules relating to the College.
- c. He/she shall preside over the meetings of the Board of Studies of the College.
- d. He/she shall formulate and present policies to the Board of Studies of the College for its considerations, without prejudice to the right of any member to present any matter to the respective Board of Studies.
- e. He/she shall submit reports to the Vice-Chancellor on the working of the College regarding resident instructions.
- f. He/she shall be responsible to the Vice-Chancellor for the use of the buildings and rooms of the College and for the equipment of the College.
- g. He/she shall serve as the medium of communication for all official business of the College with other authorities of the University, the students and the public.
- h. He/she shall normally represent the College in conferences and where necessary, he may designate representatives from amongst the staff of the College for specific conferences on resident instructions.



- i. He/she shall prepare the budget of the College.
- j. He/she shall exercise, in consultation with the Heads of Departments, administrative control over the teaching loads of the members of faculty and work with the Directors of Research/Extension Education on workload assignments of joint teaching, research or teaching extension personnel.
- k. He/she shall be responsible to the Vice-Chancellor for maintaining discipline, law and order in the College and for the discharge of his/ her duties, he may award suitable punishment e.g. fine/rustication/ expulsion etc., to students for acts of indiscipline and misdemeanour.

Director of Research

The Director of Research shall coordinate all research in the University in cooperation with the Deans. While his dealings would be mainly with the staff concerned with research in Departments of Colleges, he shall be directly responsible to the Vice-Chancellor for the initiation, guidance and coordination of the research programme of the University and its out-stations.

- a. He shall be responsible for initiation, organization and conduct of research programmes of the University and for that purpose, shall pass such orders as may be necessary in consultation with the Heads of the Departments concerned.
- b. He shall exercise broad administrative control over: (i) research staff, (ii) research funds allotted for the purpose, and (iii) all physical properties, facilities and materials assigned by the University for the pursuit of the research programme.
- c. He shall prepare, in consultation with the Heads of Departments the budgetary needs of research of different Departments of the University.
- d. He shall be the principal liaison officer for dealing with aid-granting agencies, such as ICAR, Commodity Committees or private institutions.
- e. He shall formulate and present policies to the Research Advisory Committee for its

consideration.

- f. He shall publish regularly research bulletins, circulars, articles in scientific journals and popular magazines and press releases which summarize practical research findings on important problems.
- g. In formulating research policies and programmes of the University, he shall work in close consultation with the Deans and the Director of Extension Education.
- h. He shall assume leadership in development and maintenance of research productivity of a high level by :
 - promotion of self-improvement on the part of research personnel;
 - stimulation of a wholesome, aggressive esprit de corps; and
 - development of an attitude in the minds of the staff as to the worthiness and self-satisfaction (humble pride) of a life vocation of service in the field of agricultural research.
- i. He may represent the University in conferences regarding research.

Director of Extension Education

The Director of Extension Education shall plan and execute all extension education programmes and activities in cooperation with the Deans and the Director of Research.

The Director of Extension Education shall supervise and control the field activities of the extension subject-matter specialists who shall otherwise hold academic rank and be members of the staff of the departments.

- a. He shall be responsible for initiation, organization and conduct of extension educational programmes of the University, and for that purpose, shall passes such orders as may be necessary, in consultation with the Heads of Departments concerned.
- b. He shall exercise broad administrative control over :**
 - (i) Extension Education staff.
 - (ii) Extension Education funds allotted for this purpose; and

- (iii) All physical properties, facilities and materials assigned by the University for the pursuit of extension programmes.
- c. He shall assess, in consultation with Heads of Departments, the budgetary needs of extension education of different Departments of the University
- d. He shall be the principal liaison officer for dealing with such agencies as the Departments of Agriculture, Animal Husbandry, Co-operation, Development and Panchayats of the Government in the matter of extension education.
- e. He shall formulate and present extension educational programme of the Extension Advisory Committee, for its consideration.
- f. He shall guide and supervise the working of the Information Section dealing with publications, audio-visual aids, radio, press and other materials directed to the successful implementation of the extension educational programmes.
- g. In formulating the extension policies and programmes of the University, he shall work in close consultation with the Deans of Colleges and Director of Research.
- h. He shall assume leadership in the development and maintenance of effective and productive extension educational programmes :
 - promotion of self-improvement on the part of extension personnel; and
 - inculcation in them of a missionary spirit for dedicated service to the farmers of the State.
- i. He may represent the University in conferences regarding extension education.
- d. To assist in the placement of graduates of the University;
- e. To obtain travel facilities for holidays, study tours of students;
- f. To communicate with the guardians of students concerning the welfare of the students;
- g. To exercise general control and supervision over the physical education programme and other co-curricular activities of the students;
- h. To perform such other duties as may be entrusted to him by the Vice-Chancellor from time to time.

Comptroller

The Comptroller, PAU shall be responsible to the Vice-Chancellor to ensure:-

- a. Expenditure, not authorised in the budget, is not incurred without appropriate sanction;
- b. All finances/money belonging to the University are kept in a scheduled bank approved by the Board of Management;
- c. All the accounts of the University are properly kept, adjusted and audited;
- d. The budget of the University is prepared and submitted to the Vice-Chancellor and that the financial sanctions are obtained in time;
- e. Income and fees due to the University are collected and that salaries and other amounts due to the staff and others are paid promptly;
- f. Notices are issued and the minutes of all meetings of the Finance Committee are maintained to conduct the official correspondence of the Finance Committee;
- g. Development plans are prepared;
- h. Dealings with the Government, with the authority responsible for the auditing of the accounts of the University, Commodity, Committees and other aid-granting agencies regarding financial and accounts matters, are on correct lines.

Estate Officer

The Estate Officer shall work under the control and supervision of the Vice-Chancellor and in the exercise of his responsibilities, under Section 19

Director of Students' Welfare

The Director of Students' Welfare shall be directly responsible to the Vice-Chancellor and shall have the following duties:

- a. To make arrangements for the housing and messing of students;
- b. To direct a programme of student counselling;
- c. To arrange for the part-time employment of students in accordance with the plan approved by the Vice-Chancellor;



of the Act, shall be responsible for the following:-

- a. Maintenance of the University buildings, fencing, lands, other than the land comprising the agricultural farms;
- b. Maintenance of fire protection services;
- c. Preparation of the maintenance budget of the University;
- d. Maintenance of accounts relating to the maintenance work in his charge on prescribed forms;
- e. Maintenance of an up-to-date record of all the immovable properties of the University, including lands and buildings in co-operation with the Heads of Departments;
- f. Procurement/disposal of immovable property of the University.

Chief Engineer

The Chief Engineer shall work under the control and supervision of the Vice-Chancellor and shall be responsible for the following:

- a. Construction and maintenance of utility services;
- b. Maintenance of architectural and construction services of the University;
- c. All University construction;
- d. Preparation of the annual construction budget of the University and a periodical report showing the progress of works under construction;
- e. Maintenance of accounts relating to the works in his charge on prescribed forms.

Librarian

The Librarian shall work under the control and supervision of the Vice-Chancellor and, in exercise of his responsibilities under Section 22 of the Act, shall be responsible for the maintenance of all libraries of the University and for the organization of their services. The University Librarian shall have the following powers and duties:

- a. He/ she shall have general overall supervision of the University Library, and Library personnel and departments; libraries or collections;
- b. He/ she shall prepare the Library budget for

the University Library including Department collections;

- c. He/ she shall have the responsibility of receiving and accessioning all library materials;
- d. He/ she shall have the responsibility of initiating the purchase requisitions for all library materials;
- e. He/ she shall have the responsibility of renewing in time subscriptions to journals;
- f. He/ she shall prepare a library newsletter at monthly intervals which will carry a list of all library materials received since the last preceding newsletter and other timely library news of interest to students and staff;
- g. He/ she shall initiate, participate and cooperate in programme designed to stimulate and encourage the use of the library by students and staff;
- h. He/ she shall arrange library hours which will permit maximum library use by both students and faculty; and
- i. He/ she shall arrange for departments and selected research sub-stations, small collections of volumes and journals that are in almost constant use by the staff and postgraduate students as references.

6.6.1.5. Supporting Units

Several supporting units have been established at the University level which helps in the effective functioning of the day-to-day activities on the campus (Fig. 4).

Estate Organisation: The estate organisation of PAU takes care of the university buildings, residential area, electrical supply lines, sewer and water supply lines, roads, landscape and security operations on the campus. Adequate staff strength, including two Executive Engineers (Civil and Electrical), two Sub-Divisional Engineers (Maintenance and Public Health), and a Security Officer are available in the estate organisation, reporting to PAU Estate Officer. Further, the maintenance wing, public health wing and electrical wings of the University are strengthened with the required manpower and equipment facilities to deliver these services. Necessary support to the outstation centres and

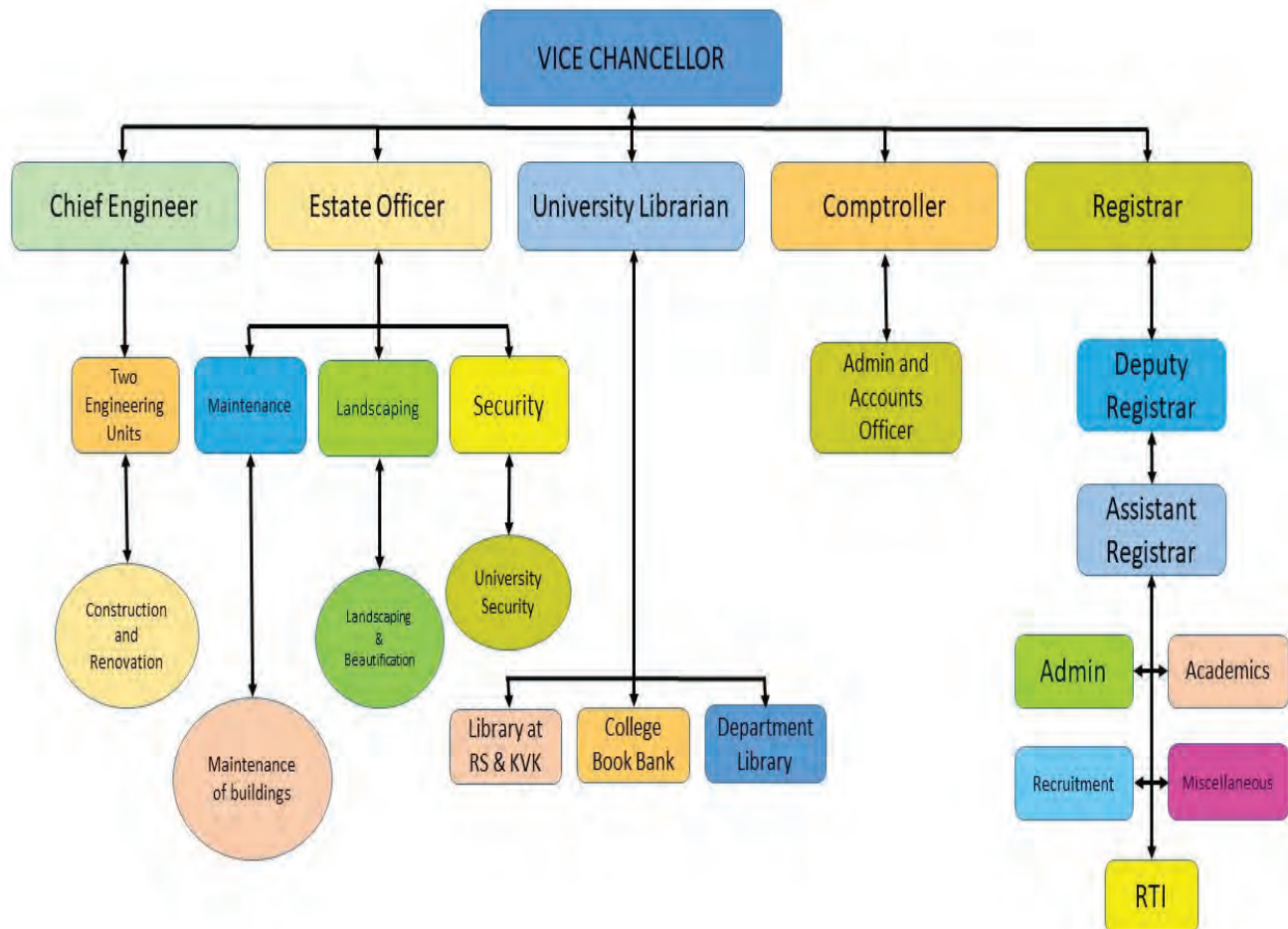


Fig. 4: Channels of Communication for Support Services in Punjab Agricultural University

offices is also provided by the estate organisation as and when required.

Office of the Chief Engineer: To carry out the construction work in the University, PAU has an office of the Chief Engineer which executes the civil project activities. This unit prepares the construction/ repair estimates, building designs, floating tenders (as applicable) and carries out construction work through contractors based on the project requirements.

Health Facilities: To meet the medical needs of students, faculty and staff, PAU has 20-bed University Hospital in the campus on an area of 16604 sq.ft. The hospital has two female and one male Medical Officer, one staff nurse, one MHW, four nursing assistants, two pharmacists, two lab technicians and one radiography technician. The hospital is equipped with a clinical laboratory, a Radiology section with an X-ray unit and an Ambulance. The Biochemistry Lab has an auto-analyser and caters to various tests like CBC, ESR, Blood biochemistry test (LFT, kidney function test,

lipid profile) blood serology for RA factor and routine urine analysis tests. The students, staff and staff dependants are provided with a free facility for all the above tests. Annually, on an average, about 30,000 patients are treated at this centre. In addition, regular medical examination of students and the new job entrants is conducted.

University Workshop: University Workshop is not a commercial unit, but a facility for the immediate supporting repairs. It is established for repair and maintenance, overhauling of the university vehicles, paintwork of buildings and road signage, carpentry, welding and fitting jobs etc. without any charges. Foreman, mechanics and equipment support are available in the workshop to perform duties. The estimation and inspection of tyres, batteries and spare parts is carried out by the University Workshop.

Printing Press: PAU has its own Printing Press to prepare the university stationery items including writing pads, file covers, papers information brochures and other publications. Adequate paper



printing, binding and cutting facilities are available in the campus for carrying in-house activities/jobs. However, processes for printing job work to be outsourced have also been established at the university level.

Store Purchase Organisation: To make available routine usage centralized items like office stationery, electrical appliance etc. to various sections/ departments in the University, a central store is established under Store Purchase Organisation (SPO) working under the Office of University Comptroller. The SPO also coordinates the Central Purchase Committee work, tender process, placement of purchase orders and procurement etc. to make purchase procedure efficient and transparent.

SC/ST Cell: The University has a policy in place for the welfare of employees and students. A nodal officer has been appointed by the university to ensure the implementation of various policies as per the guidelines of the State Government and Central Government for requisite representation of reserved categories in university services (direct recruitment and promotions). The University also ensures proper implementation of various schemes of UGC, Government of India and State Government concerning scholarships, stipends etc. for the welfare of reserved categories. The University has a dedicated Scholarship Cell for all SC/ST scholarships, through which scholarships are provided to the students. The guidelines for various types of scholarships/ stipends as revised from time to time by the Central and State Governments are notified to all departments and are displayed on the Notice Boards of the concerned departments. These are also incorporated in the University Prospectus for its wide publicity for the benefit of the students of reserved categories. This Cell ensures that these guidelines are strictly adhered.

6.6.1.6. Technology Support

To upgrade and enhance the system efficiency in academic, research, extension and administrative affairs of the university, technological interventions are always made at each level. The entire campus is covered under internet connectivity through cable network and also through WiFi facility in the colleges, hostels and office premises. Necessary

hardware and software facilities have been incorporated in each section of the University. Accordingly, faculty and staff members have also been trained in bringing these changes and adopting technological tools in their work.

- a) **Administration:** To bring administrative reforms in the university, PAU has introduced electronic and computer tools in the processes which include online fee collection, centralised salary payment system, purchase and financial management system (PFMS), campus-wide camera network for monitoring and control of security operations.
- b) **Academics:** Every college has SMART class rooms, need-based computer labs and specialised softwares (as mentioned in point 6.6.2.6). Online semester registration (Fig. 5a, 5b), attendance, result preparation and submission have been adopted in all the colleges of the University. The class rooms are equipped with latest audio-visual aids to make learning process more participative and elaborative. The academic centre of the University, PAU Library has been upgraded as fully computerised and digital facility with latest online solutions available to students and faculty of the university. The details regarding PAU Library are further discussed in point no. 6.6.2.3. Video lectures are also made available to the students through the National Knowledge Network (NKN) project in the University.
- c) **Research:** PAU has been carrying out prestigious research work under various national and international projects as the lead or consortium partner. Data management tools, decision support systems (Fig. 6), predictive analytics, MATLAB, design software solutions etc. are used by the research teams.
- d) **Extension:** PAU has well established linkages with farmers and various functionaries to deliver its duties and build its capacity from the strengths/experiences of partner stakeholders. A network of KVKs, FASS and extension agencies has been established through internet and android based group applications. Farm literature alongwith package of practices and latest information

related crop production practices are shared with the farmers through dedicated web portals and mobile apps (Fig. 7 and 8).

6.6.1.7. Institutional Data Base and Website Update

The University Website is maintained and hosted by the Department of Electrical Engineering

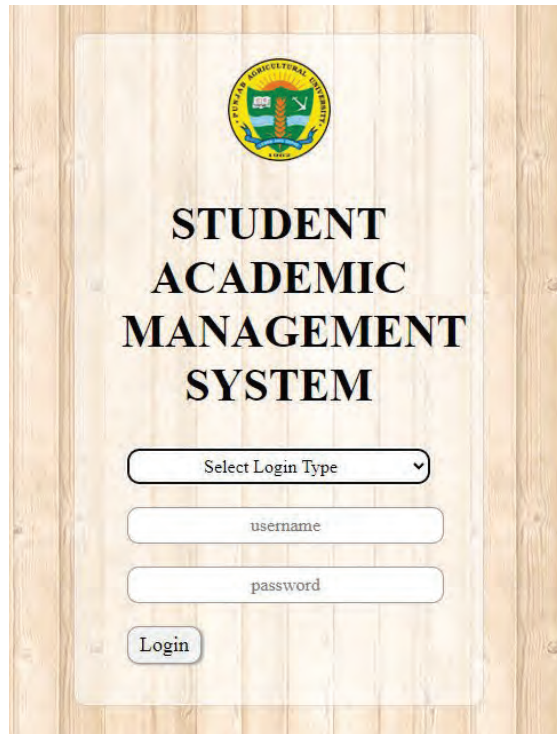


Fig. 5a: Screen view of Student Academic Management System for online registration

Year 2023
Semester FIRST SECOND SUM. SESS. WINTER SESSION
 Load.....

List of Courses offered in the Academic Semester -2,2023-2024

Course No	Course Title	Credit Hours	Stream Year	Lecture type	Section	Programme/ Discipline (ProgramID)
GPB-506	GPB-506 (Molecular Breeding and Biotechnology)	2+1	2022	P	A	Ph.D. Biotechnology Ph.D. Vegetable Science M.Sc. Biotechnology M.Sc. Plant Breeding & Genetics Ph.D. Horticulture (Vegetable Science) M.Sc Genetics & Plant Breeding M.Sc Molecular Biology & Biotechnology Ph.D. Molecular Biology & Biotechnology

Print

Fig. 5b: Screen view of Student Academic Management System for online registration

Web-Based Decision Support System for Late Blight Disease of Potato

[View in Punjabi](#)

Home
Late Blight Maps
About Project
Site Map
FAQ
Advisory

Potato Cultivation in Punjab

Late Blight Disease of Potato

Favourable conditions for late blight development

Management of Late Blight

Cautions and Useful Tips

Contact Us

Location of Automatic Weather Stations

Late Blight Forecast

District:

Daily Weekly

Date:

Expected Disease Severity Value:

Decision Support System for Late Blight

Late blight is a serious disease of potato and drastically affects tuber yields. Effective management of this disease is realized through application of fungicides. The project aims to develop decision support system (DSS) for timely management of this disease and will lead to need based rational and economical use of fungicides. The web enabled DSS will help the farmers in taking timely measures for managing this disease.

[More.....](#)

Fig. 6: Screen view of one of the online Decision Support Systems

47944

ਪੰਜਾਬ ਐਗਰੀਕਲਚਰਲ ਯੂਨੀਵਰਸਿਟੀ, ਲੁਧਿਆਣਾ

ਬਾਰੀ ਕ੍ਰਾਂਤੀ ਦੇ 50 ਸਾਲ

ਕਿਸਾਨ ਪੋਰਟਲ

ਮੁੱਖ ਪੰਨਾ
ਨਿਰਦੇਸ਼ਕ ਪਸਾਰ ਸਿੱਖਿਆ
ਟ੍ਰੇਨਿੰਗਾਂ
ਮਹੀਨੇਵਾਰ ਰੁਖੇਵੇਂ
ਸਫਲ ਕਿਸਾਨ
ਫੋਟੋ ਗੈਲਰੀ
ਮੰਡੀਕਰਨ
ਸੰਪਰਕ ਕਰੋ

ਫ਼ਸਲਾਂ

ਖੇਤੀ ਮਸ਼ੀਨਰੀ

ਪ੍ਰੋਸੈਸਿੰਗ ਮਸ਼ੀਨਾਂ ਅਤੇ ਤਕਨੀਕਾਂ

ਵਣ ਖੇਤੀ

ਸਬਜ਼ੀਆਂ

ਫਲ

ਫੁੱਲ

ਖੇਤੀ ਸਹਾਇਕ ਧੰਦੇ

ਜੈਵਿਕ ਖੇਤੀ

ਬੀਜ

ਪ੍ਰਕਾਸ਼ਨਾਵਾਂ

ਕਿਸਾਨ ਬੀਬੀਆਂ ਲਈ

ਮੇਸਮ ਨਾਲ ਸੰਬੰਧਿਤ ਖੇਤੀ ਸਲਾਹ

ਹੋਰ ਜਾਣਕਾਰੀ

- ਮਿੱਟੀ ਅਤੇ ਪਾਣੀ ਪਰਖ
- ਜੀਵਾਣੂ ਖਾਦਾਂ
- ਰਸਾਇਣਕ ਖਾਦਾਂ
- ਮਿਸ਼ਰਤ ਖਾਦਾਂ
- ਖਾਰੇ ਪਾਣੀ ਦੀ ਸਿੰਚਾਈ ਲਈ ਵਰਤੋਂ
- ਪੀਣ ਯੋਗ ਪਾਣੀ ਪਰਖ ਕਿੱਟ
- ਪਰਾਲੀ ਦੀ ਸੰਭਾਲ
- ਬੀਜ ਸੋਧ
- ਬਹੁ-ਫਸਲੀ ਪ੍ਰਣਾਲੀ
- ਖੇਤੀ ਰਸਾਇਣਾਂ ਦੇ ਛਿੜਕਾਅ ਦਾ ਢੰਗ
- ਗਾਜਰ ਬੂਟੀ/ਭੰਗ ਦੀ ਰੋਕਥਾਮ
- ਠਕਸਾਨ ਦਾਇਕ ਪੱਛੀਆਂ ਦੀ ਰੋਕਥਾਮ
- ਚੂਹਿਆਂ ਦੀ ਰੋਕਥਾਮ
- ਖੁਹਾਂ ਵਿੱਚ ਗੈਸ ਦੀ ਸਮੱਸਿਆ
- ਖੇਤੀ ਹਾਦਸਿਆਂ ਤੋਂ ਬਚਾਅ
- ਸੂਰਜੀ ਊਰਜਾ ਦੀ ਵਰਤੋਂ
- ਖੇਤੀ ਕਾਮਿਆਂ ਲਈ ਵਸਤਰ

Fig. 7: Screen view of dedicated web portal



Fig. 8: Screen view of PAU Mobile Applications

and Information Technology. The Department provides and maintains the essential IT services viz. distribution of internet, e-mail and web server. The PAU website is regularly updated. The research data is compiled at the level of Directorate of Research under the umbrella of ICAR research data management system. A new user friendly format of the website is being created. A database management group has been formed in the Directorate of Research. In all the colleges at department level, one person is designated to update the website regularly. It will collect data of research as well as human resource development and act as a repository of data. Research outcomes in the form of Thesis/ Project reports / Technical Bulletins are archived at the University Library. A softcopy of the same is uploaded to Krishi Prabha – a portal for thesis digitization updation. Institutional Data of NIRF is uploaded on University Website. All India Survey on Higher Education (AISHE) is regularly uploaded on AISHE portal under MHRD. The website of the university (www.pau.edu) is maintained by the Associate Director – Information Technology. Institutional database is maintained through different portals such as Fee Collection Portal, Online Registration System, Admissions Portal. Information about the events being organized by the University are displayed on the website. All departments have been given

their login credentials to update information of their respective departments on regular basis.

6.6.1.8. Interdepartmental Linkages

Various departments, placed under the six constituent colleges, have very close linkages with one another. The academic programmes of the Colleges have been framed and implemented as per recommendations of Fifth Deans' Committee (FDC) of ICAR. Academic support for various UG programmes is well supported by inter-departmental linkages. Various departments of College of Basic Sciences and Humanities provide support to the UG programmes of College of Agriculture, College of Agricultural Engineering and Technology, College of Horticulture and Forestry and College of Community Science. In the PG programmes, students opt for minor and supporting courses from departments within their college or from other colleges depending upon the area of research to be undertaken by the student. This allows for very effective linkages within the university.

In the Directorate of Research, the University has created and filled four posts of Additional Director of Research (ADR) (Crop Improvement, Horticulture & Food Science, Natural Resource & Plant Health Management and Farm Machinery & Bio-energy) to augment research capability of the



University in the prioritized areas and enhance coordination in research planning and monitoring. All the ADRs assist the Director of Research in planning, monitoring and coordinating scientific research on various aspects relating to Crop Improvement and IPR across the colleges in PAU Campus and outstations. They also motivate the faculty to write new research projects, scrutinize the submitted research projects and review the synopsis of PG students.

Interdisciplinary group of scientists has been formed to solve the emerging problems of agriculture. One such recent example is the Crop Residue Management group formed for developing interventions for effective paddy straw management/ utilization. This group has scientists from Departments of Farm Machinery and Power Engineering, Soil Science, Microbiology, Biochemistry and Renewable Energy Engineering.

Progressive farmers and industrialists are occasionally invited to deliver special lectures to UG students in their respective courses. The undergraduate students of all the programmes are associated with progressive farmers, KVKs, State Agricultural Department, State Forest Department, Food Processing Industries, Wood-based industries, etc. for Rural Agriculture Work Experience (RAWEX), Experiential Learning Programme (ELP) and Agro-Industrial Attachment (AIA) trainings. Students develop a close linkage with various organisations like cooperative societies, panchayats, industries and departments. Apart from this, exposure visits are arranged for students of many UG courses to the related industry, sites, situations, etc. to fulfil their course curriculum requirements. During mandatory educational tour visits, students interact with industries, farmers, students and teachers in various national and international institutions outside the state. Experts from these industries are invited to share latest developments in the industry for the benefit of students. The research problems of the students are decided, keeping in view the industry needs.

6.6.1.9. Monitoring Mechanism

The constituent colleges of the university follow the prescribed course curriculum with

the suggested changes by internal faculty, if any, to have parity of syllabus with other State Agricultural Universities. The course curriculum is revised periodically by following the National level expert committee recommendations. The recommendations of the Fifth Deans' Committee with certain modifications suitable to the students according to their degrees have been implemented in all the Colleges of the University at undergraduate level since 2016-17. For the Postgraduate level courses, the University follows the ICAR' BSMA recommendations since 2022-23.

The Deans of respective colleges monitor the monthly attendance of students in all the courses. The overall evaluation of a student in the courses registered is through hourly, mid-term and end-of-the-term examination in the semester. Laboratory and library assignments on special problems and seminars are also exercised to evaluate the students' performance. The question papers are screened at the Dean's Level for their comprehensiveness and students' evaluation quality. Teachers provide feedback to students and report student learning outcomes to parents at regular intervals. Similarly, the advisory system for post graduate students, HODs and Dean PGS keep a constant check on students' academic performance as well as their personal and social behaviour.

The University has a well established advisory system for both undergraduate and postgraduate system. The newly admitted undergraduate students are allocated with academic advisors who meet students once in a week to monitor the progress and problems faced by them during the course of study. Heads of Departments and Deans of constituent colleges interact with students from time to time to ensure quality education. They also visit classrooms, especially the practical classes to ensure hands-on trainings to students and fields for farm demonstrations.

Even the newly recruited faculty undergo a 10 day Orientation Course on "Effective Teaching, Research and Extension". Further, they are mandated to undertake six month induction training at various KVKs and RRS to make them acquaint with the current agricultural scenario of the state.

The University has developed a basic systematic monitoring and evaluation system for the performance of teachers. CCTVs have been installed in all the lecture rooms to monitor the regularity of classes. The evaluation of teachers by the students helps to sensitize the teachers to improve upon their teaching skills. The University follows comprehensive curriculum monitoring mechanism which includes teachers' Annual Performance Appraisal Report (APAR) to check their teaching, research and extension effectiveness. APAR of Assistant/ Associate Professors or equivalent are evaluated by their reporting officer, committee at the department level and the accepting authority at Dean/Director level whereas the APAR of Professors and equivalent are reviewed by the committee comprising of Head, Dean of respective college, Dean, Postgraduate Studies and Director of Research/Director of Extension Education. This helps the administration to monitor the faculty effectiveness and also to stress upon the improvement in overall system.

6.6.1.10. Institute Quality Assurance Cell/ Project Monitoring & Evaluation (PME) Cell

The University is ISO 9001: 2015 compliant.

Realizing the importance of a PME Cell and the critical role it could play in facilitating effective management of research projects at PAU, the PME Cell at PAU was established on 12.1.2014 and was reconstituted on 22.12.2017. The constitution of the PME cell at PAU is given below:

1. Vice-Chancellor - Chairman
2. Director of Research
4. All Additional Directors of Research - 4
3. All Additional Directors of Extension Education- 2
4. Additional Comptroller
5. Director, TMIPR Cell- (Secretary)

The scientists develop project proposals based on the information collected through: i) field visits and interaction with various stakeholders to identify the problems and research gaps; and ii) literature search to understand the existing research gap.

The proposals are submitted to the Project Review Committee of the concerned college which after discussion with all Heads of Departments recommend it to the PME Cell of PAU. Here it is critically examined in terms of relevance, scientific merit and feasibility by the Project Monitoring and Evaluation Cell. The project is submitted to the funding agency only after approval by the PME Cell.

The review of physical and financial progress of various research projects of all the Departments and Research Stations running in university is undertaken by the PME Cell. This exercise was undertaken in 2018. The periodic review helps in plugging the loopholes/deficiencies to achieve the physical and financial targets.

6.6.1.11. Collaboration with Academic Institutions and Industry

The PAU has very strong collaborations with leading industries in Tractors and Farm Machinery, Food, Agro-Chemicals, Seed Production and IT Sector organizations for research and development; academic excellence-cum-institution development; technology transfer activities. Nine MoUs between PAU and industrial organisations including ITC, Nestle, FMC, John Deere, IBM, Gujarat Seeds, Nippon Steels, Sumikin Bussan, Pargo Frozen Foods, Sokhi Manufacturing etc. are active to work in collaboration with industry partners. PAU has also established relations with industries including Avon Cycles, Vardhman, ICICI Foundation etc. to carry out collaborative activities under their CSR project initiatives.

Further, PAU has been taking timely initiatives to extend its outreach programs for building institution relations with corporate sector organisations including Confederation of Indian Industry (CII), Chamber of Industrial & Commercial Undertakings (CICU), Federation of Indian Chambers of Commerce & Industry (FICCI) etc. for enhancing collaborations.

The details of different schemes funded by various industries /organisations during last five year are given in Annexure II.

6.6.2. Academic Support

6.6.2.1. Academic Council

The Academic Council is the supreme body administering the academic functioning of the university. The PAU Act and Statutes provides powers to the Academic Council to supervise, direct and control, and be responsible for the maintenance of the standards of instructions, education and examinations and other matters connected with obtaining the degrees and shall exercise such other powers and perform such other duties as may be prescribed.

Composition of the Academic Council

- a) The Vice Chancellor - Chairperson
- b) The Dean of the Postgraduate Studies
- c) The Deans of the Colleges of the University
- d) The Director of Research
- e) The Director of Extension Education
- f) Senior-most Head of Department from each College
- g) Registrar – Member Secretary

The Director Students Welfare, Controller of Examinations, National Professors and President, PAU Teachers' Association also attend meetings of the Council as special invitees. The Academic

Council can call any teacher or officer of the University whenever discussion on a specific agenda item so requires.

The details of the meetings held in the last five years (2018-19 to 2023-24) are given in Table 2.1.

Table 2.1: Details of Academic Council meetings held in last five years

Sr. No	No. of Academic Council meeting	Date of meeting	No. and date of proceedings*
1.	396	24.07.2018	18187-212/27.07.2018
2.	397	30.07.2018	19062-87/06.08.2018
3.	398	18.08.2018	20436-61/21.08.2018
4.	399	05.12.2018	26490-16A/13.12.2018
5.	400	16.01.2019	1425-50/21.01.2019
6.	401	18.03.2019	5436-61/22.03.2019
7.	402	17.07.2019	14035-60/22.07.2019
8.	403	21.08.2019	18647-72/03.09.2019
9.	404	20.09.2019	20949-75/22.09.2019
10.	405	28.09.2019	21277-300/28.09.2019
11.	406	10.01.2020	767-796/14.01.2020
12.	407	20.03.2020	8286-311/30.04.2020
13.	408	01.07.2020	14315-40/12.07.2020
14.	409	28.07.2020	15330-355/30.07.2020
15.	410	4.08.2020/ 07.08.2020	16294-319/11.08.2020
16.	411	14.10.2020	19318-27/15.10.2020
17.	412	12.12.2020	28875-905/31.12.2020

18.	413	01.03.2021	5447-471/12.03.2021
19.	414	27.04.2021	9918-45/03.05.2021
20.	415	05.08.2021	15724-47/10.08.2021
21.	416	12.11.2021	20078-102/17.11.2021
22.	417	27.12.2021	175-199/05.01.2022
23.	418	23.02.2022	2140-65/28.02.2022
24.	419	07.03.2022	2615-40/09.03.2022
25.	420	25.05.2022	5738-63/27.05.2022
26.	421	07.09.2022	11174-200/09.09.2022
27.	422	08.12.2022	17295-319/21.12.2022
28.	423	15.02.2023/ 17.02.2023	2724-48/23.02.2023
29.	424	06.05.2023/ 16.05.2023	7313-37/29.5.2023
30.	425	21.08.2023/ 28.08.2023	19683-706/08.09.2023

* Proceedings of Academic council meeting as well as ATRs will be provided to visiting Accreditation committee.

6.6.2.2. Innovation and Best Practices

The University strives to bring new ideas and adopt best practices for improving overall performance of the students. The University has a strong advisory system for all undergraduate students of the different degree programmes. Under this system, a maximum of ten new entrants (fresh students) are allotted to one teacher (advisor) immediately after the completion of admission process for guiding and grooming of students throughout the degree programme. There is a mandatory culture of holding weekly advisory meetings of the teachers (advisors) with their advisees to discuss the progress of students, problems and other academic affairs. There is a time schedule specially set aside in case of undergraduate students. These students meet their respective advisors on Wednesday at 2.30 pm. Many times, class in-charges, Dean of the respective colleges may call common meetings to discuss important and common issues. Career oriented and motivational lectures are arranged from time to time during these advisory meetings. To apprise the parents of students about the progress of their wards, Parent-Teacher Association (PTA) has been formed in the colleges. Meetings of PTA are also held regularly in which parents come to know about performance of their wards and give feedback for their further improvement.

During their undergraduate programmes, students are provided exposure to different state of art laboratories namely Electronic Microscopy and Nanoscience (EMN) laboratory, Plant Tissue Culture Lab, Plant Transformation Lab, Molecular Biology Lab, Molecular Cytogenetic Lab, Genomics Lab, Herbicide Residue Lab, Crop Physiology Lab, Insect Molecular Biology Lab, Biological Control Toxicology Lab; are among few. These labs are equipped with latest equipments from across the country. Classrooms in the various colleges are well furnished having all kinds of audio-visual aids along with computer, projector and internet facility. Smart classrooms have also been setup in all the colleges. To give a unique experience of learning, museums have been setup in the different departments namely Soils' museum, National Insect museum, Plant Disease museum, Plant Breeding museum, museum of Rural Life of Punjab, Zoology museum, etc. where students are regularly brought to witness the process of development in different fields.

Practical crop production is hands on practice carrier oriented activity of the students in which students themselves raise crops right from sowing to harvesting/threshing over the year. Each department is offering Experiential Learning Programme to develop entrepreneurial spirit and boost self-employability among the students. In this way, students learn the practical skills in a number of ELPs like commercial apiculture and mass production of parasitoids and predators of insect pests, nursery raising of flowers and ornamentals, nursery raising, hybrid seed production, nursery production of fruit crops, etc. Profit earned from these practical crop production and ELPs activities is distributed between students which develops a entrepreneurial spirit among them. Various departments provide an opportunity to students to organise various extension activities for the farmers viz. demonstrations, field days, seminars, etc as an experiential learning so as to escalate their managerial skills. To develop originality in ideas and research, plagiarism check for assignments, synopses, theses and dissertations through software has been introduced.

A student exchange programme for Ph.D. students has been developed in which Doctoral students from PAU go to other universities namely CCSHAU



Hissar, CSKHPKV Palampur and YSPUHF Solan to study for one semester and vice versa. Further to improve the quality of PG research and exposure to advanced labs, PAU has introduced the concept of having reputed scientists from National/International institutions as co-major advisors on the advisory committee of PG students. Academic excellence is also inculcated amongst students by inviting Alumni of the university who are placed at high positions through a series of guest lectures/sessions on latest developments in the industry. Field visits to industry/institutes are also taken up to help the students for practical exposure.

The University is in the process of digitalization of academic documentations in the “National Academic Depository (NAD)” in accordance with the guidelines of Ministry of Human Resources Development and University Grants Commission by appointing NSDL Database Management Limited (NDML) to facilitate Academic Institutions to Digitally, Securely and Quickly issue Online Academic Awards to the Students directly in their online NAD Account.

For sensitizing the students towards the clean and safe environment, PAU follows innovative/ good practices.

Green Environment

The University is kept very neat and clean with green environment. Volunteers of Eco Club, NSS and NCC play vital role in maintaining the eco- friendliness of the campus. Tree plantation, prohibition of the use of plastic and polythene bags, periodical cleaning of the campus are some of the Eco-friendly activities initiated by the University. With the objective of clean environment, University has also started PAU Peddlers, where cycles have been provided on rent basis and E-rickshaws are available for movement within the campus without any charges.

Rainwater Harvesting

As water is a fast depleting resource in the country, there is a need to conserve this valuable resource and to motivate the students, farmers and other stakeholder in this regard. Rainwater harvesting systems have been provided at key locations on the campus.

Waste Management

University has started garbage collection through the firm ‘A2Z’. An effective housekeeping system is practiced where hazardous waste management is effectively taken care of. The Environmental Club, with support from the NSS units, has taken up initiatives in solid waste management. Used papers and other recyclable wastes such as plastics are collected and sent to recycling units. The chemicals and other hazardous waste materials are neutralized before disposal. Old computers and their accessories are deposited to Store Purchase Organization (SPO) office for further necessary action.

6.6.2.3. Library

Universities are the learning centres of higher education and their learning resources reflect the quality of education. Named after Dr. Mohinder Singh Randhawa, a renowned administrator and second Vice Chancellor of Punjab Agricultural University (PAU), the University Library caters to the informational needs of the academia comprising scientists and students of the University. It plays a pivotal role in supporting on-going research, teaching and extension activities of the University.



Library Space and Holdings

Library Space: Mohinder Singh Randhawa Library is housed in a five-storey centrally air-conditioned building having total covered area of 93,320 sq. ft. and a seating capacity of 850 in its six reading halls. It is surrounded by lush green lawns, dotted with beautiful ornamental trees and has pollution free environment. The modular architect of the library is also focused on the state-of-the-art interiors

along with providing congenial environment to the readers. The information about physical infrastructure of the library is given in Table 2.2.

Table 2.2: Physical Infrastructure of the Library

Number of floors	05
Total area	93320 sq.ft
Net area for books & reading halls	74170 sq.ft
Seating capacity	750
Research carrels for intensive study	39
Auditorium seating capacity	70
Two outer reading hall seating capacity (24x7)	120

Library Staff

Sr. No.	Staff	Number
1	Librarian	1 (Addl. Charge)
2	Associate Librarian	2
3	Assistant Librarian	3
4	Junior Library Assistant	04
5	Library Attendants	07
6	Personal Assistant	01
7	Assistant Accounts Officer	01
8	Supporting Staff Sr Asstt.(3), Technical Asstt. (1), Clerk (1), Binder (1), Restorer (1), Packer (1), Messenger (3), Chowkidar (1), Sweeper (1)	14

Library Holdings: Library has an excellent collection of books, journals, theses, e-books, e-journals,



CDs, online databases in the field of Agriculture, Agricultural Engineering, Basic Sciences and Humanities, Home Science and allied areas. The library holdings along with journals and databases subscribed during the period under report (2018-23) are given in Table 2.3. Online Public Access Catalogue (OPAC), online databases, e-journals, e-books and other e-learning resources in addition to photocopying facilities, internet access through 40 computers are available for the members.

During the year 2023 the CeRA usage was 1,09,303, Indiatat.com usage was 4516, CRCnetBASE was accessed 33 times, EBSCO Net Library was used 4824 times. Business Source Elite was used 7213 times, Food Science Source was used 6976 times and Internet usage was 1074 as recorded in the library.

Automation

- Library has successfully automated all its library operations like Cataloguing, Circulation, Serial control, Reference services

Table 2.3: Library Holdings

Particulars	2018-19	2019-20	2020-21	2021-22	2022-23
Total holdings	409101	414058	417017	419616	421061
Books, Print journals, databases, e-journals and e-books added each year					
1. Books	1611	4041	1905	1552	1048
2. Theses	578	419	459	516	212
3. CD format Documents	525	419	459	516	212
4. Indian print journals	22	43	13	4	2
5. Foreign print journals	51	44	16	24	08
6. Online databases	5	5	5	5	4
7. Online journals	-	28	22	22	25
8. Online journals (under CeRA & j-gate)	37103	3578	3578	3947	3950
9. e-books	-	-	51	35	301



etc. by using open source software KOHA. All the documents of library are being entered in KOHA software for their easy access and retrieval.

- **OPAC/WEBOPAC:** Online public access catalogue is available on intranet and Internet for faster and easy searching of the library documents. Campus wide and remote access is available for online catalogue of the library.
- **Scholarly databases CeRA & Krishikosh:** Campus wide online access to scholarly databases Ce RA (Consortium for e- resources in Agriculture) provides full text access to journal articles and KRISHIKOSH provides full text access to Theses. All these electronic services are available online to all the departments of the university. Remote access to all the resources is available for the faculty at the outstations

Anti-plagiarism software: In order to enhance the quality of research PAU library has been instrumental in procuring anti-plagiarism software TURNITIN for the university in order to check the plagiarism in synopses, theses and other research publications of the university during this period.

Library Timings and Usages: The library serves PAU fraternity 361 days of a year with extended working hours from 9.00 AM to 9.00 PM on all working days during summer season and from 9.00 AM to 8.00 PM during winter. The library also opens on Sunday, Saturday and all gazetted holidays from 9.00 AM to 5.00 PM. except Independence Day, Republic Day, Diwali and Holi. In addition to PAU students and faculty, the Library also caters to outsiders for their academic and informational needs through casual membership. Presently there are 4470 permanent members and 80 casual members are enrolled with the library. During 2023 the library had foot fall of 62733 readers/visitors and 9509 books were issued during the year.

Additional Features

- **Research Carrels:** Thirty-nine research carrels are available to the postgraduate students, research scholars and faculty members engaged in library oriented research work.
- **Open book shelf:** Open book shelf facility in the outer reading hall of the library has been started for the library users under which gifted books (350) are kept for use/carry along by the reader as per their requirement.
- **Digitization:** Library has digitized all the theses and PAU publications like PAU Annual Reports, Proceedings of Research and Evaluation Committee, Agricultural Research Journal, Progressive Farming, Change Kheti from 1965 onwards.
- **Section for disabled:** A separate section for disabled was set up with Braille collection to facilitate the disabled persons.
- **Competitive Books Section:** A section namely Competitive Books Section has been created. Books relating to various competitive examinations are displayed in this Section
- **ICAR Publications Corner:** The ICAR is an apex body for coordinating, guiding, managing research and education in agriculture. All the ICAR publications are of incredible significance for providing latest information on on-going national agricultural research. Thus, all such publications are housed separately for the speedy retrieval by the users
- **Maps Section:** The geographical world maps are displayed in this Section to provide single platform access to the users
- **Dr. Randhawa Section:** Rare documents authored by Padma Bhushan Dr. Mohinder Singh Randhawa, the former Vice Chancellor of the University and other books and art pieces donated by him are displayed in this section. This valuable collection is very useful to the historians and research scholars.
- **Book stall facility:** PAU library invite reputed book vendors on first cum first serve basis regularly to exhibit latest published material in the form of book stall covering agriculture & allied areas for the faculty and students of the university.
- **Hall of Fame:** Twenty three portraits of eminent international scientists and administrators are displayed here. These scientists made significant contributions in

the field of agriculture and were associated with PAU in its development.

- **Museum of History of Agriculture:** Thirteen paintings, depicting growth of human civilization from the African ape man to the Green Revolution are displayed in the museum.
- **Library Auditorium:** Auditorium, with a seating capacity of 70, is available to conduct the library users training programmes and other lectures.
- **Outer reading hall :** Two reading halls namely Saxena Reading Hall and Kulbir Singh Gill Reading Hall have been set up to provide reading facility 24x7 to the members where they are allowed to bring their personal books Unique Instructional Material/Techniques adopted
- The university library has automated its operations using KOHA library management software.
- In order to acquaint the undergraduate and postgraduate students, other users and faculty members with Library rules and regulations the various activities are undertaken. The library staff conducted 51 such training/orientation programmes during this period on Using Web OPAC, Information retrieval, User Orientation Programmes for students/faculty and Training on features and use of various online databases.

6.6.2.4. Center for excellence / Advance Studies/Centre for Advanced Faculty Training

Two Centres for Advanced Faculty Trainings (CAFT) have been established in the university to impart trainings to the scientists from institutes/ universities from various parts of the country:

1. Centre of Advanced faculty Training (CAFT) in Soil Science

Year of Establishment	:	1994
Funding Agency	:	ICAR

The Centre of Advanced Faculty Training (CAFT) In Soil Science (earlier CAS in Soil Science) was



sanctioned and established in the Department of Soil Science in the year 1994. The lectures in the training programmes are delivered by the faculty of Soil Science, Agro-forestry, Microbiology, Soil & Water Engineering and other relevant departments. Apart from faculty of Soil Science, many eminent scientists from national and international institutes are being invited to share their experiences on various issues related to theme of the training programmes. Interactive sessions are organized in which all the participants make presentations about the nature of work they are performing at their respective institutes. This exercise has helped the participating scientists to integrate the knowledge they acquired/gained during the course of the training to further improve their teaching & research programmes and submit projects. The participating scientists are in regular contact with the faculty. 101 scientists from different parts of the country were trained in this centre during the accreditation period, the details of which are given below (Table 2.4).

Table 2.4: List of training programmes conducted by CAFT in Soil Science (2018-23)

Year	Title of the training programme	Duration
2018-19	Natural resource management – A step towards doubling farm income:	Oct 10 – Oct 30, 2018
2019-20	Assessing soil plant atmospheric continuum for enhanced input use efficiency:	Oct 1 – Oct 21, 2019
2021-22	Soil & water management for sustaining intensive agriculture	Dec 1 – Dec 21, 2022
2022-23	Climate smart strategies to increase input use efficiency of soil and water resources:	Nov 28 – Dec 19, 2023

2. Centre of Advanced faculty Training (CAFT) in Genetics and Plant Breeding

Year of Establishment : 1997 Funding Agency : ICAR

Centre of Advanced faculty Training (CAFT) in Genetics and Plant Breeding was established by Indian Council of Agricultural research (ICAR), New Delhi at Punjab Agricultural University (PAU), Ludhiana in year 1997. Since its inception, the Centre has organized 34 training programmes for the scientists working in various State Agricultural Universities and ICAR Institutes. The objective of these training programmes is to share the knowledge and experience of the researchers of PAU and experts from other institutes with the participating breeders, researchers and teachers to sensitize them to the developments in the field of crop improvement. For years 2018-2020, the CAFT centre at PAU has organized two training



programmes and provided training to a total of 42 participants covering wide areas of genetics and plant breeding (Table 2.5). The training programmes were planned to apprise the young researchers about several emerging issues in different field crops, the effect of climate change on the crop plants and the paradigm shift in plant breeding approaches towards genomics, laying emphasis on designing new plant architecture of important field crops that are more productive, climate resilient and suitable for specific human needs. The emphasis was laid on the importance of pre breeding through planned utilization of plant genetic resources in crop improvement programme to confront future challenges. The participants were familiarized with several advances in the field of molecular biology techniques and various softwares for molecular data analysis. Experts from department of Plant Breeding and Genetics and other departments of College of Agriculture and Basic Sciences and Humanities, PAU including School of Agricultural Biotechnology, School of Climate Change, Vegetable Science, Fruit Science, Entomology, Plant Pathology, Biochemistry and Nanotechnology delivered lectures and conducted practical sessions. Guest lectures of eminent scientists from NBPGR, IARI and other ICAR Institutes were arranged for the benefit of the trainees. The basic amenities and food for trainings were also taken care of.

Table 2.5: List of trainings conducted by CAFT in Plant Breeding and Genetics (2018-19 and 2019-20)

Year	Title	Dates	No. of participants
2018-19	Genomics Assisted Crop Breeding Techniques	22.1.2019 to 11.2.2019	21
2019-20	Biotic and Abiotic Stress Tolerance in Plants under Changing Climatic Conditions	6.8.2019 to 26.8.2019	21

3. Niche Area of Excellence on Kinnow Mandarin for Fruit Quality, Biotic and Abiotic Stress Tolerance

A Niche Area of Excellence (NAE) on 'Genetic Improvement of Kinnow mandarin for Fruit quality, Biotic and Abiotic Stress tolerance'

was awarded to PAU by ICAR in the year 2015 for a period of five years with a budget outlay of Rs. 282.08 lakhs.

The project aimed at qualitative improvement of Kinnow mandarin for seedlessness, easy peelability and development of rootstocks with tolerance to Phytophthora and soil salinity. The pre-requisite for such improvement is to develop hybrid progenies. Prevalence of the polyembryony in Citrus creates problem in the development of zygotic embryos and identification of hybrids post germination. The use of polymorphic molecular markers like Simple Sequence Repeat (SSR) markers can prove useful for hybrid identification.

To develop seedless and easy to peel Kinnow hybrids, the crosses of 'Kinnow' were made with Mukaku Kishu (a small sized, easy to peel mandarin). In the course of this project, a total of 1742 'Kinnow' x 'Mukaku Kishu' hybrids were developed. Of these, 1050 are under field evaluation for the targeted traits.

For rootstock breeding, 167, 288 and 502 hybrids were developed and verified with SSR markers in the crosses namely 'Jatti khatti' x 'X-639', 'Jatti khatti' x 'Sour orange' and 'Volkamer lemon' x 'Cleopatra mandarin', respectively. These rootstocks are now being screened against Phytophthora nicotianae, in second phase, the Phytophthora tolerant hybrids will be screened against soil salinity.

In addition, 'PAU Kinnow 1', a low seeded mutant of seedy 'Kinnow' was found stable for low seed content after two cycles of vegetative propagation. About 23,000 plants of this elite mutant were multiplied and distributed to the growers at Ludhiana.

4. Centre of Excellence for Utilization of Brackish Water for Fruit and Vegetable Production in South- Western Punjab

A mega Indo-Israel project entitled "Centre of excellence for utilization of brackish water for fruit and vegetable production in South- Western Punjab" worth Rs. 14.96 crores awarded to the Punjab Agricultural University, Ludhiana by National Horticulture Mission (NHM) was aimed to achieve broader

objectives (i) To standardize technologies to use brackish water for irrigating fruits (guava, kinnow, peach, pear) and vegetable crops (potato, tomato, chilli, broccoli) using drip irrigation, desalination, conjunctive use of brackish water with canal water and mulching (ii) To develop technologies for production of high value vegetable crops (seedless cucumber, coloured bell pepper and tomato) under naturally ventilated poly-net house (iii) To standardize technologies for off-season vegetable production in shade net house in South-Western Punjab (iv) To produce and sell nursery of vegetable varieties and F1 hybrids using soilless medium in plug trays under high-tech poly-house for the benefit of the farmers. In this mega project, a desalination plant installed with 10 cu.m/h capacity with 90% efficiency has been installed solely powered through with 60 KW solar photo voltaic cells. The good quality desalinated water thus produced has been tested for irrigating fruits (Kinnow, guava, peach and pear) and vegetables (tomato, cucumber, capsicum, chillies, potato and broccoli) against canal water and saline groundwater automated drip and fertigation system in open as well as protected cultivation to address the problem of fresh water scarcity expected in future. The significant research outcomes in the form of recommendations made out of this project for the benefit of the farmers are: (i) Occasional irrigation to kinnow mandarin trees with mixture of fresh and saline water (Electrical conductivity; EC around 2 dS m⁻¹) only through drip irrigation as a life saving irrigation during canal closure and scarcity of canal water (ii) Standardization of fertigation schedule for kinnow mandarin and drip irrigation schedule for kinnow mandarin (planted at 6 m x 3 m) (iii) Standardization of drip irrigation and fertigation schedule for guava (planted at 6 m x 5 m) (iv) Use of mixed water (fresh + saline water) of EC up to 2.0 dSm⁻¹ and Residual Sodium Carbonate; RSC < 2.5 meqL⁻¹ through drip irrigation in potato planted in paired rows on raised beds in the event of inadequate canal water availability In light textured soils of South-Western Punjab. A farmers' awareness



programme-cum-field day is organized every year to disseminate the new technologies and to update the knowledge of the farmers about drip irrigation and fertigation in fruit and vegetable crops. Besides, about 1 lakh seedlings of various vegetables are sold every year among farmers since the inception of this project.

5. Centre of Excellence in Apiculture

National Bee Board (MoA, GOI) funded Integrated Beekeeping Development Centre/ Centre of Excellence project in Apiculture was sanctioned to the Punjab Agricultural University, Ludhiana with a total funding of Rs.1.31 crores. The project completed in 2020. Under this project, quality queen bees were developed and disseminated among the beekeepers of the Punjab and adjoining States. The other activities of the Centre included developing innovative bee husbandry technologies, establishing bee diagnostic facility, developing value added hive products and the technology dissemination.

6. Centre of Excellence on Mushrooms

To promote the mushroom cultivation as a subsidiary occupation for farmers and to open an arena for the entrepreneurs, a State government sanctioned Centre of Excellence on Mushrooms was established. A total of 4.99 Crores was allocated for providing the latest knowhow of mushroom cultivation by providing physical demonstration of pasteurization tunnels for short method of composting (SMS) and controlled mushroom growing incubation rooms for year round cultivation of mushrooms. The centre is well equipped not only for bulk seed production, Hi-tech composting, controlled growing rooms but also for providing analytical facility for testing of compost, casing and mushroom samples. Need based guidance is also given to the farmers, farmwomen, entrepreneurs and trainees for post harvest handling of the produce.

7. Centre of Excellence on Brassicas

Centre of Excellence on Brassicas was sanctioned by Department of Biotechnology, Govt. of India to initiate genomics assisted

breeding for architectural restructuring of Indian mustard under the leadership of Prof. S.S. Banga, ICAR National Professor. Studies helped to link determinacy to a single recessive gene, Sdt1 which was mapped to the linkage group 15 (corresponding to chromosome 5B) of *B. juncea*. Marker assisted transfer allowed development of many genotypes with determinate inflorescence for the first time. One such genotype, DTM184 was included in early mustard multilocation trials under ICAR-All India Coordinated Research Project during 2018-19.

Determinate mustard hybrids were also developed. Project also allowed genotyping by sequencing of four recombinant inbred lines, two introgression sets and one diversity panel. These were also phenotyped for a large number of trait. Combined with genotypic data, studies allowed identification of a large number of QTLs and underlying candidates for productivity and biotic stress related traits. Excellent cytogenetic probes were also created. World class facilities could be created for molecular cytogenetics and SNP genotyping.

6.6.2.5. Incubation Centre/Start-up units/ Venture capital

The Food Industry Business Incubation Centre (FIBIC) in Punjab Agricultural University (PAU), Ludhiana, is established. Department of Food Science & Technology, with the technical guidance of Ohio State University, FIBIC is a dynamic hub that fosters innovation, entrepreneurship, and growth within the food industry with the help of university's extensive resources, expertise, and research in agriculture and food technology. This synergy creates an optimal environment for aspiring entrepreneurs, providing them with unparalleled access to knowledge, facilities, and mentorship. With a prime focus on nurturing emerging food-related businesses, this incubation centre plays a pivotal role in transforming ideas into viable, successful enterprises. The centre offers a diverse range of support services tailored to the needs of farmers, new food business start-ups and industry.

Table 2.6: Incubation facilities provided and Entrepreneur established (2018-2023)

Sr. No.	Technology and facilities provided	Stakeholder
1.	Pulping of guava	Ms. Vinod Kumari, M/s Sandhya Self-help group, VPO- Maili, Block Mahialpur, Hoshiarpur
2.	Guava squash and nectar	Ms. Vinod Kumari, M/s Sandhya Self-help group, VPO- Maili, Block Mahialpur, Hoshiarpur
3.	Pulping of tamarind	Mr. Navdeep Bali and Mr. Gursharn Singh, M/s G.B Foods, Rampura Phul, Bathinda
4.	Turmeric pickle	Mr. Navdeep Bali and Mr. Gursharn Singh, M/s G.B Foods, Rampura Phul, Bathinda
5.	Pulp & Squash of peach	Mr. Amandeep Singh, Farmer, Balachour,
6.	Canning of mushroom	Mr. Navdeep Sohal, M/s Navdeep Mushroom Farms, Ludhiana.
7.	Peanut butter	Mrs. Harvinder kaur and Jasvir Kaur, M/s Satnam Self help group, Dehlon, Ludhiana
8.	Bottling of sugarcane juice	Mr. Rajgopal Patil, M/s Sri Om Sai Sugar Allied Products Pvt. Ltd. Karnataka Mr. Ashish Awasthi, M/s Triveni Engineering & Industries Limited, New Delhi Mr. Sohan Garud, M/s RVG Agro Pvt. Ltd. Maharashtra Mr. Chaitra Raj, M/s M.R. Enterprises, Karnataka Mr. Kulbir Kaliramana and Mr. Jagwinder Jodha M/s Kavery Power Industries, Hisar, Haryana Mr. Sunil Kumar Sharma, M/s Upright Food and Beverages Pvt. Ltd. Bihar Mr. Rohit Bajaj, M/s Cane-o-Blast, Maharashtra Mr. Shashank Varekar, M/s Fruitvilla Corporation, Maharashtra M/s Farmist Producer Company, Ghaziabad, UP Mr. Gopal Jadav, Farmer, Gujarat Ms. Deepa Agrawal Ganguli, Gujarat Mr. Rattan Dhiman, M/s Rattan Agro Foods Mr. Tasim Pasta, M/s Cocoland International LLP, Gujarat
9.	Amla juice & beverage	Mr. Virsa Singh, Farmer, Tarn Taran
10.	Amla candy	Mr. Virsa Singh, Farmer, Tarn Taran Mr. Gaurav, Farmer, Ludhiana Mrs. Monika Garg, Entrepreneur, Ludhiana
11.	Turmeric pickle	Mr. Udeekwan Singh, Farmer, Bathinda
12.	Mango pickle	Mr. Paramjit Singh, Entrepreneur, Balachaur, SBS Nagar
13.	Mixed pickle	Mr. Paramjit Singh, Entrepreneur, Balachaur, SBS Nagar
14.	Millet cookies	Mr. Bharpoor Singh, M/s Icchha Foods Pvt. Ltd Ludhiana
15.	Multi millet cookies	Mr. Bharpoor Singh, M/s Icchha Foods Pvt. Ltd Ludhiana
16.	Oat cookies	Mrs. Harjot Kaur Gambhir, M/s DB Delectious Bites Pvt. Limited, Ludhiana
17.	Almond cookies	Mrs. Harjot Kaur Gambhir, M/s DB Delectious Bites Pvt. Limited, Ludhiana
18.	Ragi cookies	Mrs. Harjot Kaur Gambhir, M/s DB Delectious Bites Pvt. Limited, Ludhiana
19.	Frozen potato & vegetables	Mr. Navdeep Singh and Mr. Paramvir Singh, M/s F-Tech Foods, Ludhiana
20.	Canning of sarson da Saag	Mr. Jaswant Singh, M/s Tiwana Bee Farm, Ludhiana
21.	Ginger processing	Pinning lifestyle, New Delhi

Collaborative workspaces, state-of-the-art laboratories, and pilot-scale processing units enable entrepreneurs to refine their concepts and develop scalable prototypes. Minimal processing techniques, heat preservation approaches, cold preservation strategies, drying and dehydration techniques, juices and beverages, canning, packaging, extrusion processing, and soy milk processing are all included in the center's incubator facilities.

The centre has conducted various training for farmers, farm women, rural youth and entrepreneurs. During the year 2018-2023, the details of incubation facilities provided are given in Table 2.6.

6.6.2.6. Technology Enabled Learning Resources

- Most departments have developed ICT enabled teaching resources. All the



departments are provided with Computer and Internet facilities to prepare computer-aided teaching/ learning material. Wi-fi facility is provided to all faculty members to use online content for teaching and learning. All the colleges have smart classrooms.

- In addition all the departments have lecture rooms with audio visual teaching aid facility. LCD projectors have been installed in most of the classrooms to facilitate curriculum delivery system. The e-courses for undergraduate teaching developed under NAIP project and available under ICAR portal are being used by the faculty and students to supplement the class room teaching. The details are given below (Table 2.7).
- An Education Technology Cell placed under the Dean PGS is functioning in the university.
- Capacity building of HODs and faculty was undertaken by NAARM. Newly recruited classrooms to facilitate curriculum delivery system. The e-courses for undergraduate teaching developed under NAIP project and available under ICAR portal are being used by the faculty and students to supplement the class room teaching. The details are given below (Table 2.7).
- An Education Technology Cell placed under the Dean PGS is functioning in the university.
- Capacity building of HODs and faculty was undertaken by NAARM. Newly recruited faculty members undergo Induction training. Regular trainings are being arranged for the faculty on Statistical Analysis Software System and other genomic tools. It is mandatory for the faculty to undergo advanced trainings from time to time in their field of specialization.
- The faculty and students are being provided the online access to scholarly material through online databases namely Consortium for e-Resources in Agriculture (CeRA) for journal articles and Krishikosh Access to these digitized documents has been provided to the faculty and staff posted at various research stations and KVKs of the university to enable personalized and technology enabled learning among them.

Table 2.7 Details of technology enabled classrooms

College	Smart Class-rooms	Video Confer-ence Rooms	Classrooms with projection facilities	Total number of class rooms
Agriculture	4	1	29	33
Horticulture and Forestry	8	3	10	11
Agricultural Engineering & Technology	1	2	14	17
Community Science	2	-	5	12
Basic Sciences & Humanities	9	1	8	18

6.6.2.7. Integrated Learning Systems (Experiential Learning)

During the period under report, a total of eleven Experiential Learning Units are operational in different colleges. These Units are based on the Fifth Deans' Committee Recommendations which were implemented in 201 earlier sanctioned by the ICAR are still operational in the University. In addition, 12 additional Experiential Learning Units have been established by the University from its own resources. Currently, all the Experiential Learning Units are being run out of the income/profit earned and siphoned back into the Experiential Learning Unit to provide it due support to make their functional, and need based support is also provided by the University from its own resources. The system for profit sharing in the respective Experiential Learning Units has been established and is now in place.

College of Agriculture offers total of 11 experiential learning programme (ELPs) modules for the undergraduate students of the B.Sc. (Hons) Agriculture programme in this college. Out of these 16 ELP modules 4 are ICAR funded and the 12 are state funded. All modules are functioning as per guidelines of ICAR.

6.6.2.8. Academic Industry Interface

A meeting is held half-yearly between the academia of the university and the industrial stake holders. In this interface, the industry and the university brainstorm on the needs of the industry and a road map of need based research.

Table 2.8: Present ELP Modules operational in the University

Sr. No.	Department	Name of ELP
College of Agriculture		
1.	Entomology	Commercial Apiculture
2.	Plant Pathology	Production of Bioagents against Plant Pathogens
3.	Vegetable Science	Nursery Raising Techniques and Protected Cultivation of Vegetables
4.	Food Science and Technology	Student READY Experiential Learning Programme
5.	Agronomy	Organic Production Technology
6.	Plant Breeding and Genetics	Seed Production and Technology
7.	Soil Science	Soil, Plant, Water, and Seed Analyses
8.	Fruit Science	Commercial Horticulture
9.	Floriculture and Landscaping	Commercial Floriculture and Landscaping
10.	Forestry and Natural Resources	Nursery Production of Agro-forestry Trees
11.	Microbiology	Mushroom Production
College of Community Science		
1.	Family Resource Management	Artistic Creations
2.	Food and Nutrition	Bakery and Confectionary
3.	Apparel, Clothing and Textiles	Apparel Manufacturing Unit
4.	Human Development and Family Studies	Child Care Providers' Training Laboratory-After School Care
College of Agricultural Engineering & Technology		
1.	Farm Machinery and Power Engineering	Production of Agricultural Machinery Using Advanced Techniques
2.	Processing and Food Engineering	Agro Processing and Value Addition of Agricultural Produce
3.	Soil and Water Engineering	Design and Operation of Micro Irrigation Systems and Protected Cultivation Structures
4.	Renewable Energy Engineering	Entrepreneurship opportunities in Renewable Energy Sector

Training of students is carried out in more than 60 different industries as part of their internship under RAWE/ELP program. Besides training, visits to the industry are also conducted to equip the students with the latest on-goings in the agriculture- industry sector.

Owing to established liaison with the industry, the PAU students are securing prestigious Prime Minister Fellowship for their Ph.D. research. During the period under report 27 students successfully won the prestigious fellowship. Besides, the industry is providing financial support to assist UG and PG students in terms of scholarships/fellowships (FMC, Bharti Field Fresh, Dhanuka, Jain Irrigation, Bayer, etc). Many medals and honours for the students have been instituted with the financial support from industry.

Further, to provide technological knowledge to the industry, the University is successfully running a two year diploma in Agrochemical which is being

run at six stations of the university. This interface is highly beneficial for the faculty in getting field based knowledge from the industry.

6.6.2.9. National Ranking (ICAR/MHRD)

During the report period PAU has ranked among the top State Agricultural Universities in India. The ranking released by ICAR and by NIRF, Ministry of Education are summarised in Table 2.9

Table 2.9 National Ranking of PAU

Year	ICAR Ranking	National Institutional Ranking Farmework (NIRF)		
		Overall Ranking	University Ranking	Agriculture and Allied Sector Ranking
2018	7	60	38	3
2019	2	75	51	3
2020	5	-	-	-
2023	-	74	54	3

Experiential Learning Students at Work



ELP students of Commercial Horticulture



Protected Cultivation and Nursery Production of Vegetable Crops



Tissue Culture



Mushroom cultivation



Entrepreneurship opportunities in Renewable Energy Sector



Production of Agricultural Machinery using advance techniques



Bakery and Confectionary



Apparel manufacturing unit

6.6.3. Research Support

The main mandate of the University is to conduct research and seek solutions to emerging agricultural problems of Punjab state.

6.6.3.1. Research council

The Research Council is an apex body to monitor research activities of the University (Table 3.1). The guidance, feedback and directions for the

on-going research and future line of action are discussed threadbare in the meetings of the Research Council which are held twice a year (Table 3.2).

The issues related to state agriculture are discussed at length in the presence of the crop experts/subject matter experts and the extension staff deployed at Krishi Vigyan Kendras and as District Extension Specialists. The research achievements

Table 3.1 Composition of Research Council, PAU

1.	Vice-Chancellor, Chairperson
2.	Director of Agriculture & Farmers' Welfare, Punjab
3.	Director of Horticulture, Punjab
4.	Chief Conservator of Soils, Punjab,
5.	Chief Conservator of Forests, Punjab.
Experts	
6.	Dr. P.S. Minhas (Former Director, NIASM, Baramati)
7.	Dr. Joginder Singh (Former HoD Entomology)
8.	Dr. R.K. Mahey (Former Registrar-cum-HoD, Agronomy)
Farmer member	
9.	S. Jagtar Singh Brar, V&PO Mehma Sarja, Distt. Bathinda.
PAU members	
10.	Director of Research, PAU, Ludhiana
11.	Director of Extension Education, PAU, Ludhiana
12.	Dean, Postgraduate Studies, PAU, Ludhiana
13.	Dean, College of Agriculture
14.	Dean, College of Agril. Engineering & Technology
15.	Dean, College of Horticulture and Forestry
16.	Dean, College of Basic Sciences & Humanities
17.	Dean, College of Community Science

18.	Additional Director of Research (Crop Improvement)
19.	Additional Director of Research (Horticulture and Food Science)
20.	Additional Director of Research (Natural Resource and Plant Health Management)
21.	Additional Director of Research (Farm Machinery and Bio-Energy)
22.	Registrar (Non-member invitee)
23.	Comptroller (Non-member invitee)
Outside Experts	
1.	Prof. K.K Jindal, Former Director of Research and ADG (Hort.)
Progressive Farmers (additional members)	
1	S. Balwinder Singh Tikka, V&PO AbulKhurana, Distt. Muktsar Sahib
2	Major Manmohan Singh Verka, Ranjit Avenue, Amritsar
3	S. Rubash Singh Jakhar, V&PO Patrewala, Block Khuia Server, Ferozepur
4	S. Jaswant Singh Chotala, V&PO Chotala, Distt. Hoshiarpur
5	S. Harvinder Singh, V&PO Bhadalwad, Distt. Sangrur
6	S. Nek Singh Khokh, V&PO Khokh, Distt. Patiala



of PAU in the last six months particularly related to development of new varieties, production, protection and post-harvest technologies are shared with the members of research council.

Functions of Research Council

The following components are discussed in the meeting held bi-annually:

- Research programmes and projects undertaken or to be undertaken by the university scientists in the field of agriculture and allied sciences, their prioritization, monitoring and evaluation.
- Physical, fiscal and administrative facilities required for implementing research projects.
- Orienting research to meet farmers and other stake-holders' needs.
- Public-Private Partnership in research; and any other matter pertaining to research programmes, which may be referred to it by the Vice-Chancellor or the Board or any other authority of the University.

Table 3.2 Meetings of Research Council held during last 5 years

Sr No	Year	Date of Meeting
1.	2018-19	15.06.2018
2.		05.11.2018
3.	2019-20	18.06.2019
4.		21.11.2019
5.	2020-21	27.02.2020
6.		23.09.2020
7.	2021-22	26.04.2021
8.		28.10.2021
9.	2022-23	27.04.2022
10.		21.11.2022

6.6.3.2. Directorate of Research

The main mandate of the University is to conduct research and seek solutions to the emerging agricultural problems of the Punjab state.

The Directorate of Research oversees the research programmes of the University through regular reviews and monitoring of the ongoing projects. The monitoring process involves continuous

updating/ evolution of research agenda. The funds for research are generated through external and internal resources. Technology management in public and commercial domains are also taken care of by this Directorate.

Present Establishment of Directorate of Research

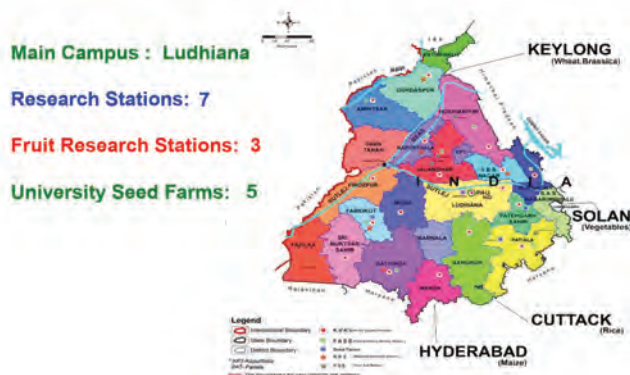
- Director of Research
- Additional Director of Research (Crop Improvement)
- Additional Director of Research (Horticulture and Food Science)
- Additional Director of Research (Natural Resource and Plant Health Management)
- Additional Director of Research (Farm Machinery and Bio-Energy)
- Directors of Regional Research Stations
- Associate Director (Seeds)
- Deputy Director (Farm)

The Additional Directors of Research assist the Director of Research in planning, monitoring and coordinating scientific research on various aspects across the Colleges at PAU Campus and at Regional Research Stations.

Besides the Regional Research Stations and Fruit Research Stations, PAU has four seed farms Ladhawal (Ludhaina), Nabha (Patiala), Naraingarh (Fatehgarh Sahib) and Raja Harinder Singh Seed Farm (Faridkot). The University has an elaborate physical facility for conducting research in the form of modern laboratories with the latest equipments, research farms and seed farms. The Associate Director (Seeds) and Deputy Director (Farm) look after the work of seed production/ distribution and management of research farms.

The University has a well established School of Agricultural Biotechnology, Electron Microscopy & Nano-science Laboratory, a NABL accredited Pesticide Residue Analysis Laboratory, Molecular Biology Laboratory, Food Industry and Incubation Centre, Mushroom Research Centre, Screen Houses and Weather Forecasting Centre at its main campus.

Research Set-up



Staff Pattern

To bring about diversity in faculty constitution and reduce in-breeding, about 1/3 of the faculty was recruited from outside the state during the past 5 years. Almost all the scientists engaged in research are also given teaching assignments and PG student guidance. PG students are also allotted to the faculty at Regional Research Stations. The scientists at RRS Bathinda and Gurdaspur regularly teach courses at the two PAU Institutes of Agriculture at these stations. All the departments have departmental research committees which are fully integrated with the research in their respective disciplines. These committees also interact across the departments for multidisciplinary research.

Research Coordination Mechanism

The research activities of the University are coordinated at different levels. The primary and the most important is the Research Evaluation Committee which is the key committee that discusses and approves the recommendations to be passed on to the farmers for adoption in the state.

- Research Evaluation Committee:** As a prerequisite for approval and inclusion of research recommendations in the Package of Practices of PAU, the research proposals are discussed in Research Evaluation Committee meetings held once in two months. Since the inception of this evaluation mechanism in PAU, 297 meetings have been held to discuss the research proposals from different departments. The meetings are chaired by Director of Research and are attended by

Director Extension Education, Additional Directors of Research, Additional Directors of Extension Education and all the Heads of the Departments, across the colleges of the University.

A unique system of evaluation of varieties/ and technologies exists in PAU. At least three years of research data followed by multilocation testing in the form of adaptive research trials at farmers' fields is required for consideration of proposals in the Research Evaluation Committee. As per the need of the hour, in the recent meetings there is an increasing representation of food processing/ subsidiary occupation and farm machinery related technologies.

- In-house Reviews:** To discuss the research achievements of the past, as well as to plan the research experiments for future, in-house reviews of different colleges are held.
- Project Review Committee:** The research proposals on the relevant field issues are prepared by the faculty of the respective departments and are then reviewed by the concerned ADR; and then are then forwarded to the relevant funding agency through Director of Research.
- Collaborative Research:** To widen the scope of improvement in research activities of various departments, collaborative research at national and international level is promoted. A corpus fund for uplifting the research output of University has been generated at PAU. The fund is used for training of faculty abroad, inviting prominent scientists from foreign Universities and for funding collaborative research.
- Research Publications:** The research publications submitted by various departments are reviewed from time to time by the concerned Additional Directors of Research. This is to make sure that the research papers are submitted to quality journals having high NAAS rating/ Impact factor.
- Agricultural Research Journal:** PAU publishes Agricultural Research Journal (earlier known as Journal of Research, PAU) at bi-monthly



intervals. Quality research papers are encouraged for publication in this journal.

Research and Seed Production Centres

Research is being carried out at Regional Research Stations (10) apart from PAU main campus (Table 3.3). These include 3 Fruit Research Stations

at Bahadurgarh (Patiala), Jallowal-Lesriwal (Jalandhar) and Gangian (Hoshiarpur). Apart from these, the University has 5 Seed Farms, which have a prime mandate of seed production of both Kharif and Rabi crops. Primarily, the breeder seed is produced at seed farms (Table 3.4).

Table 3.3 Research Stations of Punjab Agricultural University (2018-19 to 2022-23)

Sr. No.	Farm & its Location	Establishment year	Research Focus	Salient Achievements/ Recommendations
1.	Regional Research Station, Gurdaspur	1910	Lentil, Urdbean, wheat, sugarcane, litchi, mango, disease testing hot spot	<ul style="list-style-type: none"> Developed three mash varieties : Mash 1137 (spring), Mash 883 (Kharif), Mash 1014 Leaf sampling technique for litchi
2.	Dr. JC Bakshi Regional Research Station, Abohar (Fazilka)	1962	Citrus, cotton	<ul style="list-style-type: none"> Cultivation of Daisy tangerine on rough lemon rootstock recommended for south western part of Punjab. 'Vaniglia Sanguigno' a coloured and acid-less variety of sweet orange is recommended for south-western region of Punjab.
3.	Fruit Research Station, Bahadurgarh (Patiala)	1963	Guava, ber, sapota	<ul style="list-style-type: none"> Guava hybrid HB 1-1 (Punjab Safeda) Guava hybrid HB 4-1 (Punjab Kiran) Punjab Apple guava
4.	Regional Research Station, Faridkot	1970	Cotton, sugarcane	<ul style="list-style-type: none"> Developed PAU Bt 2 and PAU Bt 3 for cultivation in North zone comprising Punjab, Haryana and Rajasthan during 2019-20 Developed F 2662 and PBH 115 for cultivation in North zone comprising Punjab, Haryana and Rajasthan during 2020-21 Development and identification of compact plant type American cotton variety, PBH 116 for cultivation under high density planting in North zone Development and Notification of American cotton Bt variety, PAU Bt 5 for cultivation in North zone
5.	Regional Research Station, Bathinda	1972	Cotton, wheat, oilseeds, grapes	<ul style="list-style-type: none"> Cotton varieties PAU Bt 2, PAU Bt 3, PAU Bt 5, PBH 115 and PBH 116 were released and notified for cultivation in north zone by Central Varietal Identification Committee
6.	Regional Research Station, Kapurthala	1972	Sugarcane, rice	<ul style="list-style-type: none"> Developed and released CoPb 92 in early and CoPb 98 in Mid-late segment of sugarcane for North West Zone. Developed and released CoPb 95 and CoPb 96 as high yielding early maturing varieties of sugarcane in the Punjab state Developed and released CoPb 93 and CoPb 94 high yielding mid-maturing varieties of sugarcane in the Punjab state
7.	MS Randhawa Fruit Research Station, Gangian (Hoshiarpur)	1972	Mango, citrus, litchi	<ul style="list-style-type: none"> Standardization of leaf sampling technique in litchi Bagging of litchi bunches for quality production National recommendation on "Bagging of litchi bunches for quality production" (Approved in ICAR-AICRP on fruits 8th Group discussion held from 3/3/2021-6/3/2021).

				<ul style="list-style-type: none"> Technology for Rejuvenation of old senile litchi orchards.
8.	Dr D.R. Bhumbla Regional Research Station for Kandi Area, Ballawal Saunkhri (Shaheed Bhagat Singh Nagar)	1982	Chickpea, Taramira, rainfed wheat, water management under rainfed conditions	<ul style="list-style-type: none"> Gram variety PBG 8 recommended for cultivation under irrigated as well as rainfed conditions of Central and Southern districts of Punjab. JC-12: A new composite maize variety was recommended for cultivation under rainfed conditions. Two cultivars of apple, Anna and Dorset Golden are recommended for kitchen gardening or small scale cultivation in lower Shiwaliks, Punjab.
9.	Fruit Research Station Jallowal and Lesriwal (Jalandhar)	2012	Nursery production, citrus	<ul style="list-style-type: none"> Provided fruit growers with 1.17 lakh quality nursery plants of citrus (100% containerized) and other fruit crops. Citrus variety "Vaniglia Sanguigno" recommended for commercial cultivation in Punjab Rough Lemon rootstock of citrus recommended for Daisy mandarin in Punjab.
10.	Regional Research Station, Dyal Bharang (Amritsar)	2016	Oilseeds, Pulses, sugarcane, Seed Production	<ul style="list-style-type: none"> Total of 5140.0 quintal certified seed of recommended varieties of paddy, basmati, wheat, pulses and oilseeds produced and sold at Research Station.

To promote much needed crop diversification from the existing wheat-rice dominant cropping pattern, the nursery production of horticulture crops has been given priority in the recent past (Table 3.5).

6.6.3.3. Technology Developed and its Adoption

Approved Technologies

Varieties : Varieties are the pivotal component of agrotechnological packages. The list of varieties / hybrids of crops developed during 2018-23 are listed in Table 3.6.

Table 3.4 Details of seed production of field crops during 2018-19 to 2022-23

Field crops:

Class of Seed	Seed Production (q)				
	2018-19	2019-20	2020-21	2021-22	2022-23
Breeder Seed	4186.26	3911.05	4308.14	2952.12	4135.61
Foundation Seed	6519.18	4756.26	2474.96	3248.67	9818.30
Certified Seed	40539.16	38406.59	40762.00	16929.76	20236.53
Truthfully labelled Seed	6138.51	13244.90	13288.22	13135.14	10181.65
Total	57383.11	60318.80	60833.32	36265.69	44372.08*

Table 3.5 Nursery production of fruit and forest tree species

Nursery plants/ kits (no.)	2018-19	2019-20	2020-21	2021-22	2022-23
Fruit plants	5,70,235	6,01,000	7,00,000	7,09,347	7,09,634
Forest plants	82,194	1,23,539	98,009	1,00,702	1,15,267
Winter vegetables (q)	600.00	292.23	492.70	548.00	440.00
Summer vegetables (q)	50.00	66.37	61.00	43.00	42.00
Potato & turmeric (q)	3113.00	5402.00	5359.00	5088.00	4472.00

Table 3.6 Varieties/hybrids released during 2018-23

Crop	Varieties released in Punjab
Wheat	PBW 752, PBW 757, HD 3226, DBW 222, DBW 187, Sunehri, PBW 771, PBW 757, PBW 1 Chapati, PBW 803, PBW 824, PBW 869, PBW 826
Rice	Pusa Basmati 1718, PR 128, PR 129, HKR 47, Punjab Basmati 7, PR 131, PR 130
Maize	PMH 11, P1844, JC 12, PMH 13, JC 4, Punjab Baby Corn 1, PMH 14
Cotton	PAU Bt 3, PAU Bt 2
Sugarcane	Co15023, CoPb 95, CoPb 96, CoPb 98
Pulses	
Mungbean	SML 1827, ML 1808,
Lentil	LL 1373
Mash	Mash 1137
Urdbean	Mash 883
Chickpea	PBG 8
Oilseeds	
Raya	RCH 1, PHR 126
Gobhi Sarson	PGSH 1707 (Canola type)
Sunflower	PSH 2080
Ground Nut	J 87
Pearl millet	PCB 165
Forages	
Oat	OL 13, OL 14, OL 15, OL 16
Ryegrass	Punjab Ryegrass 2
Sorghum	SL 45, SL 46
Napier Bajra	PBN 342, PCB 166
Berseem	BL 44,
Fodder maize	J 1007, PFM 12
Barley	PL 891, DWRB 123
Medicinal	
Mentha	CIM Kranti

PBW 826 (Wheat): This variety has been recommended for cultivation under timely sown



PBW 826

irrigated conditions in the North-Western Plains Zone of India comprising Punjab, Haryana, Delhi, and Western Uttar Pradesh, parts of Rajasthan, Uttarakhand, Jammu, and Himachal Pradesh. It has also been recommended for release under irrigated timely sown conditions of North Eastern Plains Zone of India comprising eastern Uttar Pradesh, Bihar, West Bengal, Jharkhand, etc. Its average plant height is 100 cm and it matures in about 148 days. It is moderately resistant to yellow rust and brown rust. It possesses lustrous bold grains. Its average yield is 24.0 quintals per acre.

PBW 803 (Wheat): This variety outperforms other varieties, especially, the currently preferred HD 3086, under abiotic stress (salinity) environment. It has been recommended for timely sowing in South-Western region of Punjab under irrigated conditions. It takes 151 days to mature and attains a height of 100 cm. It is resistant to brown rust and moderately resistant to yellow rust. Its average grain yield is 22.7 quintals per acre.

PBW 824 (Wheat): It has been recommended for cultivation in Punjab state under timely sown irrigated conditions. It matures in about 156 days and attains an average plant height of 104 cm. It is resistant to brown rust and moderately resistant to yellow rust. It has high hectolitre weight (79.7 kg/hl), which is an index of flour yield. Its average yield is 23.3 quintals per acre.

PBW 869 (Wheat): This variety has a relatively longer coleoptile, which enables its better establishment in the fields retaining rice residue. Accordingly, it has been recommended for sowing with Happy Seeder/Super Seeder in the fields retaining rice residue after combine harvesting. It matures in about 158 days and attains an average height of 101 cm. It is resistant to brown rust and moderately resistant to yellow rust. Its grains are bold (1,000-grain weight: 49 g) and yields on an average 23.2 quintals per acre.

PBW 1 Chapati (Wheat): This is a premium quality bread wheat variety, having excellent chapati making properties. The chapatis are whitish in colour and remain soft even after hours of cooking with good palatability and texture. Its average plant height is 103 cm and it matures in about 154

days. This variety has been developed through MAS and carries *Lr76/Yr70* genes for leaf rust and stripe rust. Its average grain yield is 17.2 q/acre.



PBW 1 Chapati

DBW 187 (Wheat): This bread wheat variety has been recommended for cultivation under irrigated timely sown conditions in the Punjab PBW 771 state. Its average plant height is 104 cm and it matures in about 153 days. It is moderately resistant to yellow rust and resistant to brown rust. Its average grain yield is 22.6 q/acre.

Sunehri (Wheat): Sunehri (PBW 766) has been recommended for general cultivation in Punjab state under timely sown conditions. Its average plant height is 106 cm and it matures in about 155 days. It is moderately resistant to yellow rust and resistant to brown rust. Its average grain yield is 23.1 q/acre.

HD 3226 (Wheat): Average plant height of this variety is 106 cm and it matures in about 155 days. It is resistant to yellow and brown rusts. It possesses good grain quality characteristics. Its average grain yield is 21.9 q/acre.

DBW 222 (Wheat): This bread wheat variety has been recommended for cultivation in the Punjab state except sub-mountainous areas. Its average plant height is 103 cm and it matures in about 152 days. It is moderately susceptible to yellow rust and resistant to brown rust. Its average grain yield is 22.3 q/acre.

PBW 757 (Wheat): This variety has been recommended for general cultivation in North-West Plains Zone, including Punjab, under very late sown conditions (suitable for January sowing). It can follow pea, potato, sugarcane, turmeric, etc., generally as a third crop. Its average plant height is 82 cm and it matures in about 114 days. It is

resistant to yellow rust and brown rust diseases. Its average grain yield is 15.8 q/acre.

PBW 771 (Wheat): This variety has been recommended for general cultivation at national level in the North-West Plains Zone, including Punjab, under late sown irrigated conditions. Its average plant height is 80 cm and it matures in about 133 days. This variety has been developed through marker assisted selection (MAS) and carries *Lr57/Yr40* genes for resistance against leaf rust and stripe rust. Its average grain yield is 19.0 q/acre.

PL 891 (Barley): It is a two-rowed hull-less barley variety suitable for human food consumption. It has 4 per cent β -glucan and 12 per cent protein content. It matures in 144 days. It is a medium tall (102 cm) variety. It is resistant to major pathotypes of yellow rust, brown rust and leaf blight diseases. Its average grain yield is 16.8 q/acre. Hull-less barley can be consumed as whole grain cereal, barley flakes and barley flour. Its sattu (roasted grain ground into fine powder) is suitable for use as a traditional energy drink. The β -glucan content is helpful in preventing heart diseases and Type-II diabetes.

DWRB 123 (Barley): It is a two-rowed malt barley variety developed by Indian Institute of Wheat and Barley Research, Karnal. It matures in 141 days. It is a medium tall (101 cm) and bold-seeded variety with 11 per cent protein content. It is resistant to major pathotypes of yellow rust, moderately resistant to brown rust and tolerant to leaf blight disease. Its average grain yield is 19.4 q/acre. This variety is particularly suitable for brewing industry.

PR 131 (Rice): It is a high yielding, medium maturing (110 days after transplanting) and lodging tolerant variety. Its average plant height is 111 cm. It possesses long slender translucent grains with high total and head rice recoveries. It is resistant to all the 10 pathotypes of bacterial blight pathogen (*Xanthomonas oryzae* pv. *oryzae*) prevalent in the Punjab state. Its average yield is 31.0 quintals per acre.

PR 130 (Rice): It is a high yielding, mid-early (about 105 days after transplanting) and lodging tolerant variety. Its average plant height is 108 cm. It possesses long slender translucent and lustrous grains with high total and head rice recoveries. It



is resistant to all the 10 pathotypes of bacterial blight pathogen (*Xanthomonas oryzae* pv. *oryzae*) prevalent in the Punjab state. Its average yield is 30.0 quintals per acre.

PR 128 (Rice): It is an improved version of PAU 201. It possesses long slender clear translucent grains. Its average plant height is 110 cm and matures in about 111 days after transplanting. It is resistant to all the 10 presently prevalent pathotypes of bacterial blight pathogen in the Punjab state. Its average paddy yield is 30.5 q/acre.

HKR 47 (Rice): This variety has been developed by CCS Haryana Agricultural University, Hisar, Haryana. It is a mid-early maturity variety of rice. It takes 104 days to mature after transplanting and its average plant height is 117 cm. Its average yield is 29.5 q/acre. It is suitable for parboiling.

Table 3.7 Average yield (kg/ha) of wheat and non-Basmati paddy in Punjab

Year	Wheat	Non-Basmati Paddy
2018-19	5188	6531
2019-20	5004	6465
2020-21	4868	6964
2021-22	4216	6834
2022-23	4715	6812

Pusa Basmati 1718 (Basmati rice): It is an improved version of Pusa Basmati 1121 and has been developed by Indian Agricultural Research Institute (IARI), New Delhi. It has resistance to bacterial blight disease (conferred by two genes Xa13 and Xa21). Its average plant height is 121 cm and it matures in about 114 days after transplanting. It possesses extra long slender grains. Its average paddy yield is 17.0 q/acre.



Pusa Basmati 1718

Punjab Basmati 7 (Basmati rice): It is a semi-dwarf variety which is about 111 cm tall. It possesses extra-long slender grains which are soft, non-sticky and almost double in length upon cooking. It has high aroma. Its average yield is 19.0 quintals per acre. It is resistant to all the 10 presently prevalent pathotypes of bacterial blight pathogen in the Punjab state as it has Xa13 and Xa21 genes.

Table 3.8 Area under PAU recommended varieties (% to total area under crop)

Crop	2018-19	2019-20	2020-21	2021-22	2022-23
Wheat	95.71	96.27	93.62	93.47	92.62
Non-Basmati paddy	73.94	61.76	64.09	65.56	62.41
Basmati paddy	92.97	95.20	97.06	91.03	87.99

PAU Bt 3 (Cotton): It is a Bt cotton variety with inbuilt resistance against spotted and American bollworms. Its average seed cotton yield is 10.2 quintals per acre; average fibre length is 26.2 mm and ginning outturn is 36.5 per cent. It is tolerant to jassid and cotton leaf curl disease.



PAU Bt 3

PAU Bt 2 (Cotton): It is a Bt cotton variety with inbuilt resistance against spotted and American bollworms. Its average seed cotton yield is 10.0 quintals per acre. It possesses average fibre length of 27.6 mm and ginning outturn of 34.4 per cent. It matures in 160-165 days. It is tolerant to jassid and cotton leaf curl disease.

SML 1827 (Summer mungbean): It has been developed from an inter-specific cross and has yellow mosaic disease (YMD) resistance derived from ricebean. The YMD resistance makes Kharif season seed production possible, which would

facilitate its wider adoption. The variety SML 1827 matures in 62 days. It possesses medium sized shiny grains with good culinary properties including absence of hard grains. The average seed yield is 4.7 q/acre.

ML 1808 (Moong): Plants of this variety are erect and medium statured (71 cm). Pod formation is profuse and each pod contains 11-12 seeds. It is resistant to mungbean yellow mosaic virus, Cercospora leaf spot and bacterial leaf spot diseases. It matures in about 71 days. Grains are shining green and medium bold with good cooking quality. The average grain yield is 4.8 q/acre.

Mash 1137 (Urdbean): It is a spring urdbean variety recommended for sub-mountainous zone of Punjab. It has erect and compact plant type with short stature (30 cm). It matures in about 74 days. Pod bearing is profuse and each pod contains 6-7 seeds. It is resistant to yellow mosaic disease. Its average grain yield is 4.5 q/acre. Its grains are bold, blackish in colour and possess good culinary properties.

Mash 883 (Urdbean): This variety is recommended for the entire Punjab state. Plants are dwarf, erect and compact. It matures in about 77 days. Podding is profuse and each pod contains 6-7 seeds, which are medium bold, black and possess good culinary properties. It is resistant to yellow mosaic disease and tolerant to other foliar diseases. Average grain yield is about 4.2 quintals per acre.

LL 1373 (Lentil): Its plants are short, erect with profuse branching and bear greater number of pods. It has light green leaves, pink flowers, non-pigmented light green pods and rudimentary tendrils. It matures in 140 days. It is resistant to



SML 1827

rust and possesses tolerance to pod borer. Its seeds are attractively bold (100-seed weight 3.5 g) with good culinary properties. Its average yield is 5.1 q/acre.

PBG 8 (Chickpea): This is the first variety of chickpea developed from an interspecific cross between *Cicer arietinum* and *Cicer judaicum*. The latter parent imparts grey mould resistance. It has been released for Central and South-Western districts of Punjab. Average grain yield is 8.4 q/acre. It matures in about 158 days. This variety is moderately resistant to Botrytis grey mould and Fusarium wilt diseases and has good culinary properties.

PMH 11 (Maize): It is a single cross hybrid suitable for cultivation in Kharif season. The plants have a sturdy stem and well developed root system. Its ears are long with dark orange, flint grains. It matures in 95 days. Its average yield is 22.0 q/acre

P1844 (Maize): It has been developed by PHI Seeds Pvt. Ltd. and has been approved for cultivation in spring season. It is moderately tolerant to charcoal rot and Fusarium stalk rot diseases, and is moderately susceptible to shoot fly. Its average yield (in spring season) is 32.0 q/acre.

JC 12 (Maize): This variety is recommended for Kharif season cultivation in traditional composite maize growing sub-mountainous zone of Punjab. It has semi-flint, yellow orange grains. It matures in about 99 days. Its average yield is 18.5 q/acre. It has a medium thick stem with medium ear placement and resists lodging.

PMH 13 (Maize): This single cross hybrid has tall plants with medium ear placement. Its leaves are dark green and broad, ears are conico-cylindrical and long with light orange flint grains. It matures in 97 days and average yield is 24.0 q/acre. It is moderately resistant to Maydis leaf blight, charcoal rot and maize stem borer.

JC 4 (Maize): This is a medium tall composite variety. Its ears are long and medium placed and grains are deep-orange and bold. It has good quality parameters like taste, texture, appearance and flavour and is suitable for chapati making. It matures in about 90 days. It yields about 13 q/acre. This variety is recommended for irrigated and Kandi areas of the state.



PMH 14 (2023): This single cross hybrid has tall plants with broad and erect leaves. Its ears are long, medium placed with yellow-orange flint capped grains. Its average grain yield is 24.8 q/acre and matures in 98 days.

Punjab Baby Corn 1 (Maize): This single cross hybrid is male sterile with medium tall plants. This hybrid is most suitable for baby corn as it gives higher yield of uniform and good quality ears. Being male sterile, it does not need detasseling during hybrid seed and commercial baby corn production. Picking of ears starts around 52 days after sowing and gives three harvests during cropping span. It yields on an average 8.4 quintals of dehusked ears and additionally provides 128 quintals per acre fodder after final harvest for baby corn.

J 87 (Groundnut): It is an early maturing bunch type variety suitable for cultivation during spring as well as Kharif season in Punjab. Its 100 kernel weight is 79 g. It has 69 per cent shelling out turn. Its average pod yield is 15.3 q/acre in spring season and 12.8 q/acre in Kharif season. It has 49 per cent oil content and 5.2 per cent sucrose content. It matures in 112 days. On account of higher oleic acid (65.7%), it has longer shelf life and is more suitable for deep frying. Larger seeds qualify it for confectionary purposes. Early maturity helps it fit as a third crop in potato/pea based cropping systems.

RCH 1 (Raya): It is the first canola quality ('00') hybrid of raya in the country. It is recommended for cultivation in South-Western region of Punjab under timely sown irrigated conditions. This hybrid is tall with profuse siliquae bearing. Its average seed yield is 9.2 q/acre with 39.4 per cent oil content. It matures in 152 days.

PHR 126 (Raya): It is a medium tall hybrid with profuse branching and siliquae bearing. It is recommended for cultivation in South-Western region of Punjab under timely sown irrigated conditions. Its average seed yield is 9.1 q/acre with 40.2 per cent oil content. It matures in 145 days.

PGSH 1707 (Gobhi Sarson): It is the first canola quality ('00') hybrid of gobhi sarson developed by public sector in the country. It is recommended for general cultivation in Punjab under timely

sown irrigated conditions. It is resistant to white rust. This hybrid is tall with profuse siliquae. Its average seed yield is 8.8 q/acre with 41.0 per cent oil content. It matures in 162 days.

PSH 2080 (Sunflower): It is a short duration medium tall hybrid with an average plant height of 151 cm. The average seed yield of this hybrid is 9.8 q/acre. Seeds of this hybrid are black and elongated with 100 seed weight of 5.8 g. Oil content of this hybrid is 43.7 per cent. It matures in 97 days.

BL 44 (Berseem): It is a quick growing variety with higher number of tillers. It is moderately resistant to stem rot disease. It has superior nutritional quality especially in vitro dry matter digestibility. It supplies green fodder up to first week of June and yields about 395 quintals per acre of green fodder. For better seed yield, it should be left for seed production in mid-April.

J 1007 (Fodder maize): Its plants are tall (2.20 m) with broad leaves that stay green for longer time. It is moderately resistant to Maydis leaf blight and charcoal rot. It possesses high crude protein and digestibility. It gives 168 q/acre of green fodder yield.

PCB 166 (Pearl millet): This is a dual purpose composite variety with higher number of tillers. It is a tall variety (281 cm) with long and broad leaves. It is a late maturing variety and reaches 50 per cent flowering after 89 days. It is tolerant to all the major diseases of bajra. It possesses good fodder quality, especially, with respect to crude protein and in vitro dry matter digestibility. On an average, it gives 282 quintals per acre of green fodder.

PBN 342 (Napier Bajra): It is a hybrid with long, broad and smooth leaves. It sprouts early in spring and remains in vegetative growth till the onset of winter. It is resistant to leaf blight and possesses non-hairy and succulent leaves that enhance its fodder quality. It yields 877 q/acre of green fodder.

OL 15 (Oat): It is a single cut variety for irrigated areas of Punjab. Its plants are tall, having long and broad leaves with more leafiness and tillering ability. Its fodder quality is better than OL 12, OL 11, Kent and at par with OL 13. On an average, it yields about 319 quintals of green fodder per acre. Its seed yield is about 9.8 quintals per acre.

OL 14 (Oat): OL 14 is a multicut variety for irrigated areas of Punjab. Its plants are tall with profuse tillering and leafy growth. Its fodder quality is superior in terms of total digestible nutrients (TON) and digestible crude protein (DCP) than OL 10. On an average, it yields about 307 q/acre of green fodder. Its seed yield is 10.9 q/ acre.

Punjab Ryegrass 2 (Ryegrass): It is a multicut, fast growing, late flowering variety. Its leaves are long and broad. It has better fodder nutritional quality, especially, in-vitro dry matter digestibility (IVDMD) than Punjab Ryegrass 1 variety. It gives six cuttings from November to May with a green fodder yield of 327.0 q/acre.

SL 46 (Sorghum): It is a dual purpose variety. SL 46 recorded green forage yield of 275.7 q/acre against 266.5q/acre of check variety (SL 45),thereby, showing an advantage of 3.6 percent. SL 46 is resistant to red leaf spot and moderately resistant to zonate leaf spot diseases. It possesses better fodder and nutritional quality especially the crude protein and in-vitro dry matter digestibility and has low HCN content. SL 46 is suitable for value addition like popping and flour products. The grains of SL 46 have high iron and zinc content.

SL 45 (Sorghum): It is a single cut, late maturing variety, having tall (297cm) plants with long and broad leaves. Its stem is juicy and sweet. It is resistant to red leaf spot and is moderately resistant to zonate leaf spot diseases. It possesses better fodder nutritional quality, especially, with respect to crude protein and in vitro dry matter digestibility. It has low HCN content, a toxic chemical that can cause mild to severe reactions in animals. It gives 271 quintals per acre of green fodder yield.

Co15023 (Sugarcane): It is an early maturing variety. Canes of this variety are medium thick, cylindrical and yellowish green in colour. Its juice contains 16-17 and 18% sucrose in November and December, respectively. It is moderately resistant to the prevalent pathotypes of red rot disease and other diseases except Pokkah Boeng. It is less susceptible to borer complexes. The average cane yield is about 310 q/acre.

CoPb 95 (Sugarcane): It is an early maturing variety. Canes of this variety are tall, thick with

zigzag internode alignment and are purplish green in colour with broad leaf canopy. Its juice contains 17% sucrose in the month of December. It has field resistance to the prevalent pathotypes of red rot disease, and is moderately resistant to smut and less susceptible to top borer. It is a good ratooner, lodging and frost tolerant. The average cane yield is about 425 q/ acre, which is about 20.7 and 11.8% higher than the CoPb 92 and Co 0238.

CoPb 96 (Sugarcane): It is an early maturing variety with medium thick, cylindrical and yellowish green canes. Its juice contains 16-17% and 18% sucrose in November and December, respectively. It is a good ratooner. It is tolerant to the prevalent pathotypes of red rot. It yields gur of very good quality. Its average cane yield is 382 q/acre.

CoPb 98 (Sugarcane): This mid-late maturing variety has tall, thick, cylindrical and yellowish green canes. Its juice contains 17% sucrose. It is a good ratooner. It is tolerant to pathotypes of red rot pathogen. Average cane yield is 400 q/acre.

CIM Kranti (Mentha): It is a high yielding variety of menthol mint & is suitable for planting from end of January to mid of February. The average herb yield is 110 q/acre and herb oil content is 0.6-0.7%. It gets ready for harvesting in 140-150 days after planting.

HORTICULTURAL CROPS

FRUIT CROPS

Table 3.9 Varieties/hybrids of Horticulture crops released during 2018-19 to 2022-23

Crop	Varieties released in Punjab
Vegetables	
Onion	PRO 7, PWO 2, PYO 1, POH 1
Tomato	PTH 2
Brinjal hybrid	Punjab Bharpoor
Chilli	CH 52,
Bitter Gourd	Punjab Karela 15
Sponge gourd	Punjab Nikhar
Carrot	PC 161, PCP 2, PCY 2
Muskmelon	Punjab Sarda
Cluster bean	PVG 16
Pumpkin	Punjab Nawab
Cucumber	PKH 11
Capsicum	PSM 1

Fruits	
Rootstock	Daisy Tangerine on Rough Lemon Rootstock, Kala Amritsari as a rootstock for Satluj Purple
Guava	Punjab Apple Guava
Fig	Black Fig I
Apple	Dorsett Golden, Anna
Dragon Fruit	Red Dragon 1, White Dragon 1
Sweet orange	Vaniglia Sanguigno
Ornamentals	
Chrysanthemum	Annual Chrysanthemum 19, Annual Chrysanthemum 23
Antirrhinum	Punjab Antirrhinum 1, Punjab Antirrhinum 2, Punjab Antirrhinum 3, Punjab Antirrhinum 4
Agro-forestry	
Dek	Punjab Dek 1, Punjab Dek 2

Punjab Apple Guava: Trees of this variety possess round crown with drooping branches. Fruits are medium in size and round in shape. Fruits attain dark red (apple coloured) peel during winter season and have creamy flesh with medium-sized seeds. Fruits have 11.8% TSS and 0.45% acidity. Average fruit yield per tree is 58.0 kg. It is recommended for bearing in winter season only in order to fetch premium price due to attractive apple coloured peel.



Punjab Apple Guava

Black Fig I: Trees of this variety are compact and dwarf, and yield on an average 13.0 kg fruits per tree. Fruits mature from mid-June to first week of July. Fruits are medium to large in size, delicious with purplish-pink colour and have a medium sized eye. The flesh is cream to pink coloured and has an excellent flavour. It is suitable for dense planting (440 plants/acre in comparison to 110 plants/acre in earlier variety, Black Turkey).

Daisy Tangerine on Rough Lemon Rootstock: Daisy Tangerine plants propagated on Rough Lemon (Citrus jambhiri) rootstock are more suitable for cultivation in alkaline soils (pH more than 8.0) prevalent in South-Western zone of Punjab. Daisy Tangerine was previously recommended on Carrizo rootstock. The scion-stock combination of Daisy Tangerine-Rough Lemon imparts tolerance to tree decline along with higher yield (15%) in alkaline soils. Average yield of this combination is 47.4 kg fruits/tree.

Dorsett Golden (Apple): It is a low chilling and early maturing variety of apple. The fruits are round-conical, greenish yellow in colour. Fruit size remains small (55-65 mm diameter), TSS 13.0%, acidity 0.3% and TSS/acid ratio of 43.3. Fruits are available during first fortnight of June. Average yield is 30 kg/plant.

Anna (Apple): It is a low chilling and early maturing variety of apple. Fruits are oblong-conical and greenish yellow with slight red blush on some fruits. Fruits are smaller in size (55-65mm diameter), TSS 12.7%, acidity 0.38% and TSS/acid ratio 34. Fruits are available from the fourth week of May to second week of June with an average yield of 32 kg/ plant.

Vaniglia Sanguigno (Sweet orange): It is an early maturing variety that matures during mid-October to end-October as compared to end-October to mid-November of Early Gold. Its flesh is pink in colour with 0.21% acidity as compared to yellow flesh and 0.64% acidity of Early Gold.

Kala Amritsari as a rootstock for Satluj Purple (Plum): Kala Amritsari has been recommended as a rootstock for Satluj Purple variety of plum. Nursery raised on this rootstock exhibited high survival (84.1%) and healthy plant growth (1.08 m height and 2.0 cm girth). Satluj Purple on this rootstock had an average 38.8 g fruit weight and 33 quintals per acre fruit yield.

Red Dragon 1 (Dragon fruit): It bears fruits from July to November, fruits are oblong with red-green brackets and average weight is 334.2 g per fruit. Its flesh colour is dark red embedded with small black seeds. It is rich in beta carotene (42.91 micro g) per 100 g), phenols (48.33 mg per 100 g), flavanols (30.66 mg per 100 g). Fruits are rich in K, Ca and Mg.

White Dragon 1 (Dragon fruit): It bears fruit from July to November, fruits are oblong with red-green brackets and average weight is 287.32 g per fruit. Its flesh colour is white embedded with small black seeds. Average TSS is 9.24 with 0.62 percent acidity.



White Dragon 1

VEGETABLE CROPS

CH 52 (Chilli): It is the first cytoplasmic genetic male sterility (CGMS) based chilli hybrid of PAU. It is an early maturing hybrid, which is suitable for November transplanting under low tunnel. It becomes ready for the first picking in 112 days. Fruits are long (9.8 cm), pungent (0.9% capsaicin), thin-skinned, pendent and borne singly. Its average fruit yield under low tunnel conditions is 106 q/acre.

PSM 1 (Capsicum): Fruits of this bell pepper variety are uniform, non-pungent, sweet flavored, each weighing about 82 g under poly-net house and 75 g under low tunnel. It gives an average yield of 246 q/acre under poly-net house and 82 q/acre under low tunnel cultivation. It is an early maturing variety and gets ready for first picking in 109 days after transplanting under poly-net house and in 120 days under low tunnel cultivation. It



Capsicum: PSM 1

Table 3.10 Area and production of Fruits and vegetable crops

Year	Vegetables		Fruits	
	Area (ha)	Production (tonnes)	Area (ha)	Production (tonnes)
2018-19	273.6	544.1	86.8	1857
2019-20	289.4	5779	90.5	1972
2020-21	305.4	6110	93.6	2027
2021-22	321.5	6439	96.7	2142
2022-23	338.8	6807	99.7	2219

has shelf life of 4 days at ambient temperature and is suitable for fresh market and distant transportation. It is tolerant to high temperature and its seed can be produced in plains.

POH 1 (Onion): It is the first hybrid variety of onion developed by PAU. Its bulbs are round, large and light-red. It takes 142 days to harvesting. It is tolerant to bolting and has longer storage life (4 months under ambient conditions in comparison to complete rotting in check hybrid T-821 within this period). It is rich in vitamin C (50 mg/100 g). Its average yield is 221q/acre.

PTH 2 (Tomato): First picking of this hybrid tomato is possible after 114 days of transplanting. Fruits are round, deep red, medium sized (75 g) and firm with 3-4 locules. Fruits have 4.2 Brix TSS and 4.7 mg/100 g lycopene content. It is resistant to late blight and root knot nematodes. It yields on an average 270 q/acre and is suitable for processing purposes.

Punjab Karela 15 (Bitter gourd): Its fruits are dark green and have a matted appearance. It is moderately resistant to yellow mosaic disease. Its average yield is 51 q/acre. It takes 71 days from sowing to first fruit harvest.

PWO 2 (Onion): Its bulbs are white, medium-large and round with tight neck. It takes 139 days from transplanting to harvesting. It has good keeping quality and tolerance to bolting. Its average yield is 155 q/acre. White colour and high TSS make it suitable for flakes and powder making. These products have good export potential and are getting established in Indian market also.

PYO 1 (Onion): Its bulbs are yellow, large and globular with tight neck. It takes 141 days from transplanting to harvesting. It has good keeping



quality and tolerance to bolting. Its average yield is 164 q/acre. It is suitable for fresh consumption and export.

PCP 2 (Carrot): It is a tropical variety which gets ready for harvesting in 92 days after sowing. Its foliage is purple green, having an average plant height of 68 cm. Roots are purple in colour with orange flesh, tapering, 26.5 cm long, and about 3-4 cm in diameter. Roots have high juice content (500 ml/kg of roots). It is rich in anthocyanin and β -carotene. It has 9.49% dry matter, 7.85% TSS, 0.94 mg/100 g iron and 37.6 mg/100 g of calcium. Average root yield is 217 q/ acre.

PC 161 (Carrot): It is a tropical variety with deep red colour. The carrots on an average are 30.7 cm long and slender with 2.8 cm diameter. This variety has an average yield of 256 q/acre. mottled-brown colour at maturity. Fruit cavity is medium, and flesh is thick and golden-yellow. It is tolerant to pumpkin yellow vein mosaic virus disease (which is serious during rainy season). It gives 137 q/acre yield. Its suitability for lean period rainy season cultivation is expected to attract premium prices.

PCY 2 (Carrot): It is a tropical variety and gets ready for harvesting 96 days after sowing. Its foliage is green, having an average plant height of 66 cm. Roots are yellow in colour, tapering, 25.6 cm long and about 3-4 cm in diameter. It is a rich source of lutein and β -carotene. Roots have high juice content (476 ml/kg of roots), TSS (7.10%), dry matter (10.31 %) and calcium (47.3 mg/100 g). Average root yield is 208 q/acre.

Punjab Nikhar (Sponge gourd): It is an early maturing variety, which takes 143 days from transplanting to first picking. Its fruits are slender, smooth, tender, long and attractively light green with average fruit weight of 110 g. The vines are medium long with intermediate inter-nodal length. Its average yield is 82 q/acre.

PKH 11 (Cucumber): This cucumber hybrid is parthenocarpic gynoecious with dark coloured fruits. Its plants bear 1-2 fruits per node. The fruits are seedless, bitterness free, moderately ribbed, cylindrical in shape, 16-18 cm long with average fruit weight of 150-160 g and do not require peeling. It is recommended for general cultivation in Punjab state under poly/ net house environment. It takes 45 and 60 days for first fruit

picking after sowing in September and January, respectively. Average total yield is 320 q/acre and 370 q/acre in September and January sown crop, respectively.

Punjab Nawab (Pumpkin): Its fruits are medium sized with flat-round shape. Its bulbs are red, medium-large and round with thin tight neck. It is an early maturing variety and takes 120 days from transplanting to harvesting. It has good keeping quality and tolerance to bolting. The average yield is 159 q/acre. It is suitable for fresh consumption and its early maturity will help fetch premium prices.

Punjab Bharpoor (Brinjal): Its fruits are small, oblong, shining, deep purple with green calyx and are borne in heavy clusters (6-9 fruits). Its plants are medium-tall (92 cm), compact and thorn-less with green foliage. It is resistant to bacterial wilt. Its average yield is 224 q/acre. This variety caters to the demand of small fruit segment.

Punjab Sarda (Muskmelon): This canary yellow group muskmelon variety has medium long and vigorous vines with light green foliage. Its fruits are oval-round, having bright yellow smooth rind, thick white flesh and small seed cavity. Fruits are attractive with average fruit weight of 780 g. Its flesh is thick, creamy white, medium juicy with 13.5 per cent total solids content and characteristic crispy texture. It takes 70 days from transplanting to first picking. Its average fruit yield is 56 q/acre. The fruits have high firmness and long shelf life which make it amenable to distant transportation.

PVG 16 (Cluster bean): This vegetable-purpose variety has been recommended for general cultivation in the Punjab state. It has erect, unbranched and medium-statured (116 cm) plants. The first picking is ready in 51 days after sowing. The pods are short, green, pubescent and straight. The average green pod yield is 38.7 quintals per acre.

ORNAMENTALS

Punjab Glad 3: Its leaves are green and sword shaped. Its spike length is 103 cm with 17 florets. The florets are bright yellow with 17 days vase life. It takes 105 days to flower; produces 1 corm, 22 cormels per corm on an average; and is suitable for cut flower production.

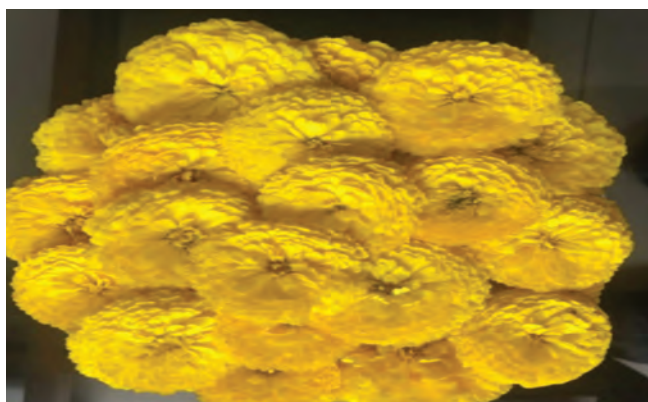
Punjab Antirrhinum 1: Plants are tall with yellow coloured flowers. It produces 12 racemes, which are 51 cm long. It takes 91 days to flowering and flowering lasts for 77 days. It has a six-day vase life.

Punjab Antirrhinum 2: Plants are tall with cream coloured flowers. It produces 15 racemes, which are 49 cm long with a six-day vase life. It takes 92 days to flower and flowering duration is 77 days.

Punjab Antirrhinum 3: It has tall plants with magenta coloured flowers. It produces 16 racemes, which are 48 cm long. It has a six-day vase life. It takes 87 days to flower and flowering duration is 81 days.

Punjab Antirrhinum 4: Plants are tall with pink coloured flowers. It produces 14 racemes, which are 53 cm long. It has a six days vase life. It takes 89 days to flower and flowering duration is 75 days.

Punjab Bahar Guldaudi 1 (Chrysanthemum): It has tall plants with dark green leaves and cream coloured flowers. It takes 106 days to flower and has flowering duration of 62 days. It is suitable for loose flower production. The average flower yield is 91.6 quintals per acre.



Punjab Bahar Guldaudi 2

Punjab Bahar Guldaudi 2 (Chrysanthemum): It has tall plants with dark green leaves and yellow coloured flowers. It takes 105 days to flower and flowering period lasts for 58 days. It is suitable for loose flower production and average flower yield is 66.8 quintals per acre.

AGRO-FORESTRY

- **Punjab Dek 1 (Burma dek):** This *Melia composita* variety has about 30 feet high clear bole, which makes it amenable to use in plywood industry. Overall tree height is

about 14.5 m and girth is 76 cm. The per tree volume is 0.385 m³.

- **Punjab Dek 2 (Burma dek):** This *Melia composita* variety has about 30 feet high clear bole, which makes it suitable for use in plywood industry. Overall tree height is about 14.8 m and girth is 91 cm. The per tree volume is 0.284 m³.

FARM MACHINERY

Lucky Seed Drill: Lucky Seed Drill has been developed and recommended for simultaneous seeding and spraying of pre-emergence herbicide in direct seeded rice. It provides effective and timely weed control, and labour-saving benefits. The drill consists of an inclined plate seed metering mechanism, nine furrow openers, a tank and a boom sprayer. Lucky Seed Drill was further refined by fitting it with press wheel attachment for enhanced weed control efficiency, better profile moisture conservation and better krand control in direct seeded rice as compared to earlier design.



Sub-surface Drip Laying Machine: Tractor-operated sub-surface drip laying machine developed for placing drip laterals at 30 cm depth with adjustable row to row spacing (varying from 40 to 75 cm) has been recommended. It has an average field capacity of 0.62 ha/h and saves more than 95 per cent of labour costs.

Boom type sprayer on Paddy Transplanter: A boom type sprayer attachment was developed and mounted on the rear of self-propelled fourwheel drive paddy transplanter, after removing its transplanting unit. The field capacity of the machine for spraying in paddy and wheat was 0.87 and 1.38 ha/h, respectively, with negligible damage/trampling of plants. The fuel consumption was found to be 2.1-3.0 l/h. The

technology improves economics of the machine by increasing its annual use.

Sugarcane Trench Planter: Existing two paired rows sugarcane trencher has been modified to single paired row trench planter. The machine cuts the setts of desired length, places the sett in furrow and covers the sett with soil along with making trench and furrows. There was 25 per cent reduction in cost of planting and 58 per cent reduction in labour cost as compared to conventional method.

Tractor-operated vertical cup type Vegetable Transplanter: Tractor-operated vertical cup type vegetable transplanter is a two-row semi-automatic tractor mounted machine used for transplanting cell type nursery of different vegetable crops. Field capacity of the machine for transplanting tomato, brinjal and chilli was 0.10 ha/h, 0.13 ha/h, and 0.15 ha/h, respectively at recommended spacing and forward speed with plant missing of less than 4 per cent. Labour saving in tomato, brinjal and chilli was 84.7 per cent, 86.2 per cent, and 85.7 per cent, respectively.



Happy Seeder refinement: Three flail blade rows, having replaceable sharp edge section of 4 mm thickness mounted on the rotor of earlier developed Happy Seeder at an angular spacing of 1200 with tines having serrated bit (4mm replaceable) resulted in improved field capacity and fuel consumption of Happy Seeder by 13.7 and 21.5 per cent, respectively, as compared to existing design. The speed improved by 2.87 km/h. Three flail blades were found better than 6, 4 and 2 blades in all aspects.

Super Seeder: The tractor mounted machine for direct sowing of wheat in combine harvested paddy field, developed by the private sector,

and was approved upon evaluation by PAU. The machine is operated by a 55 hp or above tractor. Fuel consumption for the Super Seeder varied from 8-9 l/h and field capacity varied from 0.22-0.27 ha/h.

PAU Smart Seeder: It manages the paddy straw by partial incorporation in a narrow band and retains the remaining straw as surface mulch and thus combines the advantageous features of Happy Seeder and Super Seeder. PAU Smart Seeder places wheat seeds in a well-tilled narrow band of soil and covers the seed rows with soil, using furrow closing rollers. Tillage in seed rows, followed by furrow closing rollers, enhances the soil seed contact and conserves furrow moisture, which results in early and uniform wheat establishment compared to Super Seeder and Happy Seeder. The machine can be operated with a 45-50 hp tractor. Field capacity and fuel consumption of the machine are 0.4 ha/h and 5.0 l/h respectively.

Tractor-operated Seeder for mat type paddy nursery: This machine is used for raising mat type paddy nursery for mechanical paddy transplanter. It lays one-meter-wide perforated polythene sheet (50-60 gauge) over one-meter-wide soil bed with simultaneous uniform seed placement over the soil bed. The machine can raise mat type paddy nursery for about 180-200 acres in one day. As a result, labour can be saved by 93-94% over the conventional nursery raising method.



Pneumatic Maize Planter: Tractor-operated pneumatic planter for maize has been developed in collaboration with industry. This four-row planter is additionally equipped to make beds as well. This machine employs about 22.5-25 kg seed per hectare to sow at an average depth of 55 mm. Field capacity of the machine varies from 0.6 to

0.8ha/h. Approximate savings in cost and labour over conventional method are 46.6 and 96 per cent, respectively.

PAU Surface Seeder: PAU Surface Seeder comprises of straw cutter-cum-spreader fitted with seed & fertilizer box attachment. This machine can be easily operated by the 40-45 hp tractor or above. Average field capacity of the machine was observed as 0.6-0.7 ha/h. It is a low-cost machine which does uniform application of wheat seed & basal fertilizer along with cutting & spreading of paddy straw in a single operation. It is followed by irrigation for initiating the germination of wheat.

Tractor-operated Paddy Straw Bale Shredder-cum-Mulcher: Tractor-operated paddy straw bale shredder-cum-mulcher can be used for reducing straw size and spreading it uniformly in the field for mulching in widely spaced crops. Manual spreading of loose straw is highly laborious. This machine will reduce dependence on labour for mulching; reduce straw size, thereby, effectively controlling weeds. The machine was operated using a 38 hp tractor. Machine was evaluated on garlic crop sown on beds of 1.0 meter top width. The average field capacity of the machine was observed as 0.25 ha/h.

Spraying system along with Unmanned Aerial Vehicle (UAV)/Drone: For spraying, hexa-copter drone fitted with standard/extended flat fan nozzle or anti-drift/air induction nozzles can be used for spraying. Drone can be operated at forward speed 2.0-3.0 m/s and height 2-3 m from the top of the crop at nozzle pressure 1.38 kg/cm². Drone/UAV can be used for spraying in all crops, especially, for tall crops at all the growth stages of the crops. A certified and trained pilot is required for the operation of UAV/drone in fields. Total cost on operation of drone for spraying will be Rs. 742.0/ha.



CROP PRODUCTION TECHNOLOGIES

Research programmes of the University aim at developing production technologies for tapping full potential of crop varieties, conservation of natural resource base, crop residue management and for enhancing farm profits. Technologies developed during the report period laid emphasis on micro-irrigation/fertigation, new cropping systems, efficient nutrient management with special focus on digital technologies, energy conservation and soil-less vegetable cultivation for urban/peri-urban areas.

FIELD CROPS

- Seed rate and spacing : The LL 1373 of lentil has bolder seeds than other recommended varieties. As a result, higher seed rate (18 kg/acre in place of existing 12-15 kg/acre) has been recommended.
- To optimize plant stand for realizing higher yield in maize, recommended seed rate (8 kg/acre) was revised upward (10 kg/acre). Wider row spacing (30 cm) and hence lower seed rate (15 kg/acre) have been recommended for deriving higher yields in seed crop of fodder oat.

ORGANIC PRODUCTION TECHNOLOGY

- New production technology involving use of farmyard manure (FYM) and neem extract along with optimized plant spacing (67.5 cm x 10 cm) has been recommended for organic production of gobhi sarson. It involves basal application of FYM @ 4t/acre followed by three sprays of 1:2 FYM extract (S0, 65, and 85 days after sowing). The extract can be prepared by mixing 10 kg FYM and 3 kg fresh neem leaves in 30 litres of water.

MICRO-IRRIGATION

- Sub-surface drip irrigation and fertigation technology package in summer moong-maize-wheat cropping system has been recommended. Sub-surface drip lines need to be placed at 20 cm depth with drippers 20 cm apart using row to row spacing of 67.5 cm. Two rows of summer moong, one row of maize and two rows of wheat sown on each line of sub-surface drip during respective seasons gave 18.4 per cent higher system



productivity (maize equivalent yield) besides saving 28.5 per cent of irrigation water and 20 per cent of fertilizers.

- Surface and sub-surface drip fertigation recommended in sugarcane at 100 per cent cumulative pan evapo-transpiration with 80 per cent recommended dose of N fertilizer in 10 equal splits helps save 40-50 per cent of irrigation water and 20 per cent of N fertilizer.
- Drip irrigation schedule recommended in raya and gobhi sarson results in 12.7 per cent and 23.0 per cent higher seed yield, respectively. Besides, drip irrigation saves 15.8 per cent and 26.2 per cent of irrigation water in raya and gobhi sarson, respectively along with 20 per cent of nutrients in both the crops.
- A solar energy operated tubewell and drip irrigation system have been recommended in two sub-surface drip irrigation systems: direct seeded zero-till rice-wheat system and maize-wheat permanent bed system. The rice-wheat and maize-wheat systems save about 48 per cent and 53 per cent of water, respectively, over conventional flood irrigation and confer 2 per cent and 9 per cent yield advantages, respectively.
- Drip irrigation and fertigation schedule for guava involving application of water equivalent to 80 per cent of crop evapo-transpiration and 80 per cent of recommended fertilizer dose have been recommended. Plastic mulch (25 μ) confers additional yield advantage. This technology provides higher yield and better quality.
- Drip irrigation and fertigation schedule recommended for bitter gourd provides 37 per cent irrigation water saving (over conventional system) and 20 per cent saving in fertilizers besides higher and better quality yields. Plastic mulch, followed by straw mulching, provides additional yield advantages.
- Drip irrigation and fertigation technology package has been recommended for densely planted Kinnow (6m X 3m spacing) involving fertigation in 15 equal splits from February to April and 12 splits from July to mid-September. It raises yield by 30 per cent besides saving water and fertilizers (20%) in comparison to conventional irrigation system under high density plantation.
- During scarcity of canal water, life-saving irrigation to Kinnow mandarin trees can be occasionally provided through drip irrigation by mixing fresh (canal water) and saline water (tubewell water with electrical conductivity around 2 mmhos/cm).
- Micro-irrigated soil-less rooftop/terrace vegetable nutrition garden model for urban/peri-urban areas and hobbyists has been recommended. A five-row model 2 requires a gross area of 20 m, whereas a 2 three-row model needs gross area of 13 m. The structure can withstand wind speed up to 169 km / hour. Staggered sowing/transplanting/cutting can ensure vegetable supply throughout the year for a family of 3-4 persons.
- Drip irrigation and fertigation package has been recommended in pumpkin (at 100% replenishment of cumulative evapo-transpiration and 80% of recommended fertilizer dose), which provides 55 per cent higher yield besides saving 50 per cent of water in comparison to conventional system.
- Micro-irrigated soil-less (coco peat slabs) cultivation of seedless (parthenocarpic) cucumber under naturally ventilated polyhouse has been recommended. The technology increased fruit yield by 26.5 and 21.2 per cent over the conventional soil based system in September and January sown crop, respectively.
- Drip irrigation in marigold involving 100 per cent replenishment of cumulative evapo-transpiration along with fertigation of 100 kg N/ha (220 kg urea per ha) have been recommended. The technology provided 20.6 per cent increase in flower yield over the conventional system.
- Irrigation through sub-surface drip system in cotton at 80% cumulative evapo-transpiration (ETc) with 112 kg N/ha in 10 equal splits at 1 day interval starting from 30-35 days after sowing gave 26% higher yield than obtained under conventional surface-flooded with

100% recommended dose of fertilizers (RDF) and 9.4% higher than the surface drip system with 100% RDF. In case of wheat crop, sub-surface drip irrigation at 80% ETc and 80% RDF gave 9.5% higher yield than the conventional surface flooded (100% RDF) system and 3.4% higher than in surface-drip (100% RDF) system.

- Water stress in cotton, e.g. during canal closure and lack of rainfall, can be managed by using osmo-protectants like salicylic acid (12.5 g dissolved in 375 ml alcohol and applied through 125 litres of water).
- In case of poor quality irrigation water, Bt cotton can be grown without any yield penalty by alternately using good and poor quality irrigation water through surface drip, providing 80 per cent of the recommended dose of N fertilizer in a sandy loam soil.
- In areas having poor quality irrigation water, some fodder crops can be grown with alternate use of good quality (canal water) and saline irrigation water (electrical conductivity 3.8-4.2 dS m⁻¹, residual sodium carbonate (RSC) 1.36 mEq L⁻¹) after pre-sowing irrigation with good quality water.

DIRECT SEEDED RICE AND LEGUME BASED SYSTEMS

- Direct Seeded Rice (DSR)-potato-onion, DSR-potato-mentha, and Direct Seeded Basmati Rice (DSBR)-potato-mentha cropping systems have been recommended. The cropping systems with mentha and onion gave 124, 119 and 115 per cent increase in rice equivalent yield, respectively, as compared to transplanted rice-wheat cropping system. Rice equivalent yield for DSBR-potato-mentha and soybean-pea-summer moong system was 115 and 51 per cent higher, respectively than the conventional transplanted rice-wheat system. An all legume cropping sequence of soybean-pea-summer moong has also been recommended. Introduction of DSR and legumes in sequences confers water saving and soil health advantages.
- Planting on beds with row to row spacing of 67.5 cm and plant to plant spacing of 20

cm or on 60 cm apart ridges in Kharif maize provides a yield advantage of 10 per cent and 14 per cent, respectively, over flat sown crop. In addition, planting by these methods witnesses low incidence of bacterial stalk rot and banded leaf and sheath blight.

- For obtaining better yields from transplanted gobhi sarson and African sarson, seedling age of 30 days is optimum for current set of varieties.
- Sowing time of toria has been extended from first half of September to whole of September as germination of crop was noticed to suffer from rainfall and high temperature. Earlier, time recommended for toria sowing allowed it to be grown as a catch crop before late sown wheat which is not that common. Now, toria can be grown as a catch crop before other crops (like sunflower, spring groundnut, etc.) sown in January and February.
- Pusa Basmati 1718 and Punjab Basmati 7 have been found suitable for direct seeding. These varieties matured 3-4 days earlier under direct seeding environment.

MINOR CROP AND INTERCROP AGRONOMY

- Package of standardized production technologies for sugarbeet, a short duration sugar crop, has been recommended. Sugarbeet can potentially extend crushing season by two months besides being suitable for bio-ethanol production.
- Relay planting of pea, on ridges placed 60 cm apart, with celery germinating naturally from shattered seed of previous crop has been recommended. The recommended practice yielded on an average 32.4 q/acre pea and 4.8 q/acre celery in comparison to 35.6 q/acre pea and 5.8 q/acre celery in respective sole crops.
- **Seed rate and spacing :** The LL 1373 of lentil has bolder seeds than other recommended varieties. As a result, higher seed rate (18 kg/acre in place of existing 12-15 kg/acre) has been recommended.
- To optimize plant stand for realizing higher yield in maize, recommended seed rate (8 kg/



acre) was revised upward (10 kg/acre). Wider row spacing (30 cm) and hence lower seed rate (15 kg/acre) have been recommended for deriving higher yields in seed crop of fodder oat.

- New production technology involving use of farmyard manure (FYM) and neem extract along with optimized plant spacing (67.5cm x 10cm) has been recommended for organic production of gobhi sarson. It involves basal application of FYM @ 4t/acre followed by three sprays of 1:2 FYM extract (SO, 65 and 85 days after sowing). The extract can be prepared by mixing 10 kg FYM and 3 kg fresh neem leaves in 30 litres of water.
- Wider inter-row spacing and longer duration of sugarcane can be utilized for intercropping with okra to enhance income. Two rows of okra can be intercropped in spring sugarcane planted at 90 cm x 30 cm or 120 cm x 30 cm.
- A new diversification oriented cropping system, groundnut-pea-sunflower, has been recommended. Groundnut should be sown in the second half of May, pea during second half of October and sunflower during first half of February. The system increases net returns (over conventional rice-wheat system) by 56 per cent.
- Under certain soil situations (such as waterlogged/ sodic soils) prohibiting timely harvesting of Non-Basmati/Basmati rice and use of farm machinery, wheat can be relay cropped in paddy/basmati by broadcasting wheat seed in standing rice crop just before or immediately after last irrigation to rice during October 10 to 25. The practice entails higher seed rate (55-60 kg/acre) of wheat crop and leads to 18-27 per cent higher yield under the above conditions.
- Celery can be relay cropped in short duration varieties of pea for higher returns. For this purpose, 4 kg of celery seed/acre can be broadcast immediately after first irrigation to pea sown on ridges (two rows of pea on 60 cm ridges). Alternatively, pea can be planted in fields under celery during the previous year and naturally germinated seedlings from the shattered seed of celery crop can be retained.
- In chickpea, foliar application of zinc heptahydrate (21 % Zn) @ 0.5% along with urea @ 2% at flowering and pod formation stages has been recommended for achieving higher grain Zn content (35.9 mg/kg) in comparison to 27.7 mg/kg under untreated control.
- Rabi onion can be grown as an intercrop in autumn sugarcane for deriving higher net returns. Five rows of onion crop can be grown in between the sugarcane rows with 100% recommended dose of fertilizers. One row of tomato crop can be planted as an intercrop in autumn sugarcane for enhancing farm income.
- Based on sustained demand due to confectionery purpose use of groundnut and certain features that enable adjustment of spring groundnut as a third crop, some new cropping systems have been recommended. These include spring groundnut-maize-potato, spring groundnut-maize-pea, spring groundnut-moong-potato, and spring groundnut-moong-pea. The Green Seeker optical sensor technology that recommends optimum nitrogen (urea) dose based upon greenness index called Normalized Difference Vegetation Index (NDVI) has been recommended for wheat crop. It allows mid-season correction of nitrogen deficiency. Precise application of N in this way benefits both farmers and environment.
- A smart phone application, PAU Urea Guide App, has been developed. The App uses data collected from PAU Leaf Colour Chart and Green Seeker for working out optimum urea dose for crops like wheat, rice, Basmati, maize and cotton. Efficient urea consumption extends both economic and environmental advantages.
- Using 100 kg N/ha through neem-coated urea in wheat gives yield equivalent to that obtained by using 120 kg N/ha through ordinary urea, but using neem-coated urea @ 120 kg N/ha provides additional yield (8.6%) advantages. Hence, use of neem-coated urea @ 120 kg N/ha has been recommended in wheat to derive higher yields.

- The previously recommended schedule (three equal splits: basal, 21 and 42 days after transplanting for nitrogen fertilizer (urea) (Green Seeker application in rice) has been modified to three equal splits – 7, 18 and 36 days after transplanting – in case of short duration varieties PR 126 and PR 124 to get higher yields.
- Foliar application of potassium nitrate @ 1.5% recommended for paddy crop at boot stage increased grain yield by 5.4 per cent. The increase in yield was largely driven by improvement in panicle weight, which was further caused by improvement in number of filled grains per panicle and spikelet fertility.

PRODUCTIVITY ENHANCEMENT THROUGH BIOFERTILIZERS/GROWTH REGULATORS

- Dipping of rice seedlings in Azospirillum (free living nitrogen-fixing bacteria) biofertilizer solution (@ 5 g/litre of water) for 45 minutes before transplanting has been recommended for yield and soil health advantages.
- During 2018-19, the University produced biofertilizers for 69,500 acres of various crops for distribution among farmers.
- Liquid microbial inoculant comprising Burkholderia seminalis and Bradyrhizobium sp. in trehalose (5mM) basal medium has been recommended for enhancing yield and quality of forage cowpea. Using the culture in addition to recommended dose of fertilizers (RDF) improved green and dry fodder yield by 5.3 and 6.1 per cent, respectively. Besides, it improved forage quality by reducing acid detergent fibre (ADF) and neutral detergent fibre (NDF) content, and by increasing crude proteins and in vitro digestibility of dry matter (IVDMD). Additionally, liquid formulation enhances shelf life and ease of application.
- To obviate low germination concerns in sugarcane, seed cane setts can be soaked overnight in Etherel (2-chloroethyle phosphonic acid) solution @ 100 ppm (25 ml Etherel in 100 litres of water). It regulates plant growth and germination timings. The practice improves germination by 23 per cent and yield by 22 per cent.
- Foliar application of urea @ 2% in chickpea at flowering and pod formation stages has been recommended. This practice provides 7.3 per cent increase in yield and 3 per cent increase in protein content, and does not increase the susceptibility of crop to insect-pests and diseases.
- In soils irrigated with sodic water (residual sodium carbonate [RSC] upto 12.5 mEq/litre), combined application of liquid microbial consortia (Azotobacter + Phosphorus solubilizing bacteria + Zn solubilizing bacteria) as seed treatment and gypsum (@ 25% of Gypsum Requirement) has been recommended for countering adverse effects of sodicity on seed cotton yield in cotton-wheat system.
- A comparative evaluation of growth of Azospirillum sp. (recommended for rice) in recommended Trehalose based liquid medium, Jensen broth and charcoal based biofertilizer was performed. The longest shelf life of seven months was recorded in case of Trehalose based liquid biofertilizer i.e. 108 CFU/ml at room temperature during the period November 2021 to May 2022. Charcoal based biofertilizer was, however, able to sustain the desired count upto three months only.
- Foliar application of potassium nitrate and/or salicylic acid has been recommended in wheat for yield enhancement through mitigating the effect of heat stress. Two sprays of potassium nitrate (N:P:K::13:0:45) @ 2% at flag leaf stage and anthesis stage or alternatively, two sprays of salicylic acid (75 mg/ml) may be given. Foliar applications of potassium nitrate and salicylic acid in this way enhanced yield by 12.5 and 8.1 per cent, respectively. Salicylic acid use significantly improved 1,000-grain weight as well.
- The University prepared and provided biofertilizers for 16 crops (including rice, wheat, maize, sugarcane, arhar, moong, soybean, pea, berseem, mash, summer moong, gram, lentil, turmeric, potato and onion), which were enough for inoculating more than 63 thousand acres.



- Two foliar sprays of potassium nitrate @ 1.5% during mid-November and again in mid January helped to increase the ber fruit weight and yield (by 15.8 and 11.7%, respectively).
- Dipping of Rabi onion seedlings in biofertilizer solution, made by mixing one kg of biofertilizer consortium (Azotobacter sp.+Sphingobacterium sp.+Burkholderia sp.) in 100 litres of water, for 30 minutes has been recommended for onion yield improvement (by about 16%).

PADDY RESIDUE MULCHING

- Paddy straw mulching (@ 5.5 tonnes/acre, 10 cm thick layer) after fruit set and application of second dose of inorganic fertilizers in pear during second week of April, and during first week of March in peach and plum has been recommended for attaining better fruit yields.
- Mulching with paddy straw @30 q/acre in spring maize at the time of sowing helps save irrigation water in spring maize. However, it delays seed germination by 3-5 days.

CULTIVATION METHODS

- New DSR (Direct Seeded Rice) technique - 'Tar wattar DSR' has been proposed. The technique involves laser levelling followed by pre-sowing (rauni) irrigation and preparation of the field upon reaching Tar wattar condition (high soil moisture at workable stage). Rice is then immediately sown with tractor-operated Lucky Seed Drill which simultaneously handles sowing of rice and pre emergence herbicide application. In the absence of Lucky Seed Drill, rice can be sown alternatively with rice seed drill having inclined plate metering mechanism followed immediately by herbicide application. Under 'Tar wattar DSR', first irrigation is given at about three weeks after sowing, thus conferring advantages of better root growth, low weed population and significant water saving.
- The AL882, a short duration and early maturing variety of arhar, can be densely planted (30 cm row spacing instead of conventional 50 cm and seed rate 12 kg/acre instead of 6 kg/acre) from June 15 - 25 to obtain about 20 per cent higher yield.

NUTRIENT MANAGEMENT

- Nitrogen (urea) fertilizer schedule in wheat has been modified to derive higher nitrogen fertilizer use efficiency in wheat. In addition to basal application of N through 55 kg/acre DAP, urea @ 45 kg/acre in timely sown wheat and @ 35 kg/acre in late sown wheat should be applied each with the first and second irrigation. In case of the likelihood of delay in second irrigation due to seasonal rainfall, second split of urea should be applied about 55 days after sowing.
- Use of Leaf Colour Chart (LCC) for need-based nitrogen fertilizer application has been extended to Basmati rice. Critical greenness shade level, however, depends on variety and varies from 3.5 (CSR 30, Basmati 386 and Basmati 370) to 4 (Punjab Basmati 4, Punjab Basmati 5, Pusa Basmati 1637, Pusa Basmati 1509, Pusa Basmati 1718, Punjab Basmati 2, Punjab Basmati 3 and Pusa Basmati 1121). The LCC should be used weekly, starting from 21 days after transplanting. Urea @ 9 kg/acre needs to be top-dressed in case greenness of 60 per cent leaves slips below the critical threshold.
- In rice-wheat fields involving straw management through retention or incorporation, nitrogen fertilizer dose in wheat crop can be decreased by 25%. Practicing straw retention/incorporation over a period of more than three years improved soil health as available N, P, and K and organic carbon increased by 23.5, 29.1, 11.0, and 45.0%, respectively. Nitrogen fertilizer rate in oat seed crop has been standardized at 20 kg N/acre.
- Nutrient management intervention in spring groundnut involving application of gypsum @ 225 kg/ha in two equal splits, first at sowing and second at flower initiation stage, along with 25 kg N and 30 kg Pp/ha has been recommended for higher productivity and quality.
- Bentonite sulphur (90% S) can be used in place of other commonly used sulphur sources like gypsum and single superphosphate to make up S-deficiency in wheat crop grown

on S-deficient soils. Its high analysis (90% S-content in comparison to 11% in single superphosphate and 15-16% in gypsum) can help economize on storage and transportation costs.

- Iron deficiency in soybean induces yield limiting chlorosis. Excess rainfall during Kharif season can also restrict ferrous iron uptake due to lack of oxygen. The deficiency can be made up by foliar application of 0.5% Ferrous Sulphate solution at 30 and 60 days after sowing.
- Five bacterial strains, namely, *Acinetobacter lowffii*, *Pseudomonas brassicacearum*, *Klebsiella pneumoniae* subsp. *ozaenae*, *Pseudomonas fluorescens*, and *Bacillus thaonhiensis*, isolated from different parts of the cotton plant were classified using 16SrRNA gene sequencing and evaluated for their plant growth promoting potential.
- Long-term (over 8 years) incorporation/retention of rice residue in rice-wheat system demonstrated improvement in soil organic carbon content and rice grain yield. Owing to gradual elevation of soil organic carbon status to 'High', urea fertilizer dose can be reduced by 20 kg/acre.
- Application of $MgSO_4$ has been recommended to meet magnesium needs of cotton. The recommended practice involves basal application @ 25 kg/acre followed by two sprays (1% $MgSO_4$) at full bloom and boll development (15 days after first spray).
- Foliar application of mixed solution of Ferrous sulphate (0.5%) and urea (2%) in soybean (60 days after sowing) has been found to improve grain yield by 5.3-30.1 per cent besides increasing iron content of soybean grains.
- PAU Leaf Colour Chart (LCC) technology for nitrogen management has been extended to baby corn. The recommended practice involves application of 18 kg urea per acre as basal dose and top-dressing with 18 kg urea whenever leaf colour matches or gets paler than shade 5 of the PAU-LCC. The LCC use should be started 21 days after sowing (28 days after sowing in winter crop).

- Use of PAU-LCC for guiding fertilizer N use in wheat sown under various rice straw retention/incorporation interventions provided both N fertilizer saving and enhanced yield benefits.
- Soil application of boron (B) @ 0.5 kg B/acre through Borax (5 kg) in arhar provided 30 per cent higher yield than control and B content in grain went up by 18.7 per cent.

SALINITY STRESS MANAGEMENT

- Irrigation induced salinity stress in cotton-wheat system can be managed with the addition of rice residue biochar @ 4 t/ha in cotton. Besides, the practice leads to carbon accretion and subsequent sequestration. Residue management Field trials for in situ paddy straw degradation were carried out at five locations (PAU Ludhiana campus, 9 Ladhawal, Sangrur, Kapurthala and Gurdaspur) with four different microbial preparations developed by PAU and four commercial products. Total fibre content in terms of cellulose, hemicellulose and lignin as well as C:N ratio showed higher decrease at more locations with Delftia based PAU microbial consortia.

OPTIMUM TEMPERATURE EXTREMES

- Optimum minimum and maximum temperature ranges have been identified for different growth stages of kharif maize. The ideal minimum and maximum temperature for germination was found to lie in the range of 21-27°C and 36-40°C; for vegetative growth 24-30°C and 31-41°C and grain filling 21-27°C and 31-37°C, respectively.

SEED RATE, SOWING TIME AND METHOD

- In order to counter likely adverse impact of rice residue on wheat seed germination under Happy Seeder sowing situations, seed rate has been revised upward by 5 kg/acre.
- Furrow irrigated raised bed system (FIRBS) has been developed and recommended for direct seeding of rice under Tar-wattar conditions. The technology employs a bed planter fitted with a bed compactor to reshape bed/ridges. Two rows of hydro-primed and treated seeds are sown simultaneously. The first irrigation is



applied 21 days after seeding. The raised bed technology provides higher paddy yield and saves more irrigation water (about 8%) than flat bed/flat sown direct seeded rice.

- In order to further save irrigation water in transplanted rice with short duration variety PR 126, its nursery can be sown upto June 20, and 25-30 day old seedlings can be transplanted upto July 10 at 20 cm by 15 cm spacing. The recommended practice does not entail any yield penalty.
- Labour shortage and consequential delay in transplantation and sub-optimal plant population due to contractual nature of transplantation work in case of basmati rice require that conventional mechanical paddy transplanter be made suitable for Basmati rice as well. Since row to row spacing in mechanical transplanter has been fixed at 30 cm, plant population can be made up only by adjusting plant density within a row. To this end, it has been recommended that mat type basmati rice nursery of 3 to 4 week age should be transplanted with rice transplanter at a spacing of 30 x12 cm.

INTERCROPPING IN SUGARCANE

- One row of capsicum can be intercropped in autumn sugarcane planted in paired row trenches at 120:30 cm for additional income. Capsicum crop can be provided recommended dose of fertilizers on an actual intercrop area basis.
- One row of rapeseed-mustard crops like canola gobhi sarson (GSC 6 and GSC 7), canola raya (RLC 3), raya (PBR 357) and African sarson (PC 6) can be intercropped in autumn sugarcane planted in paired row trenches (120:30 cm) to earn additional income.
- For additional earnings, two rows of broccoli can be intercropped in autumn sugarcane planted in paired row trenches (120:30 cm). Also, two rows of cauliflower can be planted in autumn sugarcane planted in paired row trenches (90:30 cm).

ORGANIC PRODUCTION TECHNOLOGY

- Kharif moong-wheat-summer moong cropping sequence has been recommended for

organic farming. It outperforms even popular Basmati rice-wheat-green manure system in terms of net returns.

- A vegetable crop based okra-radish-pea cropping system has been recommended for organic production.

LONG-TERM CROP RESIDUE MANAGEMENT VIS-À-VIS SOIL HEALTH & CROP PRODUCTIVITY

- Results of a long-term (12 years) field experiment on crop residue management in rice-wheat sequence showed that continuous retention/incorporation of residues over 12 years significantly enhanced soil organic carbon content to 0.80 per cent (initial 0.33%) when both rice and wheat residues were retained/incorporated, to 0.76 per cent under paddy residue management only and to 0.45 per cent under conventional practice (no residue retention/incorporation). The corresponding status of bulk density was 1.28 g cm⁻³ under incorporation/retention of both rice and wheat residues (initial level 1.43 g cm⁻³), 1.32 g cm⁻³ under paddy residue management only, and 1.42 g cm⁻³ under conventional practice.
- Continuous retention/incorporation of rice and wheat residues gave 5 per cent higher wheat yield over 'only paddy straw incorporation/retention' and 15 per cent higher over 'no residue' management. In case of paddy grain yield, the increase was 3.1 per cent over 'only paddy straw' management and 11.4 per cent over 'no residue' management. System productivity went up by 4 per cent in comparison to 'only paddy residue' management and by 13.2 per cent in comparison to the conventional practice.

VERMI-COMPOST FROM RICE STRAW

- Production technology of paddy straw vermi-compost has been developed. The recommended practice involves laying one foot high bed (6'x3') of paddy straw (chopped/unchopped, maintaining moisture level at 60-70%) overlaid, upto 2 feet, by 4-day old cow dung along with one kg of earthworm (*Eisenia foetida*). Two-inch thick layer of soaked paddy straw should be used to top off

the pile in order to avoid water loss. The pile should be kept under shed. Frequent turnings (once a week) are required over a period of two months to ensure proper decomposition. The compost is ready for use after 60-70 days.

In situ rice straw decomposition

- Four straw management practices (Drill sowing after incorporation, Happy Seeder, Super Seeder and Smart Seeder) and different decomposer and urea combinations (PAU Decomposer, IARI Decomposer, PAU decomposer+33kg urea/acre, and only 33kg urea/acre) were evaluated. Fastest rate of decomposition was witnessed when urea was also applied along with PAU Decomposer. Straw incorporation as a stand-alone treatment provided benefits in terms of reduced lignin content (by 43.6%). No effect of microbial spray and sowing method on wheat yield was noticed.

HORTICULTURAL CROPS

FRUITS

Fruit drop in litchi

- Litchi trees in Punjab state sometimes exhibit heavy fruit drop after fruit set. This is mainly ascribed to imbalance in certain growth regulators. Foliar application of Naphthalene acetic acid (NAA) @ 20ppm (2g in 100 litres of water) 10 days after fruit set, has been observed to confer yield advantages in Dehradun and Calcutta cultivars (19.6 and 17.3%, respectively).

Rejuvenation of old and senile litchi orchards

- Old senile (age>30 years) litchi orchards occupy a considerable area (15-25 per cent) in the state and exhibit an obvious decline in productivity and fruit quality.
- Non-availability of productive shoots, overcrowding, intermingling of branches, and dense canopy have been implicated in this decline. These orchards require rejuvenation.
- The recommended rejuvenation technology involves heading back trees during August-Sept. at the height of 1.5-2.5 m by retaining 3-4 healthy outward growing primary branches. The desired shoots should be maintained on

each headed back scaffold branch. Bordeaux paste should be applied on cut end portions.

Nutrient management in orchards

- Phosphorus fertilization in ber crop has been standardized. Single superphosphate @ 1.5 kg per tree should be applied in July along with the first split of N fertilizer.
- Foliar application of potassium nitrate @ 2% twice during August-Sept. has been recommended for enhanced fruit yield and quality in guava.

Complete Package of Practices for Strawberry cultivation in Punjab:

- The package recommends cultivation of two improved cultivars Chandler and Winter Dawn following micro-irrigation schedule.
- Strawberry mulched with silver black polyethylene sheet (30 micron) can be irrigated daily with laterally placed drippers (30 cm apart) with discharge @ 2.2 litre/hour.
- Fertigation involving application of 44 kg N, 32 kg P₂O₅ and 40 kg K₂O per acre can be started six days after transplanting.
- Strawberry fruits harvested at fully red (ripe) stage should be packed in 200 g punnets. These can be stored at 5±1°C; 90-95% RH for 6-9 days under ambient conditions, acceptable marketing quality can be maintained upto two days.

Package of Practices for Orchid cultivation in Punjab under high-tech polyhouses:

- Orchid (*Dendrobium* spp.) is a premium pot and cut flower (sharing about 27% value of global cut flower market) crop.
- Sonia Red cultivar with plant height of 43.2 cm and having average 2.66 spikes per plant has been found suitable under Punjab conditions. The spike length is 31.1 cm with average 9.28 spikes per floret. The average vase life is 20.8 days.

Leaf sampling technique for nutritional assessment in litchi

- To assess nutritional status of litchi (*Litchi chinensis* Sonn) plantations for deciding about



fertilizer regimes, 4-5 month old autumn flush leaves collected from second and third pair of leaflets from terminal shoots of litchi just prior to or at the advent of panicle initiation are suitable for sampling.

Potassium nutrition for Kinnow

- In Central Alluvial Plains zone and Submountainous zone of Punjab, for better growth, yield and fruit quality in Kinnow, potassium should be applied (@ 110-330, 440-770, and 880 g/tree for the tree age 1-3 years, 4-7, and >8 years, respectively) in addition to the other recommended fertilizers.

Studies on trunk girdling and root pruning

- Studies performed on the effect of girdling (trunk girdling, limb girdling and sub-limb girdling) and root pruning (40 cm away from trunk and 60 cm away from trunk at 40 cm depth) on Punjab Beauty variety of pear revealed that the shy bearing behaviour of Punjab Beauty can be managed by pruning the root 60 cm away from the trunk at 40 cm depth and girdling trunk for improving fruit set, quality and yield.

Design of CFB boxes for packaging of pear fruits:

- The pear fruit can be adequately packed in CFB boxes with dimensions of 340 × 220 × 100 mm for 2 kg, 340 × 220 × 190 mm for 4 kg and 450 × 240 × 180 mm for 10 kg for better marketing.

VEGETABLES

Containerized at-home vegetable production for meeting daily vegetable needs of urban families

- Square shaped PVC containers of 12"x12"x12" size and plastic bags of 10"x10"x10" size were found suitable for solanaceous (tomato) and cucurbitaceous (cucumber) crops, respectively.
- For leafy, root and bulbous vegetables (spinach, radish and onion), boat shaped cemented containers of 37"x13"x11" size were found to be ideal.

Growing media for pot cultivation

- Growing media for pot cultivation of solanaceous, cucurbitaceous, leafy, root

and bulbous crops has been standardized. It involves mixing farmyard manure (FYM) and pressmud in equal proportions.

Agro-waste media based vegetable nutrition garden model

- The present model addresses concern regarding ease of use of earlier recommended rooftop vegetable nutrition garden model. This model (4.2 m long and 3.4 m wide) with five rows can supply year-round daily vegetable requirements of an urban/peri-urban family. It employs a nutrient-rich, economical and easily available media, which is based on agricultural wastes. The unit can be placed in sun-lit niches of houses.

Intercropping in turmeric

- Turmeric, being a long duration crop, enables intercropping. Okra intercropping in turmeric (2:1) under both flat and bed planting provides additional income (16.1 and 18.7 percent increase in turmeric equivalent yield under flat and bed planting, respectively).

Correction of Sulphur deficiency in potato

- In potato crop grown on sulphur deficient soils, gypsum (75 kg/acre) or bentonite-S 90% (13.3 kg/acre) can be used to supply 12 kg S/acre.

Management of pollination barriers

- Amides of rice straw lignin phenolic acids i.e. p-coumaric acid, ferulic acid and caffeic acid were synthesized by their reaction with n-propyl and butyl amines using microwave irradiation, and were evaluated for their effect on pollen germination and tube growth in pumpkin. At 5 ppm concentration, germination percentage and pollen tube growth under the amide treatment was enhanced over the control. These results can potentially be used in increasing pollen tube length of Cucurbita moschata, while making interspecific crosses between C. moschata and C. pepo for transferring hull-less and disease and virus resistant character of C. moschata to C. pepo.

Heat stress in tomato

- Application of plant growth regulator

4-CPA (4-chlorophenoxyacetic acid) @ 75µg/ml in tomato conferred protection against heat stress by improving membrane thermostability, content of total soluble sugars, proline, phenol, reduced lipid peroxidation, and increased pollen viability and fruit set.

Cultivation of tomato in soilless media

- Cultivation practices, with respect to planting media, microirrigation-fertigation and fruit thinning, in case of indeterminate tomato grown in soilless media under naturally ventilated polyhouse were recommended. The recommended package included planting in coco-peat @ 2.5 plants/m², fertigating at 85% of the recommended dose by calibrating irrigation frequency to achieve 20% leachate and thinning to maintain 6-10 fruits for better fruit size.

FLORICULTURE

Use of hormones for increasing efficiency of ornamental plants

- Rooting hormones can be employed to terminal cuttings for mass multiplication of chrysanthemum. The recommended practice, developed on Snowball cultivar, involves dipping cuttings in 400 ppm solution of IBA (Indole 3-butyric acid) and 200 ppm NAA (Naphthalene acetic acid) for five seconds before their planting in plug trays.
- In order to shorten four-year long natural development process of gladiolus cormels into flowering grade corms to two years, gladiolus cormels (0.5 cm) can be treated with GA3 (gibberellic acid) @ 200 mg/l (dipping for 24 hours) for two consecutive years in order to obtain flowering grade corms (4.2 cm).

AGRO-FORESTRY

Optimization of transplanting time for onion intercropping in poplar plantations

- Winter deciduous nature of poplar makes poplar plantations amenable to intercropping. Poplar-wheat system is the most prevalent intercropping system. Onion can be an alternative to wheat. However, photo-thermo

sensitive nature of onion crop requires that its planting time be optimized. Choice of a suitable variety can also help in this regard. The PRO 7, an early maturing variety of rabi onion, has been recommended as an onion intercrop in poplar plantation and it should be transplanted around mid-December for deriving maximum returns.

CROP PROTECTION TECHNOLOGIES

Plant protection research initiatives laid emphasis on preventive management of wheat rust; eco-friendly pest control interventions in Basmati rice, cotton and vegetables; and weed control in wheat through integrated approach and through paddy straw mulching in soybean and poplar nursery. In fruits and vegetable crops, the focus was on weed control and maintaining healthy moisture regimes through paddy straw mulching and extension of trap technology for eco-friendly management of fruit fly in some vegetable crops.

FIELD CROPS

WHEAT

- Forewarning system for the effective management of yellow rust of wheat has been recommended. It is a weather-driven (within season hourly weather variables) model and is based on well-established effects of environmental factors on disease cycle of yellow rust.
- Regular surveys for yellow rust disease were conducted during off-season of wheat in mid and lower-Himalayan ranges falling in Himachal Pradesh during October and November 2018. Snowfall in October led to a drop in temperature that made yellow rust fungus dormant and as a result, no uredial infection was observed during surveys. Low inoculum in hills eventually led to overall low incidence of yellow rust during *Rabi* 2018-19 in Punjab.
- Loose smut of wheat can be managed by treating seed with Tebuseed 2DS (tebuconazole 2%) @ 4 g per kg seed. The treatment reduced loose smut and flag smut by 95 per cent and 90 per cent, respectively.
- The DNA barcoding studies to characterize



11 samples of wheat armyworm collected from different regions like Patiala, Fatehgarh Sahib, Kapurthala, Shambhu border and PAU Ludhiana, led to identification of nine samples as *Mythimna loreyi* and two as *Mythimna separata*.

- Foliar application of Opera 18.3SE (pyraclostrobin 133 g/l and epoxyconazole 50 g/l) or Caviet 25 WG (tebuconazole 25% WG) has been recommended to control yellow rust in wheat.
- Neonix (a formulation of imidacloprid 18.5% and hexaconazole 1.5% FS) has been recommended to manage termites and smuts (loose smut and flag smut) in wheat.
- Seed treatment with Cruiser (thiomethoxam 70 WS) @ 1 g/kg seed has been recommended to manage termites in wheat.
- Non-chemical management of aphids in wheat using PAU Homemade neem extract @ 5 litre/ha has been recommended. In order to contain irrational pesticide use and for minimizing production costs, Economic Injury Level (EIL) and Economic Threshold Level (ETL) for managing gram pod borer (*Helicoverpa armigera*) 2.19 and 1.64 larvae per metre row, respectively, were identified.
- Yellow rust in wheat can be managed with Custodia 320SC (azoxystrobin 11 % + tebuconazole 18.3%) @ 200 ml/acre.
- Leaf and flower extracts of *Vinca rosea* exhibited inhibitory potential against wheat fungi (*Fusarium graminearum* and *Bipolaris sorokiniana*), methanol extract being the most effective.
- To assess incidence of post-harvest diseases in wheat, more than 2,550 samples were collected from 161 grain markets of Punjab state during April 2022. Karnal bunt was detected in 19.5 per cent of samples, Black point in 63.9 per cent and 77.3 per cent samples had shrivelled grains.
- Favourable meteorological parameters identified for the development of Karnal bunt of wheat included maximum temperature during March in the range of 25-31°C;

minimum temperature 8.5-11.0°C during February, morning and evening relative humidity during March in the range of 85-95 and 40-60 per cent, respectively; rainfall more than 25 mm; and sunshine hours 5.5-9.0 hrs/day during mid-February to mid-March.

- Ampect Xtra 25.5 SC (Azoxystrobin 18.2 % + cyperconazole 7.3 %) has been recommended for the management of Yellow rust.

RICE

- Spider populations, which act as natural enemies, were monitored in rice fields in South-Western region (Fazilka and Abohar) of Punjab. *Tetragnatha javana* was predominant spider species (45.6%) followed by *Tetragnatha maxillosa* (30.2%), *Neoscona theisi* (18.2%) and *Oxyopes kusumae* (6.0%).
- To manage seed-borne diseases in rice, slurry of Sprint 75WS (@ 3 g in 10 ml water/kg seed) can be used as seed treatment.
- Rice root nematode (*Meloidogyne graminicola*) in nursery beds can be managed in an eco-friendly way by applying mustard cake (@ 40 g/m²) 10 days before sowing of nursery. This practice reduced nematode infestation by 48 per cent and improved seedling population upto 15 per cent.
- Sheath blight can be controlled by two foliar applications of Pikapika 25EC (propiconazole) @ 200 ml/acre.
- Treating rice seed with Sprint 75 WS (carbendazim 25% + mancozeb 50%) @ 3 g/kg seed has been found effective in controlling seed borne and early soil borne infections of sheath blight, brown spot and blast.
- Effectiveness of the augmentative releases of *Trichogramma chilonis* and *T. japonicum* each @ 1,00,000/ha (5-6 releases at weekly interval) in organic Basmati rice in controlling stem borer and leaf folder was validated at farmers' fields (248 acres) with 55.2 per cent and 49.9 per cent respective reduction.
- Rice stem borers and leaf folders in conventional and organic Basmati and non-Basmati rice can be managed with a neem based biopesticide Ecotin 5% (Azadirachtin) @

80 ml/acre. In conventional cultivation, its performance was at par with Fame (flubendiamide).

- Rice stem borers and leaf folders under organic cultivation of Basmati and non-Basmati rice can be managed with use of neem based biopesticide, Neem Kavach 0.15% (azadirachtin) @ 1 litre/acre. Demonstrations of bio-control based IPM (5-6 releases of *T. chilonis* and *T. japonicum* each @ 1,00,000/ha) were conducted at farmers' fields in Patiala, Kapurthala, Sangrur, Amritsar, Ludhiana and Ferozepur districts in organic Basmati rice over an area of 310 acres. Incidence of white ears was significantly lower in biocontrol field in comparison to untreated control.
- Biocontrol agents like *Trichoderma harzianum*, *Bacillus amyloliquefaciens* FDK 21 and *Pseudomonas fluorescens* were tested as seed treatment, foliar spray and combination of seed and foliar treatment against false smut under field conditions. Seed+foliar spray combination exhibited 53.2% reduction in disease severity followed by seed treatment (52.4%).
- Biocontrol agents like *Trichoderma harzianum* and *Bacillus amyloliquefaciens* FDK 21 were tested as seed treatment, seedling dip and as a spray against sheath blight under field conditions on rice variety PR 121. *Bacillus amyloliquefaciens* seedling dip exhibited 26.6% disease severity followed by *Trichoderma harzianum* seed treatment+seedling dip +foliar spray (28.6%).
- Rice stem borers and leaf folders in non-Basmati rice can be managed by using Coragen 18.5 SC (Chlorantraniliprole)@ 150 ml/acre. Rice stem borers and leaf folders in non-Basmati and Basmati rice can be controlled by using Takumi 20WG (flubendiamide)@ 50 g/acre.
- Plant hoppers in rice can be managed by using Osheen 20% SG (dinotefuran) @80 g/acre.
- Epic (hexaconazole 75% WG)@ 26.8 in 200 litres of water helps to manage sheath blight and sheath rot in rice.
- Pulsor 24 SC (thifluzamide),@ 150 ml/acre using 200 litres of water manages sheath blight of rice.
- Galileo Way (picoxystrobin 7 .05% + propiconazole 11.71% w/w) SC@ 400 ml/acre controls sheath blight and false smut of rice.
- Ecotin 5% (Azadirachtin 5%) @ 80 ml/acre and PAU homemade neem extract @ 4 litres/acre have been found effective for eco-friendly management of plant hoppers in Basmati and non-Basmati rice.
- Essential oil from Arjun (*Terminalia arjuna*) leaves was extracted by hydrodistillation method and its major constituent α -terpineol was evaluated for its anti-bacterial potential against *Xanthomonas oryzae* pv. *oryzae*, *Dickeya zeae* and *Streptomyces scabies*. The α -Terpineol was found more effective than the essential oil against all the three tested bacteria with minimum inhibitory concentration (MIC) values of 31.5, 29.5 and 27.0 ppm against *Xanthomonas oryzae* pv. *oryzae*, *Dickeya zeae* and *Streptomyces scabies*, respectively.
- Extracts of guar (*Cyamopsis tetragonoloba*) leaves and fruits were tested for their anti-fungal activity against two rice fungi i.e., *Rhizoctonia solani* and *Drechslera oryzae* using poison food technique. Guar pod extract was found more effective than leaf extract against both the tested fungi. Among all the extracts, ethyl acetate fruit extracts were the most effective with minimum ED50 value of 8 and 28 ppm against *Rhizoctonia solani* and *Drechslera oryzae*, respectively.
- In order to examine the role of straw management practices on the prevalence of brown spot, observations were made on PR 124 variety of rice. Maximum mean disease severity (21.7%) was observed where the paddy straw was retained as such. It was followed by incorporation of paddy straw (17.8%) and the lowest disease severity was observed under complete straw removal scenario.
- In order to prevent spread of foot rot,



identification of affected plants at the nursery stage itself is important. Seedlings should not be sourced from the immediate neighbourhood (within 1.5 inch radius of the infected plant). This practice can cut down disease incidence by one-third. To contain the disease incidence further by one-fifth, uprooted nursery can be treated with *Trichoderma harzianum* formulation for six hours.

- In order to reduce chemical footprint in basmati rice, 14 quintals of *Trichoderma* based material was prepared for distribution among the basmati farmers in the state.
- Biocontrol agents - *Trichoderma harzianum* and *Bacillus amyloliquefaciens* FDK 21– were tested under different application methods for sheath blight management. *Bacillus* seedling dip (@ 15 g per litre of water) exhibited the lowest seed severity (26.2%), followed by seed treatment with *Bacillus* (@ 15 g/kg seed) with 27.3 per cent severity against 19.0 per cent disease severity in standard chemical treatment.

MOLECULAR CHARACTERIZATION

- The capability receptor (CAPAr) gene from whitefly (Asia II-I genetic group) was characterized and two isoforms were identified. Preliminary qPCR studies revealed that CAPAr gene expression was comparatively higher in late nymphal instars.

BASMATI RICE

- Application of neem based formulation, Achook (azadirachtin 1,500 ppm) @ 1,000 ml/acre has been recommended in Basmati rice for the management of rice stem borers and leaf folders under organic and normal cultivation conditions, especially, when their population/damage level is low in the season. The recommendation will add to options of mechanical control with coir/jute rope and tricho cards available to organic Basmati growers.
- The augmentative releases of *Trichogramma chilonis* and *T. japonicum* each @ 1,00,000/ha (5-6 releases at weekly interval) in Basmati rice at farmers' fields (294 acres) resulted

in 51.2 and 57.1 per cent reduction in stem borers and leaf folders, respectively.

- Planting of border rows of flowering plants viz. marigold, Mexican marigold, spotted snapweed/balsam, sesame, soybean, arhar and okra raised the abundance of natural enemies in Basmati rice.
- The bio-intensive pest management (BIPM) practices in organic Basmati rice involving recommended variety, optimum time of transplanting, proper spacing, green manuring, water management, erection of straw bundles, planting marigold and balsam on bunds and one spray each of neem (azadirachtin 50,000 ppm @ 200 ml/ha) and biopesticide (*Metarhizium anisopliae* @ 2.5 kg/ha) resulted in 31.7 per cent reduction in plant hoppers' population.

COTTON

- Home-made neem extract @ 1,200 ml/acre (using 125-150 litres of water) has been recommended for managing cotton whitefly. The extract is prepared by boiling 4 kg biomass of terminal shoot parts including leaves, green stems and fruits in 10 litres of water for 30 minutes. The home based neem extract performs at par with the recommended commercial neem based formulations. This extract is recommended for use during initial build-up of whitefly population in order to conserve natural enemies.
- Study on temporal distribution of whitefly, a polyphagous pest, showed that its population remained low during winter and spring seasons (average 0-3.3 per leaf), whereas the highest population was recorded during second half of April. Brinjal, tomato, potato, radish, mustard, Congress grass, bathu and hiran khuri serve as main hosts for overwintering whitefly. Spring season moong, cucurbits and okra along with weeds like Congress grass, puthkanda and chulai help in initial build-up of population.
- Whitefly in cotton can be controlled with the application of Applaud 25SC (buprofezin) @ 400 ml and Dantotsu 50WDG (clothianidin) @ 20 ml per acre using 125-150 litres of water.

This recommendation will widen the choice of pesticides for the cotton farmers.

- Delegate 11.7 SC (spinetoram) @ 170 ml/acre (125-150 litres of water) has been recommended for managing thrips (*Thrips tabaci*), in cotton.
- Celcron 50 EC (profenofos) @ 500 ml/acre has been recommended to manage thrips.
- Foliar application of Keefun 15 EC (tolfenpyrad) @ 300 ml/acre has been recommended for the management of jassid.
- Daita 10 EC (pyriproxyfen) @ 500 ml/acre and Sefina 50DC (afidopyropen) @ 1,000 ml/ha, as foliar spray, have been recommended for managing whitefly.
- Amistar 325 SC (azoxystrobin 18.2% + difenoconazole 11.45 SC) @ 200 ml in 200 litres of water per acre has been found effective against fungal leaf spot. It also provides effective control of sooty mould.
- Jassid in cotton can be controlled with Neon SEC (Fenpyroximate) @ 300 ml/acre. It provides jassid control at par with Ulala SOWP (flonicamid).
- Sefina 50 DC (Afidopyropen) provides whitefly control in cotton at par with difenthiuron (Polo 50 WP).
- Mealy bug in cotton can be controlled by using Transform 21.8% w/w SC (sulfoxaflor) @ 150 ml/acre.
- Based on comparative management costs and revenue of seed cotton and viewing potential ecological benefits, Economic Injury Level (EIL) and Economic Threshold Level (ETL) of thrips (*Thrips tabaci*), in cotton were worked out as 15.7 thrips/leaf and 11.8 (-12) thrips/leaf, respectively.
- To contain carryover of pink boll worm (*Pectinophera gossypiella*), cotton stalks infested with the larvae should be shredded with mulcher/shredder and incorporated in the soil.
- In order to manage pink boll worm, a non-chemical mating disruption technology involving specialized pheromone and

lure application technology (SPLAT) has been recommended on adhoc basis. The technology involves application of Gossyplure 4% 7,11 hexadecadienyl acetate @ 125 g/acre starting from appearance of squares (45-55 days after sowing) at 400 uniformly spaced points followed by two more applications at 30 days interval.

MAIZE

- Banded leaf and sheath blight, caused by *Rhizoctonia solani*, has been identified as an emerging disease in maize. Amistar Top 352 SC (azoxystrobin 18.2%+difenoconazole 11.4% w/w SC) @ 100 ml/acre has been recommended to manage this disease.
- Bio-suppression of maize stem borer using *Trichogramma chilonis* @ 1,00,000/ha (2 releases at 10 and 17 days old crop) carried out at farmers' fields (448 acres) resulted in 53.2 per cent reduction in dead hearts incidence as compared to 82.9 per cent in chemical control. The additional benefit over untreated control in biocontrol package was Rs 5,483/- per ha as compared to Rs 9,764/- per ha in chemical control.
- Foliar application of chlorantraniliprole 18.5 SC @ 0.4 ml/litre, Emamectin benzoate 5 WG @ 0.4 g/litre, and Spinetoram 11.7 SC @ 0.5 ml/litre using 120 litres of water (for crop younger than 20 days) or 200 litres of water (for crop older than 20 days) has been recommended for managing fall armyworm, a new trans-boundary invasive pest, in grain maize. For fodder maize, spray of chlorantraniliprole 18.5 SC @ 0.4 ml/litre has been recommended. These recommendations along with the earlier recommended non-chemical management practices broaden the spectrum of management options.
- Two releases of *Trichoderma chilonis* @ 1,00,000 /ha at 10 and 17 day old crop against maize stem borer, *Chilo partellus*, in 5 acres of maize in Hoshiarpur, Jalandhar, Shaheed Bhagat Singh Nagar and Gurdaspur districts resulted in 56.7 percent reduction in incidence of dead hearts over control as compared to 85.3 per cent in chemical control. Additional benefit over untreated control in biocontrol



package was Rs 6,530/- per ha against Rs 12,885/- per ha in chemical control.

- Total development time of fall armyworm, *Spodoptera frugiperda*, decreased with increase in temperature. Incubation period was shorter with highest hatchability being at 36-27°C. Larval survival was highest at 32-22°C and at L:D (long day) photoperiod of 14:10 hrs.

SUGARCANE

- Bio-suppression of sugarcane borers using egg parasitoids, *Trichogramma* spp. @ 50,000 per ha at 10 days interval reduced the incidence of early shoot borer, top borer and stalk borer by 54.2 to 59.4 per cent, respectively.
- Sugarcane leaf hopper, *Pyrilla perpusilla* Walker, can be managed with Dursban 20 EC (chlorpyrifos) @ 600 ml/acre.
- Biocontrol of sugarcane borers using egg parasitoids, *Trichogramma* spp. @ 50,000 per ha at 10 days interval for the management of early shoot borer (8 releases; mid-April to end-June), top borer (8 releases; mid-April to end-June) and stalk borer (10-12 releases; July to October) carried out at farmers' fields (11,406 acres) reduced their incidence by 53.9 to 57.4 per cent.
- Early shoot borer, *Chilo infuscatellus* Snellen, can be managed with Takumi 20WG (flubendiamide) @ 150 g/acre.
- Sugarcane termite, *Odontotermes obesus* Rhamb, can be managed with Coragen 18.5 SC (chlorantraniliprole) @ 200 ml/acre. Residue of the chemical in various parts of sugarcane was found to be below detection limit.
- An integrated pest management package has been recommended for early shoot borer (ESB), *Chilo infuscatellus*, in sugarcane. The intervention includes use of pheromone traps @ 10 per acre along with ESB sex pheromone lure during April to June. The approach performed better than Tricho cards.
- For better results, pheromone traps @ 10 per acre can be used in combination with *Trichogramma chilonis*. The pheromone lures should be changed after every one month. Top

borer, *Scirpophaga excerptalis*, in sugarcane can be managed by following integrated module involving use of pheromone traps @ 10/acre along with *Trichogramma japonicum* cards.

- The intervention gave better results than sole Tricho cards based approach. Pheromone lure should be changed after every one month. *Trichogramma* used @ 50,000 per ha at 10 days interval during July to October, 2019 (10-12 releases) over farmers' fields (5,010 acres) reduced the incidence of stalk borer, *Chilo auricilius*, by 56.9% over untreated control with additional returns of Rs 16,730/- per ha.
- An integrated management module for stalk borer, *Chilo auricilius* has been recommended. The package involves use of pheromone traps @ 10 per acre along with *Trichogramma chilonis* (Trichocard). The pheromone lures need to be changed every month.
- Releases of *Trichoderma chilonis* @ 50,000 per ha at 10 days interval during mid-April to June 2021 (eight releases) over 839 acres of sugarcane at farmers' fields in Hoshiarpur, Jalandhar, Gurdaspur, Patiala, Kapurthala and Sri Muktsar Sahib districts reduced the incidence of early shoot borer, *Chilo infuscatellus* by 55.0 per cent as against 81.8 per cent in chemical control (chlorantraniliprole 18.5 SC @ 375 ml/ha). However, the cost: benefit ratio (1:19.23) was higher in biocontrol as compared to that under chemical control (1:10.51).

FODDER CROPS

- In fodder maize, *Trichogramma* based Trico cards (50,000 parasitized eggs per acre) can be used to control stem borer. The cards cut into 50 strips need to be placed in plant whorls twice – first release on 10 days old crop and second one week thereafter.
- Sorghum shoot fly, *Atherigona soccata*, in forage sorghum can be managed by seed treatment with Slayer 30FS (thiamethoxam) @ 10 ml/kg seed. Seed treatment helps save labour involved in foliar application of insecticides. Also, this chemical is relatively less adverse to population of natural

enemies.

- Chlorantraniliprole 18.5 SC @ 0.4 ml/litre, emamectin benzoate SWG @ 0.4 g/litre, and spinetoram 11.7 SC @ 0.5 ml/litre using 120-200 litres of water have been found effective in managing fall armyworm in grain and fodder maize.
- A minimum 21-day waiting period, however, should be observed in case of fodder crop. For spot treatment of infested pockets in grain maize, application of pesticide (chlorantraniliprole 18.5 SC or emamectin benzoate 5 SG or spinetoram 11.7 SC @ 5 ml/kg soil) mixed with soil provides effective control. Regular scouting for egg masses and their destruction provides additional protection.
- Large-scale demonstrations using *T. chilonis* against maize stem borer, *Chilo partellus* were carried out at farmers' fields over an area of 60 acres in Hoshiarpur, Jalandhar, Shaheed Bhagat Singh Nagar and Gurdaspur districts.
- Two releases of *T. chilonis* @ 1,00,000/ ha at 10 and 17 days old crop resulted in 55.1 per cent reduction in dead hearts incidence over control as compared to 84.1 percent in chemical control.

PULSES

- Pod borer complex (*Maruca vitrata* and *Helicoverpa armigera*) in pigeonpea can be managed by using green triangle (slightly toxic) insecticides Coragen 18.5 SC (chlorantraniliprole) @ 60 ml or Fame 480 SC (flubendiamide) @ 40 ml per acre (using 100-125 litres of water) at flower initiation and pod initiation stages.
- Gram pod borer, *Helicoverpa armigera*, in gram can be managed by spraying 50 ml Coragen 18.5 SC (chlorantraniliprole) or 80 g Proclaim 5 SG (emamectin benzoate) or 160 ml Rimon 10 EC (novaluron) in 80-100 litres of water per acre on the appearance of pest at the start of pod formation. The application can be repeated, if necessary, after two weeks. The waiting period for consumption of green leaves and pods gets significantly reduced to three days (in comparison to 20 days in case of earlier recommended pesticides) when green triangle Coragen 18.5 SC (chlorantraniliprole) is used.
- Integration of microbial and insecticide spray schedule for the management of gram caterpillar led to the lowest pod damage (0.44 %) in treatment with two sprays of Coragen 18.5 SC and it did not differ significantly from treatment with first spray of Bt formulation (Mahastra) and second spray of Coragen 18.5 SC (0.85% pod damage); and treatment with first spray of Coragen 18.5 SC and second spray of Bt formulation (1.14 % pod damage). Significantly higher pod damage was recorded in untreated control (5.71%).
- Integration of microbial and insecticide spray schedule for the management of pod borer complex in mungbean reported minimum pod damage (6.9%) in treatment with two sprays of Spinosad 45 SC. It was at par with treatments involving first spray with Bt formulation and second with Spinosad 45 SC; and two sprays of Bt formulation. Significantly higher pod damage (15.6%) was recorded in untreated control.
- Commercial Bt formulation, Mahastra 0.5 % WP @ 800 g/acre was found effective and resulted in 66.8 per cent reduction in pod damage due to *Helicoverpa armigera* in gram.
- Pod sucking bug, *Clavigralla gibbosa* Spinola, has been identified as a pest of pigeonpea in Punjab. Both nymphs and adults of this pest use their mouthparts to pierce the pod wall and suck the sap from the developing seeds.
- Foliar application of home-made neem extract (@ 1,250 ml/acre in 100-125 litres of water) has been recommended for managing this pest.
- Gram caterpillar, *Helicoverpa armigera*, in gram can be managed with foliar application (first at pod initiation stage and second 10 days thereafter) of HaNPV (*Helicoverpa armigera* nuclear polyhedrosis virus) biopesticide Helicop 2% AS @ 200 ml/acre.

- Regarding management of cercospora leaf spot and stem blight in pigeonpea, application of chitosan along with Trichoderma has been found effective. Foliar application of chitosan has also been found to augment the effect of Trichoderma and Pseudomonas based biofertilizers on the control of disease severity.
- For the management of whitefly in kharif mungbean, spray the crop upon pest appearance using homemade neem extract @ 1 litre per acre using 80-100 litres of water per acre.
- For the management of pod sucking bug using homemade neem extract in kharif mungbean, spray the crop upon pest appearance at podding stage using homemade neem extract @ 1250 ml per acre using 80-100 litres of water per acre.
- Economic Threshold Level (ETL) for the management of spotted pod borer, Maruca vitrata in arhar: Monitor the crop at flower initiation stage to record the number of webs on per plant basis from a minimum of 10 randomly selected plants per acre. If the average number of webs is two per plant, spray the crop with recommended insecticides
- Commercial Bt formulation, Mahastra 0.5 % WP @ 800 g/acre was found effective and resulted in 66.8 per cent reduction in pod damage due to Helicoverpa armigera in gram.
- Pod sucking bug, Clavigralla gibbosa Spinola, has been identified as a pest of pigeonpea in Punjab. Both nymphs and adults of this pest use their mouthparts to pierce the pod wall and suck the sap from the developing seeds. Foliar application of home-made neem extract (@ 1,250 ml/acre in 100-125 litres of water) has been recommended for managing this pest.
- Gram caterpillar, Helicoverpa armigera, in chickpea can be managed with bacterial biopesticide Bacillus thuringiensis kurstaki (DOR Bt-1) @ 800 g/acre. Bihar hairy caterpillar, Spilosoma obliqua Walker, in sunflower can be managed by using Superkiller 10 EC (cypermethrin).

Table 3.11 Production of Bio control agents (q) at PAU in last 5 years

Biocontrol agent	2018-19	2019-20	2020-21	2021-22	2022-23
<i>Trichoderma harzianum</i>	5.5	12.0	15.0	14.0	6.0
<i>Pseudomonas fluorescens</i>	1.5	2.0	2.5	1.4	-

OILSEEDS

- Sclerotinia rot disease in rapeseed-mustard can be partly managed (reduction in disease incidence by 46.9%) by avoiding irrigation during the period December 25 to January 15.
- Collar rot or seed rot of groundnut can be managed by seed treatment with Tebuconazole 2 DS @ 1.5 g per kg kernels.
- White rust in rapeseed and mustard can be managed by foliar application of metalaxyl M4% + mancozeb 64% WP (Ridomil Gold) @ 250 g/100 litres of water/acre.

VEGETABLE CROPS

- Spiromesifen 22.9 SC @ 150 ml/acre can be used for managing mites in okra. It is safe to natural enemies and does not cause any phytotoxicity to the crop.
- Evaluation of microbial antagonists for the management of Ascochyta blight in pea revealed that application of *Pseudomonas fluorescence* (NBAIR-Pf DWD) gave the lowest disease incidence (40.5%) and disease severity (33.3%), and pod yield (134 q/ha) was at par with all other microbial antagonists treatments and significantly better than untreated control.
- Use of aqueous neem fruit extract has been recommended for eco-friendly management of mites in capsicum under protected cultivation. The technology involves mixing 5 kg shade dried fresh neem fruits in 100 litres of water, leaving the mixture overnight, and then filtering the extract through a muslin cloth. The filtered extract can then be used as a spray (5%) to control mites in capsicum.

- In case rapeseed-mustard foliage has to be used for 'Saag' (a thick curry often served with maize flour chapatti), then a minimum waiting period of one week, 20 and 30 days may be observed after spraying Thiomethoxam 25 WG, Dimethoate 30EC or Chlorpyrifos 20EC, and Quinalphos 25 EC, respectively.
- Purple blotch of onion, a fungal disease, can be managed by foliar application of Caviet 25WG (tebuconazole 25% w/w) @ 300 g/100 litres of water/acre. The recommended technology reduced onion blotch disease severity to 3.9 per cent as compared to 9.4 per cent in conventionally used Indofil M-45 (Mancozeb 75%) and the yield increased by 7.5 per cent.
- Black scurf of potato can be managed by dipping tubers in Emesto Prime (penflufen 22.43%FS) for 10 minutes. The seed treatment can help reduce inoculum for the next tuber crop.
- Mites infesting capsicum under protected cultivation can be managed by foliar spray of Omite (propargite) 57 EC @ 200 ml/acre or Oberon (Spiromesifen) 22.9 SC @100 ml/acre.
- Mites in okra can be controlled by foliar spray of Oberon (spiromesifen) 22.9 SC @ 150 ml/acre.
- Whitefly was accorded the status of a pest of brinjal. Whitefly nymphs and adults suck sap from brinjal leaves and make leaves sticky by excreting honey dew onto them. Diafenthiuron 50 WP @ 200 g/acre can be used as a foliar application to manage this pest.
- A study on the biology of whitefly on brinjal revealed that average life cycle of *Bemisia tabaci* was shorter during June-July as compared to April-May. The nymphal period in different instars (4 instars) ranged from 3.11-3.56 days, whereas adult longevity for its male and female was 4.18 and 6.13 days, respectively.
- Eco-friendly management of fruit fly, *Bactrocera cucurbitae*, using cue-lure based bottle trap in cucurbits (bitter gourd and sponge gourd) has been recommended. The technology employs male annihilation technique (MAT) which keeps male population levels below mating threshold. The traps when used @16 traps/acre second half of March in bitter gourd and of April in early season sponge gourd crop and fourth week of June in main season crop) recorded 21.3 per cent fruit fly infestation in comparison to 23.5, 16.6 and 74.8 per cent in commercially available trap, insecticide application and untreated control, respectively.
- Three releases of *Chrysoperla zastrowi sillemi* @ 4 larvae/plant resulted in 88.2 per cent reduction in aphid population over untreated control on capsicum grown under net house.
- Ratoon crop of brinjal recorded more moth catch as compared to uprooted stalks and within the ratoon crops, the plants left as such recorded more moth catch than the plants which were cut. Thus, the plants left in the field as such serve as a source of inoculation/carry-over of the pest.
- Use of mustard cake @ 1 t/ha+neem cake @ 1 t/ha+FYM @ 2.5 t/ha has been recommended for non-chemical management of root knot nematode in organic cultivation of cucumber under poly/net houses. The recommended intervention reduced root gall index by 42.4% as compared to untreated control. Fruit yield was higher by 62% over untreated control and by 16% over management by Carbofuran (@ 2 kg ai/ha).
- Management of whitefly, *Bemisia tabaci*, in brinjal with PAU Homemade neem extract (@ 1,200 ml/acre) has been recommended. The population of natural enemies (spiders, predatory beetles, and green lace wings) remained largely unaffected and was higher than that under difenthiuron SOWP (@ 200 g/acre).
- Jassid, *Amrasca bigutulla bigutulla*, in okra can be managed with neem-based formulation Ecotin (azadirachtin 5%)@ 80 ml/acre.
- Whitefly, *Bemisia tabaci*, in brinjal can be managed by employing homemade botanical solutions like extracts of maize, bajra and



- sorghum @ 1,500 ml/acre. Based on equality of management costs and revenue of okra yield/potential benefits, Economic Injury Level (EIL) and Economic Threshold Level (ETL) of jassid, *Amrasca biguttula biguttula*, were worked out. Economic Threshold Level (ETL) of whitefly, *Bemisia tabaci*, in brinjal was worked out to be 9 adults per leaf.
- Pegasus 50 WP (diafenthiuron) @ 200 g/acre has been recommended for managing whitefly in brinjal.
 - Fruit borer, *Helicoverpa armigera*, in chilli can be managed by spray of Coragen 18.5 SC (Chlorantraniliprole) and Tracer 45SC (Spinosad) @ 50 ml/acre.
 - Spotted bollworm in okra can be managed by spraying Coragen 18.5SC (Chlorantraniliprole) @ 50 ml/acre and Sumipleo 1 OEC (Pyridalyl) @ 200 ml/acre.
 - Whitefly, *Bemisia tabaci*, has been identified as an emerging pest of cucurbits in Punjab state. Use of PAU Homemade neem extract @ 1,200 ml/acre has been found effective in its control.
 - Whitefly, *Bemisia tabaci*, in okra can be managed with neem-based commercial formulation Ecotin (5%) @ 80 ml/acre and with PAU Homemade neem extract @ 2 litres/acre. *Amrasca biguttula biguttula*
 - Jassid, in okra can be managed by using PAU Homemade neem extract @ 2 litre/acre. Economic Threshold Level (ETL) for spotted bollworm, *Earias* spp., in okra has been found to be 1.0 per cent. - Biocontrol agents viz., *Trichoderma harzianum* and *Pseudomonas fluorescens* were tested as tuber dip treatment (@ 15 g/litre of water), soil treatment (@ 2.5 kg of talc formulation in 25 kg of FYM/acre) and their combination, respectively for control of Black Scurf of potato.
 - Maximum inhibition among was found in tuber dip treatment of *Trichoderma harzianum* @ 15 g/ litre of water (62.63%) followed by soil treatment of *Pseudomonas fluorescens* @ (2.5 kg of talc formulation in 25 kg of FYM/acre) which showed 52.30% inhibition.
 - PAU homemade *dharek* extract can be used (@ 1,600 ml/acre) to manage mite in okra.
 - Inundation and planting method have been observed to play a role in incidence of sudden wilt in chilli crop. The incidence was the highest (60%) in case of flat planting, followed by low ridge (40%) and the lowest being in high ridge planting (7-10%); experimental conditions included inundation for 48 hours and *Fusarium oxysporum* inoculation in the soil. Decreasing inundation period to 24 hours, brought down the incidence as well. The results indicated that combined effect of hypoxia induced by water stagnation and *Fusarium oxysporum* can be implicated in the sudden wilt syndrome of chilli.
 - To assess status of downy mildew of cucumber in the Punjab state, a survey was conducted in different cucumber growing regions of Punjab (Ludhiana, Hoshiarpur, Malerkotla, Sangrur and Bathinda districts). The highest disease incidence was reported in Malerkotla district (75%), followed by Hoshiarpur (65%), Ludhiana (59%) and Sangrur (44%).
 - Biocontrol agents viz., *Trichoderma harzianum* and *Pseudomonas fluorescens* were tested as tuber dip treatment (15g/litre of water); soil application (@ 2.5 kg of talc formulation in 25 kg of FYM/acre) and as both tuber dip and soil application. Maximum inhibition of black scurf of potato among the bioagents treatment was found in tuber dip treatment of *Trichoderma* (54.7%) followed by soil treatment with *Pseudomonas fluorescens* (41.5%).
 - Among various talc based bioagents for managing white rot in brinjal, maximum disease control (95.0%) was noted in soil treatment with *Pseudomonas fluorescens* followed by *T. harzianum* 'seed + soil' treatment (80.2% disease control).
 - In case of management of damping off in chilli with bioformulations, maximum disease control (90.0%) was recorded in *Pseudomonas fluorescens* + *Trichoderma viride* 'seed + soil treatment' followed by 75 per cent disease control with *P. fluorescens* 'seed+ soil treatment.'

- Among various biocontrol treatments evaluated for managing wilt in muskmelon, maximum disease control (78.6%) was recorded in seed treatment with *T. harzianum* + *Bacillus amyloliquefaciens*, followed by *P. fluorescens* + *B. amyloliquefaciens* 'seed + soil' treatment (71.4%).
- In case of biocontrol agents and their application methods tested for management of wilt in cucumber, maximum disease control (89.9%) was observed in *T. viride* + *T. harzianum* 'seed + soil' treatment followed jointly by *T. harzianum* 'seed + soil' and *T. viride* 'seed + soil' treatments (76.5% disease control).
- A bio-intensive pest management (BIPM) module comprising *Metarhizium anisopliae* (Kalichakra) @ 2 kg/acre, neem (1%) @ 600 ml/acre, pheromone traps along with cultural measures like clipping of infested shoots, destruction of infested fruits, and low risk chemicals was found promising for the management of brinjal shoot and fruit borer.
- Ideal meteorological conditions for infestation of brinjal shoot and fruit borer included maximum temperature in the range of 29.9-35.5°C, minimum temperature in range of 16.0-27.0°C, morning relative humidity 81-93 percent, evening relative humidity 31-79 percent and total rainfall in the range of 20.0-80.0 mm.
- Integrated pest management module including neem 5% @ 80 ml/acre, marigold as trap crop, and pheromone traps along with some safer molecules was found effective for management of fruit borer in tomato.
- for managing common brown snail, *Macrochlamys indica*, pest of citrus nursery. It involves application of metaldehyde (2.5% dust) based bait (metaldehyde 25 g + jaggery 250 g + wheat bran 750 g), cleaning up debris in/around nursery, placing papaya leaves or gunny bags in the nursery area to attract snails and destroying snails by immersing in salted water.
- Citrus foot rot/gummosis can be managed by using biocontrol agent *Trichoderma asperellum*. Talc based formulation of the T20 strain (applied one week after the spray of sodium hypochlorite) @ 100 g mixed with 2.5 kg FYM per plant at foot and basin gave 80-92% recovery of plants, which was comparable with the recovery achieved by drenching with Ridomil Gold 68 WP @ 2.5 g/litre.
- Litchi fruit bunches can be covered with white/pink polypropylene non-woven bags at 25-30 days after fruit set for better fruit quality. The practice reduced borer infestation to 0.01-1.06% as compared to control (3.53%). It reduces sunscald, cracking and raises pericarp anthocyanin content.
- An integrated module has been developed for managing chafer beetle in grapes. The intervention included clean cultivation, ploughing around the trees during winter, irrigating the orchard as per the recommended schedule, and fixing Anisole based PAU chafer beetle traps @ 12 traps/acre at ground level during the last week of April.
- Powdery mildew in mango can be managed by using Contaf SEC (hexaconazole) @ 1 ml/litre. Percent disease index (PDI) was 9.86 under the recommended intervention in comparison to 19.4 in Sulphur 80WP @ 2.5 g/litre and 58.2 in untreated control.
- In order to control mango hopper, use of PAU homemade neem extract or dharek extract @ 5 litres/acre, twice at weekly interval, has been recommended. However, foliar spray (twice at fortnightly interval) of Confidor 17.8 SL (imidacloprid) @ 200 ml or Actara 25WG (thiamethoxam) @ 50g in 500 litres of water, beginning during the last week of February,

FRUITS

- On-tree bagging protects the fruits from fruit fly and eliminates the use of pesticides. Mature green and hard guava fruits of rainy season before colour break stage can be covered with white non-woven bags at the end of June to middle of July. It also improves the fruit size and quality. The technology will be particularly useful for backyard/kitchen garden plantations.
- Integrated approach has been recommended



provided more effective control. Use of the chemical formulations, however, should be restricted to late evening, a time when pollinators do not visit the inflorescence. It has been further recommended that in order to minimize dependence upon agrochemicals, first spray should be of *neem/dharek* extract only.

- An integrated module recommended for management of fruit fly, *Bactrocera* spp., in *ber* involves intermittent raking and ploughing, after harvest, of soil around tree base to contain existing and pupating population; clean cultivation; and use of PAU fruit fly traps (@ 16/acre) during the first week of February.
- Fruit piercing moth has been identified as a new pest in citrus. These moths inhabit forest/vegetation areas in the environs of citrus orchard and attack orchards during night. An integrated package recommended for the management of fruit piercing moths involves clean cultivation; use of PAU homemade neem/dharek extract @ 12 ml/litre or Horticulture Mineral Oil @12.5 ml/litre at 10 days interval starting from the last week of August; covering the entire row of trees with net of mesh size 1.2 mm; fixing poison bait traps (Malathion 0.05% @ 10 ml + citrus juice 100 ml + jaggery 100g+900 ml water) @ 20 traps/acre during the first week of August with the initiation of colour break stage; and fixing homemade light traps (100W lamps) @ 20 traps/acre during the last week of August.
- Different GRAS (Generally regarded as safe) compounds were evaluated for the management of post-harvest rot of Kinnow mandarin caused by *Penicillium digitatum* both as pre-inoculation and post-inoculation treatments. Sodium carbonate @ 4% provided the highest disease reduction (85.5% in pre-inoculation and 81.8% in post-inoculation treatment) followed by garlic clove extract (80.4% in pre-inoculation and 78.1% in post-inoculation treatment).
- Paddy straw mulch can be spread in *Kinnow* orchards (@ 3 tonnes/acre) during December for managing weeds. The recommended

practicelowered weed mass by 46 per cent. The practice also helps in managing fruit drop; as a result, fruit yield in mulched fields went up to 80.4 kg/tree against 68.6 kg without mulch.

- **IPM of mango hoppers:** It's management can be done by pruning of branches in dense orchards, avoid high density planting, spraying twice at weekly interval PAU Homemade Neem or PAU Homemade Dharek Extract @5 litres or spray twice at fortnightly interval 200 ml confidor 17.8 SL (imidiclopid) or 50g Actara 25 WG (thiamethoxam), starting from the last week of February using 500 litres of water per acre.
- Management of citrus psylla, aphid, thrips and mites using Soybean oil and Cotton seed oil in Citrus: Sucking insect and mite pests such as psylla, aphids, thrips and mites can be safely managed by spraying 10 litres of Soybean oil or 10 litres of Cotton seed oil + 1.25 Kg of detergent powder (surfactant) in 500 litres of water per acre.

PESTICIDE RESIDUE ANALYSIS

- Out of the 530 vegetable samples collected from the market, 40 (7.6%) samples were found to be contaminated and 7(1.3 %) samples had pesticide residue above maximum residue level (MRL).
- Out of 389 vegetable samples collected from farmgate, 19(4.9%) samples were found to be contaminated and one sample exceeded the MRL.
- In case of Basmati rice, 9 (16.4%) out of 55 samples were found to be contaminated and 2(3.6%) samples were found to have pesticides above MRL. In case of 361 farmgate samples, 10(2.8%) were found to be contaminated and 9 (2.5%) exceeded the MRL. In case of red chilli powder, 47 samples were collected from market and 8 (17.0%) samples were found to be contaminated with pesticides, whereas, no contamination was reported in 21 milk samples, 34 fruit samples and 8 water samples during this period.
- Pesticide residue analysis of 920 samples of various food products collected from

Bathinda, Mansa and Sangrur districts and comprising vegetables (608), basmati rice (216), red chilli powder and milk (36 each), and water (24) showed that 51 samples (5.54%) were contaminated with various pesticide residues and seven samples (0.76%) had levels above Maximum Residue Limits (MRL). Red chilli powder samples were more prone to contamination, whereas milk and water samples did not contain any pesticide residues.

- Out of 811 sampled vegetable commodities, 31(3.82%) samples were found to be contaminated and 10(1.23 %) samples had contamination above MRL (maximum residue limit). Out of 306 basmati rice samples, 13(4.25%) were contaminated and one sample tested above MRL. In case of red chilli, 10 samples out of total 65 (15.4 %) were contaminated. However, no pesticide contamination was detected in milk (36), fruit (52) and water (26) samples.

WEED MANAGEMENT

WHEAT

- An integrated weed management approach has been developed to tackle multiple herbicide-resistance of *Phalaris minor* to post-emergence herbicides. Under this approach, the combination of Happy Seeder use for wheat sowing, herbicide application and hand pulling of escaped weed plants provides effective weed control and depletes weed seed bank.
- Post-emergence spray of ACM-9 (metribuzin 20% + clodinafop propargyl 9%) @ 600 g/ha provides effective control of herbicide resistant *P. minor* and other grass and broadleaf weeds; the herbicide, however, should not be used on wheat variety Unnat PBW 550.
- New pre-emergence weedicides pyroxasulfone 85 WG (@ 150 g/ha) and flumioxazin (Maxx 50% SC @ 200-250g/ha) have been recommended. However, flumioxazin should be restricted to medium- or heavy-textured soils in order to avoid phytotoxicity to wheat crop.

- With resistance emerging to widely used post-emergence weedicides, emphasis has been shifted to pre-emergence sprays. The dosage of pre-emergence spray of pendimethalin 30 EC has been enhanced to 3.75 litres/ha to provide effective control of *P. minor*.
- In order to address labour shortage and consequent high labour costs, mechanical weeding options need to be explored in organically raised wheat. It has been recommended that organic wheat should be cultivated on beds (4 rows on 105 cm wide bed or 2 rows on 67.5 cm wide bed). Two mechanical weedings can be given at 30 and 45 days after sowing, both on bed top and in furrows. For mechanical weeding on bed top, an attachment having tynes with sweep type furrow openers can be mounted on the existing ridger to interculture each row.
- For weed control in Happy Seeder sown wheat, pre-plant herbicide application package has been recommended. The package involves using pyroxasulfone (127g/ha), pendimethalin (1,125g/ha), or pre-mix of pendimethalin 35%+metribuzin 3.5% (@962.5g/ha) mixed with basal dose of urea before sowing.
- New pre-emergence herbicides AWKIRA 85 WG (pyroxasulfone) (@ 60 g/acre) and Platform 385 SE (pendimethalin 35% + metribuzin 3.5%) @ 1 litre/acre have been recommended to broaden pre-emergence management choices. The latter helps manage certain broadleaf weeds as well.
- Existing recommended dose (one litre/acre) of pre-emergence herbicide Stomp 30 EC (pendimethalin) has been revised upward to 1.5 l/acre to manage likely risk of development of resistance against pendimethalin.
- New post emergence herbicide ACM-9 (clodinafop 9% + metribuzin 20% WP) @ 600 g/ha has been recommended.

RICE

- New post emergence weedicide Council Activ 30WG (pre-mix of triafamone 20%+ethoxysulfuron 10%) @ 67.5 g (a.i.) per ha, provides broad spectrum weed



control in direct seeded rice. The target weed flora includes grass weeds (*swank, swanki, madhana, makra and chini gha*), broad leaf weeds (*tandla, itsit and gharilla*) and sedges (*chhatti wala motha and gandhi wala motha*).

- Paddy straw mulch @ 30 q/ha in Kharif maize provides effective control of weeds at par with Laud is 420SC (tembotrione) @ 105 ml/ha. Paddy straw mulch (@ 4t/acre) and black-silver polythene mulch have been found effective in controlling weeds in marigold (*Tagetes erecta*).
- Sweep Power 13.5 SL (Glufosinate ammonium) has been recommended as an alternative to the commonly used Paraquat dichloride (Gramoxone) and other herbicides for broad spectrum weed control in cotton. When used @ 2,250 ml/ha, it provided effective weed control, at par with paraquat dichloride (Gramoxone 24SL) @ 1,250 ml/ha.

COTTON

- Post-emergence directed application (45-60 days after sowing), in inter-row spaces, of Sweep Power 13.5 SL (Glufosinate ammonium) @ 900 ml/acre has been found to provide broad spectrum weed control in cotton.
- A selective post-emergence herbicide Hitweed Maxx 10MEC (pyrithiobac sodium 6% + quizalofop ethyl 4%) @ 125 g a.i./ha (in moist soil after first irrigation) has been recommended for broad spectrum weed control in cotton.

SUGARCANE

- Pre-emergence application (after planting and irrigation) of pre-mix of sulfentrazone 28% and clomazone 30% WP (700+750g/ha) has been recommended for weed control in spring planted sugarcane.

SOYBEAN

- Integrated use of paddy straw mulch @ 6 t/ha and one hand weeding at six weeks after sowing provides effective control of broad spectrum of weeds in organic soybean.

BER

- To control weeds and derive higher yields in ber orchards, application of paddy straw mulch @ 5.0 tonnes/acre in the second fortnight of October after application of second dose of fertilizers has been recommended. Thereafter, it should be incorporated during May-June along with the application of recommended dose of organic manure. This practice has potential to reduce weed biomass by 91 per cent and increase yield by 8.5 per cent.

POPLAR

- Using paddy straw as a mulch @ 4 t/acre in poplar nursery provides an eco-friendly and cost-effective weed control.

RESIDUE ANALYSIS

- During the report period, 592 vegetable samples were collected from market (149) and farmgate (443). About 2.22 per cent of market samples and 1.34 per cent of farmgate samples contained pesticides above maximum residue limit.
- In case of 319 samples of basmati rice, six samples had pesticide residues above MRLs. No milk (30 samples) and water samples (18) were found to be contaminated.

RODENT, BIRD AND VERTEBRATE PEST MANAGEMENT

- Integrated rodent management module has been recommended in pea crop. The intervention involves burrow baiting with 0.005% bromadiolone bait in the first and last week of November along with manual killing and weed control.
- Survey of rodent damage after sowing and at pre-harvest stage in direct seeded and transplanted rice crops in villages of districts Shaheed Bhagat Singh Nagar, Hoshiarpur, Jalandhar, Moga, Ludhiana and Gurdaspur revealed more damage in direct seeded rice (DSR) than in transplanted rice crops indicating, thereby, the need to prioritize on DSR.
- Installation of Trap Barrier System in transplanted rice resulted in 50% reduction in number of rodent burrows in surrounding

transplanted fields (12 acres). This technology is also effective in rice nursery. Damage caused by five-striped squirrel, *Funambulus pennanti*, was observed in ber, pomegranate, loquat, mango, brinjal, cauliflower, wheat, and maize and palm nursery.

- Management using slippery and cone guards of aluminium sheet gave 100% protection against squirrels. Some protection was also provided by alternative food, nylon net and reflective ribbon.
- T-perches installed in paddy and maize crop fields @ 25/acre, attracted insectivorous birds at all the crop stages. Maximum insectivorous species were observed during the maturing stage of the crop after installation of T-perches. Avian diversity survey of 71 villages of 11 districts i.e. Ludhiana, Jalandhar, Shaheed Bhagat Singh Nagar, Rupnagar, Patiala, Barnala, Mansa, Hoshiarpur, Tarantaran, Ferozepur and Amritsar was conducted.
- Dominant bird species were Rock Pigeon, Common Myna and House Crow. Forty species were recorded in paddy crop fields at selected 10 villages in district Ludhiana including 21 beneficial and nine depredatory bird species.
- Bird community structure in mustard and pea crop fields comprised 15 species belonging to nine orders, Passeriformes followed by Cuculiformes and Pelecaniformes being the predominant types.
- Survey of rodent damage in wheat crop fields sown with different technologies like conventional tillage, rotavator or drill machine, Happy Seeder with standing stubbles, and Happy Seeder with paddy mulch in different villages of district Fatehgarh Sahib, Tarantaran, Gurdaspur and Hoshiarpur revealed that rodent damage is not technology specific but location specific. Rodent damage in wheat fields ranged from 0 to 8.68 per cent.
- Use of reflective ribbon in tomato and mustard crops was found up to 95-97 per cent effective in bird control. Nylon nets installed in mustard crop 17 during the germinating stage gave 100 per cent protection from bird damage.
- Damage by fruit bats was minimized by using ecofriendly method of artificial light, using 16 LED (30W) bulbs/acre at 50 feet spacing in downward position (at a height of 6 feet above the top of tree canopy) in ber orchard.
- Laboratory studies revealed the efficacy of Dharek and neem seed extracts as antifeedant and anti-fertility agents against both sexes of *Rattus rattus* and *Bandicota bengalensis*. Application of Dharek and neem seed based sprays in grain stores prevented rodent damage to bags for 21-30 days.
- Survey of wheat crop fields sown under different practices of rice residue management revealed that rodent infestation is more location specific depending upon the surrounding field areas rather than the method of residue management.
- Among different methods evaluated for managing bats in litchi crop, integrated approach involving lightening with LED bulbs (30 watt) installed above the tree canopy and facing upwards, drum beating and firing crackers gave fruitful results.
- Regular survey of rice crop conducted at different stages in 76 villages of 15 districts of Punjab revealed that rodent damage is location specific, being more in early sown crop fields, fields near water channels, drains, maize and moong crop fields, poultry farms, etc. Number of rodent burrows was quite high after sowing in direct seed rice (8-60%) in June and in transplanted rice in July 2021. Number of rodent burrows peaked during August in both the environments.
- In a survey of wheat crop carried out at different stages in four villages, maximum number of rodent burrows was noticed during December in fields under rice residue management. However, no significant difference in rodent infestation in crop sown under conventional and residue management practices was observed at milky grain to maturity stages.
- Assessment of damage by birds in maize crop revealed that Rose-ringed Parakeet, House Crow and Jungle Babbler were the major bird species implicated in the damage.



- Evaluation of the integrated bird pest management methods for managing depredatory birds and wild boar in maize and mustard crops demonstrated the effectiveness of polynet for managing depredatory birds and BoRep, an olfactory repellent, for managing wild boar. A bio-acoustic device proved to be almost fully effective in managing bird pest problem in guava, citrus and grape orchards. Habitat management intervention was also used as an integrated approach for containing bird damage.
- Blue bull (Nilghai) can cause severe damage to standing crops. Blue bull was spotted in 10 out of 25 villages of Mangat 1 block of Ludhiana district, which were surveyed for this purpose. In total, 231 animals (23 adult males, 67 adult females, 19 subadult males, 67 subadult males and 55 calves) were found in 20 groups. Nylon net at a height of 7 feet was found to be fully effective in managing this vertebrate pest.

BIODIVERSITY AND BIOSYSTEMATICS

- Earthworm diversity in organic systems was richer than in conventional farming systems.
- Soil macro invertebrate diversity in relation to different organic amendments like FYM (7.5 t/ha and 15 t/ha), biochar (2 t/ha and 4 t/ha) and green manure in maize-wheat cropping system showed that wheat crop harboured 39 species, out of which 12 species were present within soil and 27 species on soil/plant surface, whereas maize crop supported 53 species, out of which 17 species were present within soil and 36 species resided on soil surface, Coleoptera being the dominant order.
- In wheat crop, total macro invertebrate population (within soil) present in FYM (15 t/ha), biochar (4 t/ha) and green manure plots was 2.08, 1.27 and 1.51 times more than conventional plots, respectively, whereas in maize crop, it was, respectively, 2.15, 1.28 and 1.60 times more than in conventional plots.

FOOD SCIENCE AND TECHNOLOGY

FRUIT PRODUCTS

- Technology for processing coloured flesh guava varieties into value added products such as guava squash, nectar and leather/bar has been standardized for Punjab Kiran and Punjab Pink varieties. The products are shelf stable for more than one year with nutritional and sensory quality intact.

VEGETABLE PRODUCTS

- Blanching and freezing technology for potato fingers and pea grains has been developed. Potato fingers and de-podded pea grains are blanched followed by freezing at -30°C using blast freezing technology. The frozen products are shelf stable up to one year with their nutritional quality intact. Microbial growth under storage conditions was almost negligible even after six months of storage. These products can be used in different curried vegetables and specialty products such as *aloo tikki*, *kabab* and *parantha*.
- Technology developed for preparation of potato *parantha/samosa* mix from dehydrated tubers of table purpose potato variety 'Kufri Pukhraj' has been recommended. Conversion of potatoes into potato flour extends their shelf life and lowers storage cost. The mix (containing potato flour, red chilli powder, cumin and black pepper) is suitable for use upto 12 months of storage at room temperature in 200-gauge polythene bags sealed in air-tight container.
- Technology for development of fibre (oat bran) incorporated probiotic *Kulfi* has been recommended. The ingredients include 1.5% oat bran, milk (standardized to 5.5% fat) and 2% Lactobacillus casei culture. The product can be stored for 35 days when stored at $-0.18 \pm 1^{\circ}\text{C}$.

BEVERAGES AND FERMENTED FOODS

KINNOW BURFI

- Technology for preparing burfi, an Indian fudge, from *Kinnow* juice has been developed. The developed product had a much longer (21 days) shelf life at room temperature than ordinary plain *burfi* (3 days).

SUGARCANE JUICE *KHEER*

- Technology for sugarcane juice based *kheer* has been developed. This convenience product, rich in iron and phytonutrients, can remain shelf-stable in cup for 20 days without any chemical preservative and upto two months with chemical preservation under refrigerated conditions. However, thermally processed canned *kheer* can stay fit for consumption upto 12 months at room temperature.

VITAMIN D ENRICHED MUSHROOM PASTE

- In order to address post-harvest loss of mushrooms and to attract premium market through round the year availability of mushroom products, value addition assumes importance. Technology for preparing vitamin-D2 enriched button mushroom (*Agaricus bisporus*) was developed. The paste prepared from mushrooms irradiated with UV-B had 17.4 µg/100g vitamin D2 content against 9.2 µg/100g in their untreated counterparts.

OTHER TECHNOLOGIES

- Development of *Jamun* pomace powder and its products (butter and tablets)
- Guava and *Amla* nectar using natural refined sugars
- Protein fortified papaya bar
- *Kinnow* peel powder as functional ingredient in bread
- Ready to use canned *bhartha*
- Muskmelon based jam and nectar
- Functional breads enriched with dried and pureed bell peppers and tomatoes
- Microwave treated pigeonpea flour incorporated pasta
- Instant soup mix
- Micronutrient fortified ready-to-bake frozen potato *paranthas*
- Augmentation of *bhujia* with tomato pomace
- Nutritionally enhanced lollipops
- Carbonated *lassi*
- Gluten free cake premix
- Mint incorporated *tofu*
- Edible packaging

PROCESSING TECHNOLOGIES

- A batch-type refraction based drying system for potato flakes has been developed for reducing drying time and maintaining quality of dried product in comparison to convective tray dryer.
- Wheat flour prepared from recommended wheat varieties at low milling speed of 80 rpm and vacuum packed thereafter was the best in retaining the properties of wheat flour in terms of protein, fat, carbohydrate and starch content upto 60 days.
- Technology for ethanol production from damaged wheat grains (at 50 L scale producing ethanol @ 33.6 g/100 g) was standardized and patent filed.
- Technology of modified atmospheric packaging and storage of gladiolus spike to enhance their post-harvest life has been recommended. Gladiolus harvested at tight bud stage (basal 1-2 florets show colour) and packed @ 10 spikes per polypropylene sleeve (100 gauge or 25 µm thickness having 120 cm length, 18 cm width with 50 perforations) can be stored vertically in cold O room (5±0.5 C) for 10 days with acceptable flower quality and vase life up to 13 days.
- Potato tubers of table purpose variety Kufri Pukhraj were used for making ready-to-cook non-cereal puddings. Potato starch was isolated and mixed with powdered sugar (45:50), artificial colour (100 mg/100 g) and vanilla flavour (8- 10 drops/100 g). The pudding preparation was acceptable in organoleptic evaluation. On account of its non-cereal, gluten free composition, it can cater to special clientele e.g. celiac patients, noncereal fast keepers, etc. Also, this value addition will contribute towards management of table purpose potato gluts.
- *Kinnow* fruit bars, having shelf life of six months, were prepared from *Kinnow* juice. After removing seeds, cut pieces of *Kinnow* were ground with sugar (1:1) in mixer to reduce bitterness. *Kinnow* juice along with pectin (4% of sugar) was concentrated by open pan boiling until a paste like consistency



was obtained. The mixture was concentrated till final TSS reached 790 B. The bar was microbiologically safe during the entire shelf life period of six months.

- Low cost technologies were developed for the production of diverse onion products (onion puree, paste and flakes) which can be available for consumption throughout the year.
- Lactic acid starter culture : Consortium of ten lactic acid bacterial strains was developed as a starter culture for preparing metabiotic lacto-fermented beverages and pickles from powder and rhizomes of turmeric and amla. Beverages and pickles prepared from turmeric and amla, endowed with antioxidants, polyphenols and flavonoids, exhibited antimicrobial activity

NEW MICROBES

- Two fungus strains *Aspergillus nomius* and *A. flavus* were isolated, respectively, from pineapple peel and citrus pulp for their potential use in Kojic acid production.
- Four strains of *Pediococcus acidilactici* were isolated from infant faeces for potential application in lactic acid fermented beverage production.

INCUBATIONAL FACILITIES

Food Industry Business Incubation Centre, established by Punjab Agricultural University with technical guidance from Ohio State University, USA, has been operational since June 2015. The Centre provides incubation facilities at nominal charges to entrepreneurs in scaling up the technologies developed by Punjab Agricultural University.

- Wheatgrass powder prepared from 7-10 days old wheatgrass (shade- or freeze-dried) was found to be suitable for enrichment of often consumed foods. Wheatgrass products, namely, bread, biscuits and spice mix can be commercialized to tap thriving segment of health foods.
- Mulberry fruits are characterized by short seasonality and high perishability. Six products, namely, jam, chutney, crush, syrup, leather and dried mulberry, prepared from

three types of mulberry fruits, exhibited moderate loss in antioxidant activity after four months.

- Eight products, namely, powder, *chutney*, *murabba*, two types of pickles, candy, jam and syrup were prepared from ripe and green karonda (*Carissa spp.*). After six months storage, powder from green unripe karonda exhibited the highest ascorbic acid content (41.6 mg/100 g); pink ripe karonda powder had the highest anthocyanins content (388 mg/100 g); and candy had the highest iron content (8.5 mg/100 g). This value addition can help capture premium health food market and help design food-based interventions for anaemic populations.
- Pumpkin seeds are highly nutritive but are generally discarded. Pumpkin seed flour (from raw or roasted seeds) can be used to supplement (upto 30%) various food products like *panjeeri*, *matthi* and cookies at commercial scale.
- The nutritional bars developed with the quality protein maize (QPM) and different ratios of other ingredients like cauliflower leaves, carrots, green chickpea and jaggery were highly acceptable in terms of sensory scores and could be safely stored for about four months. Supplementation of QPM bars for 90 days resulted in an increase in total protein, serum albumin and hematological profile of school children.
- Supplementation of carom (*ajwain*) and fennel (*saunf*) seeds significantly improved lipid profile and antioxidant status of adult women.

FOOD AND NUTRITION

- Incorporation of black carrot concentrated powder was acceptable up to 7.5 per cent level in dairy products and bread, whereas 1.0 per cent level was acceptable in cookies, cakes, laddoo and seviyan. There was a significant increase in minerals, namely magnesium, iron and zinc, polyphenolic compounds and antioxidant activity as a result of incorporation of black carrots.
- Nutrition awareness training was given to

1,516 rural school girls (13-18 years) from eight villages of Moga and Ludhiana districts. A positive change in attitude and practices was observed after the delivery of five nutrition awareness 2-hour sessions.

- Vitamin D enriched mushroom powder for food supplementation Post-harvest treatment of button and oyster mushroom with UV rays (UV-A, UV-B, and UVC) at different distances (30 cm, 45 and 60 cm) and varied time duration (10 minutes, 20, and 30 minutes) significantly increased vitamin-D₂ content.
- The optimum combination, involving exposure to UV-B radiation at 60 cm for 30 minutes caused manifold spike (228 times in button and 141 times in oyster) in vitamin D content.
- Beetroot powder can be used as a natural colorant for functional bakery products as raw, powder and juice for the development of functional foods, namely, jam, candy, cake, cookies, bread, doughnuts, juice blend and whey drink. Supplementation of beetroot powder in cake was acceptable at 25%, whereas, supplementation of beetroot powder in cookies, bread and doughnuts was acceptable at 10% for each product.

WHEATGRASS ENRICHED PASTA

- Enrichment of pasta with wheatgrass powder and juice significantly enhanced nutritional and anti-oxidant potential, curtailed optimum cooking time and increased water absorption capacity.

PHYTONUTRIENT PROFILING OF KARONDA POWDER

- The highest levels of total phenols (1926.4 mg GAE/100g), protocatechuic acid and vanillic acid (1.1 mg/100g and 17.9 mg/100 g) were found in pink ripe karonda powder. Green ripened karonda powder had the highest content of flavonoids (247.6 mg QE/100g), anthocyanins (1,588 mg/100 g) and anti-oxidant activity (88.2%). Overall acceptability of all the recipes prepared with karonda powder was better than amchur powder based preparations.

- Iron bioaccessibility in different karonda products, namely chutney, murabba, pickle, candy, jam, and syrup (prepared from physiologically mature, unripe and ripe fruit of pink and green variety) was found maximum in pickles (20.8-30.4%) of both the varieties. Karonda products are recommended for anaemic population as a source of iron.

SPROUTED FOODS

- Germination and puffing of pearl millet and sorghum resulted in a significant increase in the protein, dietary fibre, in vitro digestibility of starch and protein, and increased bioactive compounds (phenols by 49% and flavonoids by 12.1%) and retention of anti-oxidant activity.
- A soup mix prepared using 50% germinated chickpea flour and 30% carrot pomace powder, when supplemented in food of 60 hyperlipidaemic patients (30-60 years) for a period of three months led to a significant dip in weight and BMI Atherogenic index of plasma slid by 7.6 per cent.

NUTRIENT-DENSE INGREDIENT MIX

- Nutrient-Dense Ingredient Mix was formulated for improving energy and iron status in rural Punjabi women. It contained semolina, pearl millet, whole green gram, dried fenugreek leaves, peanuts, fat and other functional ingredients. This mix provided 437.4 Kcal of energy, 13.6 g protein, 3.6 mg iron, 42.4 mg calcium and 0.92 mg zinc. Supplementation of this mix (100 g) daily for 120 days along with nutrition education to 60 adult (18-50 years), undernourished and anaemic women increased weight, BMI and haemoglobin of selected subjects by 2.28 kg, 0.91 kg/m² and 0.68 g/dl, respectively.

COMMUNITY HEALTH

- “Nutrition Smart Village” programme was planned to strengthen the Poshan Abhiyan. Baseline survey revealed that majority (58%) of the farm women in the adopted village Himayunpura (district Ludhiana) were either overweight or obese. About 64 per cent of women showed clinical symptoms of iron and vitamin D deficiency. In order to plug



the identified nutritional gaps, 30 nutri-gardens were established, and trainings and demonstrations on nutritive recipes along with intensive awareness campaigns were organized.

- Leaf and flower extracts of *Cassia fistula* were obtained using methanol as solvent with Soxhlet extraction method. Phytochemical screening of methanolic extracts confirmed the presence of phenols, flavonoids, alkaloids, cardiac glycosides and anthraquinones. The extracts displayed good anti-microbial activity against of *Staphylococcus aureus* and *Escherichia coli*.
- Carrot seed essential oil (CSEO) was encapsulated using complex coacervation technique. The encapsulated and unencapsulated CSEO showed a moderate anti-microbial activity against Gram-positive pathogen, *Staphylococcus aureus*, but poor anti-microbial activity against *Escherichia coli*.

POST-HARVEST TECHNOLOGIES

FRUITS

- Technology for preparation of jamun value added products from jamun (*Syzygium cumini*) vinegar by batch and packed bed fermentation at 20 L scale has been developed by employing ethanolic fermentation of jamun juice with *Saccharomyces cerevisiae* MTCC 11815 inoculum. Jamun vinegar has potential for its wider acceptance due to its phenolic constituents, anti-oxidants and anti-inflammatory properties.
- Process for dietary fibre extraction from byproducts of Kinnow peel and pomace has been standardized. Peel part showed higher phytochemical and anti-oxidant activity.

VEGETABLES

- Shelf stable chilli products chilli paste and honey chilli sauce with enhanced shelf stability were developed from Punjab Sindhuri and CH 27 chilli varieties.
- Punjab Sindhuri had better bioactive profile as compared to CH 27 chilli variety. Freeze dried chillies showed the highest retention

of physicochemical, phytochemical and antioxidant properties in both the chilli varieties. Both the products retained nutritional profile, bioactive potential and organoleptic acceptability during storage studies in respect of both the varieties.

LIQUID JAGGERY FROM SUGARCANE JUICE

- Liquid jaggery, potential sweetener with high nutritive value without any harmful chemicals, was developed using juice from sugarcane varieties CoJ 88, CoJ 64 and CoPb 93. The preparation from CoJ 88 showed better nutritional profile and bioactive potential followed by CoJ 64 and CoPb 93. It also exhibited the highest yield (27.50%) followed by CoJ 64 and CoPb 93. The CoJ 88 was recommended for the preparation of sugarcane toffee.
- Glycemic index of liquid jaggery and sugarcane toffee was 55 and 63, respectively. It can serve as an alternative to 'Indian Golden Syrup' or 'Maple Syrup'.

OTHER PRODUCTS

- Quality Protein maize pasta was developed using HQPM 1 flour. The pasta prepared by using 100% QPM flour with 3% guar gum followed by steam treatment for 25 minutes had the highest overall acceptability. This specialty pasta exhibited better nutritional profile, functional properties, bioactive potential and cooking quality. Resultant products could serve as functional pasta for health-conscious population.
- Yellow pea flour was used to prepare traditional Indian food products such as *missi roti*, *pinni*, *pura* and *pakora*. The products prepared with yellow pea flour were cheaper than commercial products and had less fat and calorific value.

FUNCTIONAL BREADS

- Bell pepper powder and tomato powder dried at 60°C had six-month shelf life under refrigerated conditions. Incorporation of powder and purees in bread enhanced level of fibre, mineral, total phenols, flavonoids, antioxidants and carotenoids.

- Honey-based amla products; Honey was used to completely or partly replace sugar for preparation of amla candy, amla murabba and amla nectar. Amla nectar containing sugar: honey in 1 :1 ratio received highest sensory scores and had appreciable vitamin C level. Amla candy and amla murabba are being developed with whole honey to standardize the final technology.

PAU BACTERIOLOGICAL FOOD TESTING KIT

- It is a portable solution for easy, rapid and precise detection of indicator and emerging pathogens in food commodities. The kit was prepared by adding the defined concentrations of components of the BFTK in serum bottles, which were sterilized and rubber-stoppered. It promotes growth of conventional indicator microorganisms and emerging pathogens like *Campylobacter jejuni*, *Aeromonas hydrophila*, *Yersinia enterocolitica*, and *Bacillus cereus*.
Gluten free biscuits
Gluten free biscuits supplemented with quinoa flour (40% level) had good nutritional profile in terms of protein, minerals and amino acids.
- A significant increase in the intake of protein, carbohydrates, energy, thiamine, iron and calcium was observed after feeding the standardized biscuits to the children (7-9 years) suffering from celiac disease for a period of three months along with nutritional counselling. Body weight significantly improved after the interventions.

SOLAR CURING SYSTEM FOR KHARIF ONION

- *Kharif* onion needs to be cured by removing excess moisture before storage. Curing slows microbial decay and sprouting. However, cold weather following *Kharif* onion harvest prolongs curing time and hence necessitates distress sale. The recommended solar curing system allows curing by maintaining room temperature at 30° C and relative humidity at 45±10% for nine days to ensure three-month storage life. Average loss with this technology was 15 per cent in comparison to 41 per cent loss due to sprouting after 30 days and complete rotting in 45 days under storage without the curing technology.

REFRIGERATION SYSTEM

- A prototype of mobile thermoelectric refrigeration system (100L capacity) has been designed and developed for retail sale and storage of summer fruits and vegetables. It has four thermoelectric modules, liquid cooled evaporators and axial fan which can operate with 12V DC power source, consuming 4.5 kW/day. The system maintains the temperature of 15±2°C and 80-90 per cent relative humidity.

TUBEROSE TINTING

- Tuberose spikes at tight-bud stage can be variably tinted by dipping basal portion (5-7 cm) in solution comprising 1% food dye of desired colour, 2% sucrose and 300 mg/L citric acid for two hours. The technology will help capture premium market and address requirements of decorators. Handholding for agro-processing
- Seven new agro-processing complexes and 10 jaggery processing plants were established by farmers with technical guidance from PAU.

EVACUATED TUBE COLLECTOR SOLAR DRYER

- Many farm products like fenugreek (methi), turmeric, moringa leaves, ginger, garlic, chilli, mushroom, etc. require drying for inviting higher prices and for many end product requirements. Medium capacity dryers in this regard can help farmers earn higher income through value addition and storage. The recommended solar dryer provides an economical substitute to the earlier recommended model that was based on tubes having open ends on both the sides. The dryer employs tubes closed from one end. The drying time is product-specific. It costs around Rs 60,000 and has a payback period of about 300 days (150-day use over two years).

PACKAGING

- Corrugated Fibreboard (CFB) boxes of various capacities (2 and 4 kg capacity [3-ply] for retail and 10 kg [5-ply] for wholesale) have been recommended for packaging of pear fruits for transportation and marketing. The technology provides desired alternative to conventional



wooden box packaging.

- Annual chrysanthemum flowers can be packaged in 3-ply CFB boxes for prolonged shelf life (2.49 days against 1.14 days in gunny bags) and freshness (8.9% weight loss against 20.4 percent in gunny bags, and 80.5% moisture content against 65.7 in gunny bags).
- In case of groundnut (spring groundnut TG37A variety in shell), vacuum packaging proved better than other packaging systems for long-term storage (more than six months), whereas for short-term storage (upto six months), EVOH (Ethylene Vinyl Alcohol) bags proved to be the most effective.

PECTIN EXTRACTION FROM KINNOW/MOSAMBI PEEL WASTE

- Processing and utilization of citrus fruits like *Kinnow* and *Mosambi* generates waste in the form of peel and pomace, which shares about half of citrus fruit mass. The waste can be processed into various byproducts, of which pectin has a wide global market. The waste utilization technology may provide environmental and economic benefits to the processing units. To this purpose, a pilot scale plant for pectin extraction from *Kinnow/Mosambi* peel was developed. The plant with 50 kg (peel) capacity per batch yielded 14 percent and 18 percent pectin from *Kinnow* and *Mosambi* peel, respectively. Optimized operational parameters for *Kinnow* waste were: solution pH 2.0, temperature 74°C, and extraction time 60 minutes; the corresponding optimized values for *Mosambi* waste were 1.32, 78.5°C and 60 minutes.

GUAVA PRODUCTS

- High quality guava flakes/powder can be obtained from guava puree (TSS: 9°Brix) by pretreating with 0.2% potassium metabisulphite (KMS) and 1% citric acid followed by convective drying at 50°C. Using this technique, approximately 26 kg of powder can be obtained from 100 kg of guava.
- A vacuum impregnation (VI) system for the improvement of nutritional characteristics of fresh and fresh-cut porous products and

a cell alive system (CAS) freezing setup was designed, developed and evaluated for guava cubes. The osmotically pre-treated guava cubes developed under optimized conditions can be stored safely up to nine days under passive cooling chamber (<4° C) with acceptable quality attributes.

VODKA PRODUCTION FROM POTATO

- Vodka is a clear distilled alcoholic beverage. It is a type of fermented beverage made from cereal grains, potatoes, molasses, etc. Usually, potatoes are the most favoured substrate for vodka production. This technology can help sustain potato production and address gluts. The recommended technology, developed using tubers of Kufri Pukhraj variety, involves alpha amylase and glucoamylase addition for enhanced release of sugars. After four day long alcoholic fermentation process, lemon and cranberry flavours were added. Double distillation was employed to maintain alcohol percentage at 38-40.

MEAD FROM RAW HONEY

- Mead (honey wine) is an alcoholic beverage (8-14% v/v alcohol content). Fresh raw honey contains extraneous matter such as pollen, traces of wax, dirt, air bubbles, variable amounts of sugar tolerant yeasts, dextrose hydrate crystals and other solid particles. Purifying treatment for table purpose marketing entails considerable additional costs. The recommended technology completes raw honey based mead production (at 2.5L scale) in 9 days with 10.24 percent alcohol content.

OTHER FERMENTED BEVERAGES

- Sugarcane vinegar was successfully standardized at 20 L scale under the optimized packed bed fermentation conditions.
- Fermentation conditions of red wine were successfully validated on H-27 and Kohyo varieties of grapes against the benchmark of Punjab Macs Purple. Adding low concentrations of unsaturated fatty acids, especially oleic acid, promoted fermentation activity.

- Alcoholic karonda beverages were scaled up (10 L) using *Saccharomyces cerevisiae* MTCC 11,815 for both white with pink blush and green with purple blush genotypes. Alcohol content varied from 4.55-5.56 per cent. The beverages had appreciable levels of ascorbic acid, phenolics and anti-oxidants. Sensory scores varied from 8-8.75 on nine-point Hedonic scale.
- Three blends of alcoholic beverage from karonda (white with pink blush) and guava (var. Allahabadi Safeda) in the ratio of 50:50, 30:70, 70:30 were produced. Based upon desirable levels of various parameters, the 50:50 blend with 5.2% alcohol, 19.4 mg/100 ml ascorbic acid, 13.3 mg/100 ml phenolics, and 72% DPPH (2,2-Diphenyl-1-picrylhydrazyl) scavenging activity, was selected.
- Roasted maize and roasted wheat malt, used for adjunct beer production, lent better mouthfeel, flavour and colloidal stability to beer. Roasted wheat malt as adjunct during sweet sorghum-Pilsner malt blend beer production was found to be the best as it provided a cost-effective and sustainable grist solution.
- Three indigenous yeast strains namely, *Saccharomyces cerevisiae* (GP4), *Saccharomyces cerevisiae* (11,815) and *Kluveromyces marxinus* (MH6), isolated from traditional fermented products of North-Western Himalayas were used for the production of fermented whey breads. The conditions optimized for fermented whey based bread production were: temperature (230°C), inoculum size (4g), first proofing of dough (2.5 hours), second proofing of dough (30 minutes) and baking time (25 minutes).

ESSENTIAL OILS FOR VECTOR AND PEST CONTROL

- Some essential oils, namely mint oil, garlic oil and tulsi oil proved effective in managing pulse beetle, *Callosobruchus chinensis*, in chickpea.
- Kinnow peel oil @ 70 ppm exhibited larvicidal effect on the fourth instar larvae of *Aedes aegypti*.
- Neem oil (300 ppm) and eucalyptus oil Nano

emulsion (70 ppm) demonstrated significant ovicidal and pupicidal activity in *Aedes aegypti*.

AGRO-FORESTRY

PHYTOREMEDIATION

- Evaluation of phyto-remediation potential of Eucalyptus clones irrigated with effluents from distillery unit led to identification of C-413 (maximum height) and PE-5 (largest diameter) clones.

CHARACTERIZATION OF EUCALYPTUS CLONES

- Eucalyptus clone C-316 was superior for diameter, wood biomass and carbon storage as evidenced from a study involving nine clones irrigated by effluents from wine factory.
- Eucalyptus clones C-413, C-407 and PE-11 were found promising for wood productivity. Profuse flowering was recorded on three clones i.e. PE-7, PE-8 and PE-9.
- Clone PE 11 has been found suitable for planting in salt-affected and waterlogged regions of the state. In such areas, eucalyptus should be planted on polythene-covered ridges for better survival (78% against 63% on bare ridges and 6% on flat surface). After four years, average girth and plant height on polythene-covered ridge were higher (22.3 cm and 9 m, respectively) than on uncovered ridge (20.6 cm and 8 m), and average volume index was also higher on polythene covered ridges (26.6 m³ /acre) than on uncovered ridges (18.2 m³ /acre).

NUTRIENT MANAGEMENT AND GROWTH REGULATION

- Eucalyptus exhibits iron deficiency by yellowing of younger leaves initially. It can be managed by foliar application of chelated iron (Fe EDTA) @ 50 g/plant in the first year, 100 g/plant in the second or third year and 200 g/plant in the fourth or fifth year.
- Salicylic acid (@ 300 ppm) significantly enhanced plant growth of different tree species such as *Moringa oleifera* (Suhanjana), *Toona ciliata* (Toon), *Dendrocalamus strictus* (Bans), *Terminalia bellirica* (Behera) and



Pongamia pinnata (Sukhchain).

BEEKEEPING

- During spring, 10-frame hives performed better than 7 and 8-frame hives in terms of brood rearing and bee population build-up.
- Studies on muskmelon (var. Punjab Sunheri) grown under polytunnel house revealed that fruit set did not take place in polyhouse without bees. Bee pollination resulted in mean fruit weight of 520 g, having 9.5 per cent TSS in comparison to 525 g and 9.7 per cent, respectively, in hand pollination.
- *Apis dorsata* had the highest foraging intensity followed by *Apis florea*. Intensity was higher in American cotton as compared to Desi cotton. Pesticide toxicity and residue
- The median lethal value (LD₅₀) of 50 thiamethoxam to *Apis mellifera* foragers -1 through contact exposure was 7.63 ng bee after 24 h of exposure while LD₅₀ (oral) was 50 -1 5.490 ng bee .
- The bee-foraged nectar samples collected a day after application contained -1 thiamethoxam residues (0.02±0.01 mg kg) which on third day became below limit of quantification (LOQ). Residues at the level of -1 0.01 and 0.02 mg kg in case of recommended and double dose of thiamethoxam were detected in honey samples collected after 30 days of foliar application in mustard.
- The daughter queen bees were reared from the hygienic colonies. Twenty daughter colonies so developed were found to possess hygienic behaviour. After 24h of pricking, mean brood removal was 92.7 per cent (range 80.0-95.0%) in the hygienic colonies and 67.9 per cent (ranged from 36-75%) in the non-hygienic colonies.

BEE DIVERSITY

- Studies on bee diversity identified 30 bee species which existed during different seasons in various agro-climatic regions of Punjab.
- Morphometric and molecular characterization of 30 bee species has been accomplished; eight new DNA sequences of bees have been

submitted to NCBI GenBank.

BEE VENOM COLLECTION

- Installation of indigenous bee venom collector for 60 minutes on 16 bee-frame *Apis mellifera* colonies resulted in the highest (28.44 mg/colony) bee venom collection. *A. mellifera* colonies exposed to bee venom collector for 60 minutes duration showed 14.5 percent more hygienic behavior.
- Feeding pollen along with sugar solution to *A. mellifera* colonies quadrupled bee venom collection over control colonies during monsoon season.

POLLEN SOURCE PREFERENCE

- *Brassica napus* had the highest honey production potential (33-42 kg/ha) followed by *B. juncea* (15-25 kg/ha) and *B. rapa* (12-16 kg/ha).

WAXMOTH MANAGEMENT

The neem seed kernel extract (7%) treatment of hive bottom board was the most effective for waxmoth management followed by Azadirachtin 10,000 ppm 1% and neem oil (7%).

LAC CULTURE

- The life cycle and productivity linked parameters of lac insects (Rangeeni strain) were studied on plants of *Flemingia semialata*, *Flemingia macrophylla* and *Zizyphus mauritiana* species. The Rangeeni strain completed all the life stages on these hosts. The duration of Katki crop varied from 105-110 days under Punjab conditions.

MUSHROOM CULTIVATION

- Cultivation technology of king oyster mushroom, *Pleurotus eryngii*, on wheat straw under Punjab conditions has been recommended.
- Among new strains, *Agaricus bisporus* strain AVT19-201 yielded the highest (20.86 kg/q compost) followed by AVT19-202 (18.50 kg/q compost) when grown on wheat straw based compost.
- Two wild mushrooms, *Pleurotus sapidus* and *P. floridanus*, identified through 18s

rRNA sequencing, have been collected from locations in Punjab and are being evaluated for edible purposes.

COMPOST MATERIAL

- Growth of *Agaricus bisporus* (using U3 as parental strain) was evaluated on wheat straw, paddy straw and sugarcane bagasse composts. Highest yield was obtained on wheat straw compost (18.2 kg/q compost) followed by paddy straw (17.0 kg/q compost) and sugarcane bagasse compost (13.2 kg/q compost).

BIOFORTIFICATION

- Nutritional quality of mushrooms depends on the nutritional status of the medium upon which they are grown. Nutritional and anti-oxidant potential of single and dual supplementation of Se and Zn was evaluated in four *Pleurotus* species (*P. florida*, *P. sajor caju*, *P. djamor* and *P. cornucopiae*). The Se/Zn supplementations in agar media had positive effect on radial growth with maximum radial growth observed at Se supplementation @ 4 mg L⁻¹ in *P. sajor caju*. *Pleurotus sajor caju* also had the highest biomass production and total soluble protein content of mycelium at 4 mg L⁻¹ of Se supplementation. The SEM micrographs showed that supplementation of broth with either Se or Zn or both increased hyphal diameter in *P. djamor* at 6 mg L⁻¹ Se, *P. sajor caju* at 4 mg L⁻¹ Se and in *P. florida* at 4 mg L⁻¹ Se-Zn. The results showed that biofortification of Se and Zn significantly improved the nutritional profile and anti-oxidant potential in *Pleurotus* spp. which could be used as a functional food with considerable health benefits and pharmaceutical applications.

APPARELS AND TEXTILES

- Protective gloves for okra pluckers : Protective full arm length gloves for plucking okra were prepared from knitted fabric. Double layer of fabric has been provided for palms and fingers. The technology will help reduce farm drudgery and obviate the potential injury-related disability of farm workers in performing other household/ farm chores.

- Control of mosquitoes with synthetic chemicals entails considerable environmental and health issues. Essential oils, on the other hand, are biodegradable and safe for human use. The microencapsulated fabric developed using eucalyptus oil (10%) was found effective in repelling mosquitoes. The technology will contribute towards management of diseases like malaria, dengue and chikungunya. The finished fabric can be used for developing clothings like shirts, socks, wristbands and handkerchiefs.
- The knitted fabrics were constructed from a blend of soybean and waste wool fibre. The weft knitted fabrics were found to be suitable for both apparel and upholstery applications like sweaters, cardigans, socks, T-shirts, cushion covers and table linens. The yarn with 50:50 blend ratio was found to be suitable for making blankets, khes, durries and carpets. The cost of the developed weft knitted fabric from blend ratio of 20:80 and 30:70 was Rs 286 and Rs 228 per meter, respectively.
- Paddy straw was used for fibre extraction and blending with cotton to develop yarn for blinds, wall hanging and durrie. The developed blended fabric had grams per square meter (GSM) of 957, with 7.5 mm thickness. Tearing strength of the developed fabric was 73 kgf in warp direction and 71 kgf in weft direction. Drapability of the fabric was 46.71 per cent.
- Functional finishes were developed using plant extracts. It was found that pomegranate can be effectively used for treating fabric against bacterial activity, whereas *Mousami* and *Ratanjot* can be effectively used for treating fabric against fungal activity.
- The dyeing conditions of cotton and wool fabrics were optimized using two natural dyes obtained from roots of *Ratanjot* (*Onosma echiooides*) and bark of Arjun (*Terminalia arjuna*) by using ultrasonic dyeing technique and four selected mordants including amla, babool, alum and tannic acid. Ultrasonic dyeing techniques led to a significant increase in colour strength and darkness of both cotton and wool fabric.



- Low cost woven and non-woven mats were developed using paddy straw which were effective as mulch in papaya crop.

SOLAR ENERGY

- A re-circulatory 'Agro-industrial Solar Dryer' has been developed. Average drying time (in case of bitter melon and fenugreek) of this dryer was cut down by 27.6 per cent in comparison to conventional open loop solar dryer and average moisture removal rate went up by 47 per cent. The payback period for solar dryer of loading capacity of 100 kg bitter melon is about 150 drying days and that for fenugreek is about 340 days.
- Solar dryer with evacuated tube collector for faster drying of 30-40 kg vegetables like fenugreek and turmeric has been developed. It can be used by small farmers for drying high value produce. Drying time was reduced by 72-82 per cent over open sun drying. The quality of dried product is better. In case of fenugreek, the technology helps retain its green colour (total chlorophyll content 2.21 mg/g in solar dryer versus 0.82 mg/g in sundried samples).

6.6.3.4. Research Publications

The agricultural research conducted in the different areas such as basic and applied fields has been published by the faculty in the journals of international and national repute. The list of research papers (NAAS rating 5 or more) during the period under report is given in Annexure III.

6.6.3.5. Innovation and Best Practices

PLANT MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Genome Sequencing and Transcriptomics

- Guava genome sequencing on various next generation sequencing platforms and its bioinformatics analysis using hybrid assembly approach has led to generation of guava genome assembly (submitted to NCBI).
- Annotation of guava genome identified 59,448 genes. PCR based SSR/InDel/SNP markers have been developed from guava genome.
- Re-Sequencing of 21 guava genotypes of

contrasting characters at ~25 x depth on HiSeq X10 to mine the genetic differences among cultivars and to actually generate SSR/InDel/KASP markers at whole genome level.

- Assembled and analysed the mitochondrial genome of 97A and 97B lines of onion.
- The de-novo reference transcriptome assembly of *Magnifera indica* cultivar dusheri was developed and functionally annotated.
- In rice comparative transcriptomic analysis between Xa38 infected with Xoo7 and Xa38 infected with Xoo10 showed 11 putative candidate genes.
- The comparative transcriptomic studies in CML 25 and LM 11 maize inbreds under heat stress at the reproductive stage from three tissues (leaf, pollen, and ovule) gave insights into tissue-specific stress-related genes involved in biological pathways like metabolic processes, secondary metabolite synthesis, starch, and sucrose metabolism, carbon metabolism, protein synthesis, etc. Most DEGs were transcription factors, heat shock proteins, antioxidants, hormone biosynthesis, and polyamine biosynthesis-related genes. Seven DEGs were common in leaf, pollen, and ovule; and involved in the polyamines biosynthesis pathway that could be further explored in understanding heat tolerance mechanism.
- Different effectors have been identified from *Xanthomonas oryzae* pv. *oryzae* pathotypes genome to decipher their role in race-specific pathogenicity.
- Also, stripe rust pathotypes of wheat have been sequenced to understand the resistance and avirulence gene interactions.

WHEAT GENOMICS AND MOLECULAR BREEDING

- Wide-hybridization programme in wheat is strengthened by identification and mobilization of new genes for biotic and abiotic stresses into elite cultivars.
- *T. dicoccoides* derived backcross introgression lines have been developed after transfer of higher grain size and weight, stripe rust resistance, leaf rust resistance.

- Mapped *Aegilops triuncialis* derived leaf rust and powdery mildew resistance on chromosome 5A and *T. dicoccoides* derived leaf rust and stripe rust resistance on chromosome 7A and 3A.
- Marker trait association identified for terminal heat stress tolerance transferred from two important wild germplasm species of *Ae. tauschii* and *Ae. speltoides*.
- Early heat stress tolerance identified in *Ae. tauschii* derived synthetics. HSF responsible for heat stress tolerance at seedling stage have been identified in *Ae. speltoides*.
- Wheat varieties viz. PBW 752, PBW 757, PBW 771, Unnat PBW 550, PBW Chapati 1, PBW RS-1 (low glycemic index), PBW 833 (for late sown irrigated conditions) and PBW Zn 2 (high grain Zn, Fe and protein content) have been developed by introgressing different quality traits and rust resistance through marker assisted selection.

RICE GENOMICS AND MOLECULAR BREEDING

- At PAU, an active collection of 1100 accessions of wild species of rice comprising of diploid genomes (AA, BB, CC, EE, FF, and HH) were being maintained and utilized for improving the elite rice cultivars for numerous traits.
- A number of genes/ QTLs have been mapped and transferred to the elite cultivars for bacterial blight, blast, sheath blight resistance, nematode, and brown plant hopper resistance from wild *Oryza* species at School of Agricultural Biotechnology.
- From the wild species *Oryza nivara* and *Oryza glaberrima* two genes, Xa38 and xa45 for bacterial blight resistance have been designated. By utilizing these genes, an elite cultivar PR 127 has been developed and released for general cultivation in the Punjab state.
- Introgression lines of *O. glumaepatula* and *O. glaberrima* have been utilized for providing durable blast resistance.
- Several introgression of *O. nivara* and *O. rufipogon* have been characterized with higher yield potential.
- The Brown Plant Hopper (BPH) resistance gene BPH 34 has been identified from *O. nivara* and is registered with NBPGR.
- Three putative genes (LOC_Os04g35180, LOC_Os04g35190, LOC_Os04g35210) are being cloned for characterization of Bph34 resistance gene in rice.
- The QTLs/ genes for sheath blight resistance and nematode resistance were also identified from *O. nivara*, *O. rufipogon* and *O. glaberrima*.
- Pyramiding of Bph33 and Bph34 genes providing resistance to brown plant hopper in Basmati and non-Basmati cultivars is under progress.
- A major QTL from *O. glaberrima* on chromosome 6 has been fine mapped for rice root-knot nematode resistance
- Further, we also utilize wild species of rice for getting superior alleles for phosphorus



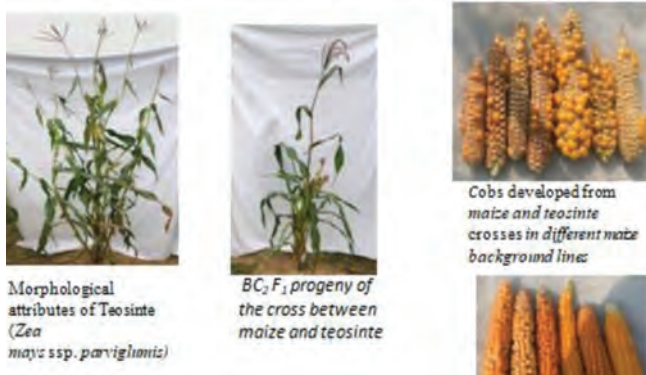
tolerance, quality and yield contributing traits. We successfully obtained better alleles for rice bran oil (PLD locus), Grain number (GN1) and Phosphorus Tolerance gene (PSTOL1) and CEN-H3 variants for induction of haploidy.

- Identified donors and genomic regions associated with traits improving germination of rice from deep sowing depth under direct-seeded rice (DSR). Genomics-assisted derived breeding lines have been identified with improved yield and adaptability under DSR.

MAIZE GENOMICS ASSISTED BREEDING

- Twelve promising BC₂F₃ southern leaf blight resistant pyramided lines carrying two QTLs (qSLB3.1 and qSLB8.2) were identified for further use in maize breeding.
- Water-use efficient lines in the background of LM23 and LM24 were developed by introgressing drought-tolerant QTL, qKNPE9.1 which are being evaluated by the maize breeders.

Wild relative teosinte (46 accessions) being used for identification and introgression of novel genetic variation



- Promising water-logging tolerant lines were identified and are being utilized for pyramiding QTLs into the elite backgrounds. Twenty-three favorable maize haplotypes for high alpha-tocopherol content were identified. CIMMYT maize panel has been evaluated for shoot fly and BLSB resistance. Identified promising lines are being used in maize crossing program. Different Teosinte accessions procured from NBPGR and GB Pant Nagar University are being screened against *Chilo partellus*, Fall army worm and Banded leaf and sheath blight.

BRASSICA GENOMICS ASSISTED BREEDING:

- The de-novo genome assembly of wild brassica species *Diplotaxis erucoides* has been developed utilizing next-generation genome sequencing (Pac- Bio, Hi-C) technologies.
- Generated wide hybrids and amphiploids between wild crucifers (*D. erucoides*, *S. arvensis*) and Brassicas for *Alternaria* blight resistance.
- Marker assisted derivatives for canola quality are being tested in the state as well as coordinated trials. Identified genes for APase activity and root system architecture in *B. juncea* under varying levels of phosphorus through GWAS and transcriptomics.
- First time developed and validated gene based markers for aphid resistance in Indian mustard. These are being used to transfer aphid resistance in agronomical superior varieties and parents of released hybrids of Indian mustard.
- Developed high oleic acid (60-65%) mustard genotypes in contrast to 40-45 per cent for the first time.
- Developed and validated gene based markers for selection of high oleic acid. These are being used to transfer this desirable trait in agronomical superior genotypes.

MOLECULAR INTERVENTIONS IN PULSES

- A resistance gene for mungbean yellow mosaic India virus qMYMIV6.1 has been mapped on chromosome 6 of urdbean using QTLSeq.
- Mapping of *Ascochyta* blight disease resistant gene(s)/QTLs from exotic *Cicer arietinum* L. germplasm in cultivated kabuli chickpea is in progress.
- Mapping of *botrytis* gray mold in chickpea is under way.
- Stem blight resistance and pod borer resistance from wild species and short stature and earliness are being mapped using SNP markers.

GENOMICS ASSISTED BREEDING IN MAJOR FRUIT CROPS

- Phytophthora tolerant rootstock hybrids are being developed and tolerance is being mapped in an intergeneric F1 population using SNP markers.
- Two intergeneric populations consisting of 230 intergeneric hybrids have been developed for mapping resistance genes for citrus greening.
- Cloning and characterization of Flowering Locus T (FT) gene from *Citrus reticulata* L. has been completed and will be utilized for induction of early flowering in citrus.
- Identification of flowering time control genes in mango to understand alternate bearing is in progress.
- Guava germplasm has been evaluated for traits of commercial importance and these traits are being mapped in different populations.
- Genetic mapping of purple locus in guava controlling anthocyanin accumulation for marker assisted breeding has also been initiated.

VEGETABLE MOLECULAR BREEDING

- Male sterility gene ms-1 was fine-mapped on chromosome 6 in muskmelon and is being used for developing hybrids.
- Fusarium wilt disease resistance gene has been mapped on chromosome 5 of muskmelon.

- Mapping of genes for Jassid and yellow vein mosaic disease resistance in okra is going on.
- Identification of genes involved in parthenocarpy and their expression analysis provided potential candidate genes for parthenocarpy in cucumber.
- Marker-assisted breeding is routinely followed for incorporation of male sterility gene in elite lines of onion and chilli.

GENOME EDITING & GENETIC ENGINEERING

- CRISPR/Cas9-mediated genome editing is being undertaken for different traits in wheat, rice, tomato, soybean, maize, sugarcane and potato.
- Transgenic sugarcane has been developed by expressing endochitinase gene cloned from *Trichoderma*.
- Agrobacterium-mediated genetic transformation of upland cotton var. PAU Bt3 with pFGC1008-VG construct has been attempted which resulted in 29 RNAi cotton plants confirmed through genomic DNA-PCR using RNAi cassette specific primers.
- A new floral drop genetic transformation in two years old guava cv. Allahabad safeda plants with marker-free RNAi construct (pFGC1008-BdECR) has resulted in seven RNAi guava plants confirmed through genomic DNA-PCR using RNAi cassette specific primers.
- The following table summarizes different genome editing projects being undertaken at PAU, Ludhiana (Table 3.12).

Table 3.12 List of crops and trait-specific genes being targeted through genome editing and genetic engineering

Sr. No.	Crop	Trait targeted	Approach
1	Tomato	Shelf life, oxalate content	Genome Editing
2	Soybean	Beany Flavour	Genome Editing
3	Rice	Bran oil, Haploid induction, herbicide tolerance	Genome Editing
4	Wheat	Resistant starch, tillering, Herbicide tolerance	Genome Editing
5	Maize	Haploid induction, Leaf and Sheath Blight resistance	Genome Editing
6	Sugarcane	Low lignin	Genome Editing
7	Potato	Resistant starch, Acrylamide content	Genome Editing
8	Guava	Fruit Fly resistance	RNAi
9	Cotton	White fly resistance & coloured fiber	RNAi & Transgenics
10	Pigeonpea	Pod borer resistance	Transgenics



6.6.3.6. IPR CELL / ITMU

The university has a technology marketing and IPR Cell with the responsibilities of filing of the IPR issues i.e. Patents, Copyrights, PPV & FRA. This cell also helps in commercialization of the technologies developed by various department of the university. MoA and MoU signing with different firms / companies is also the function of this cell. The list of Patents filed and granted during last 5 years are enlisted in Table 3.13 and 3.14.

Table 3.13 Patents granted during 2018-19 to 2022-23

Sr. No.	Application No.	Invention	Department	Status
1	1752/DEL/2006	A process for dyeing textiles using plant sources <i>Polygonum bistortata</i> and <i>Cyprus rotundus</i>	Department of Clothing and Textiles	Patent granted on 06/09/2018 & number 300816
2	1344/DEL/2009	An improved greenhouse type solar dryer	School of Energy Studies for Agriculture	Patent granted on 14/08/2019 & number 318167
3	1411/DEL/2009	Technology development for production of non-alcoholic naturally carbonated beverage from fruit juice	Department of Microbiology	Patent granted on 16/01/2019 and number 305767
4	2319/DEL/2009	Pressurized All-Glass Evacuated Tube Solar Water Heater	School of Energy Studies for Agriculture	Patent granted on 22/10/2019 and number 323425
5	3796/DEL/2011	Method for water testing and water testing kit	Department of Microbiology	Patent granted on 13/06/2022 and number 399015
6	2093/DEL/2013	Zinc in clay-mineral receptacles in nano-forms for their use as advance materials including novel fertilizer	Department of Soil Science and EMN Laboratory	Patent granted on 26/12/2020 and number 354498
7	218/DEL/2014	Heel pushed dual foot operated sugarcane bud chipping apparatus	FASS, Kapurthala	Patent granted on 23/05/2022 and number 397361
8	959/DEL/2014	Nanofabrication process involving clay minerals as receptacles for manufacturing advance nanomaterials including novel fertilizer (process)	Electron Microscopy and Nanoscience Laboratory	Patent granted on 21/07/2021 and number 372346
9	989/DEL/2014	Nanofabrication of phosphorous on kaolin mineral receptacles	Electron Microscopy and Nanoscience Laboratory	Patent granted on 24/07/2019 and number 316692
10	1042/DEL/2014	Benefication of phosphate rock for the segregation of phosphorus containing heavy metal free minerals	Electron Microscopy and Nanoscience Laboratory	Patent granted on 19/09/2018 and number 301187
11	710/DEL/2015	A mutant yeast strain for producing low alcoholic debittered beverage	Department of Microbiology	Patent granted on 16/02/2023 and number 421977
12	768/DEL/2015	Flour composition of gluten free food grain	Department of Food Science and Technology	Patent granted on 10/02/2023 and number 421209
13	914/DEL/2015	A gluten free whole grain flour composition and food product	Department of Food Science and Technology	Patent granted on 30/06/2023 and number 436517

14	984/DEL/2015	Fermentation process for enhanced glucose production from sweet sorghum bagasse using acidothermophilic fungal cellulases	Department of Microbiology	Patent granted on 1/09/2021 and patent number 376260
15	1514/DEL/2015	A fungal consortium for degradation of lignin and or silica, process therefore and application thereof	Department of Microbiology	Patent granted on 20/04/2023 and number 429474
16	1567/DEL/2015	Improved water and nutrient perforation and re-circulation system for pot based substrate hydroponics	Department of Mechanical Engineering	Patent granted on 28/10/2022 and number 410204
17	201711007856	Electronic Soil Disinfectant	Department of Plant Pathology	Patent granted on 18/02/2021 and number 358781
18	201711032209	Bacteriological food testing kit (BFTK) for rapid and efficient detection of presence/absence of recurrent indicator and emerging pathogens in food sample	Department of Microbiology	Patent granted on 24/08/2023 and number 446897
19	201811039891	Molasses Based Microbial Fertilizer And Method Thereof	Department of Microbiology	Patent granted on 01/03/2023 and number 423627
20	201811039891	Molasses Based Microbial Fertilizer And Method Thereof	Department of Microbiology	Patent granted on 01/03/2023 and number 423627

Table 3.14 Applications filed under Indian Patent Act, 1970

Sr. No.	Application No.	Invention	Department	Status
1	201811037830	Biomass Incorporator	Department of Farm Machinery and Power Engineering	Application in amended examination
2	201811046415	Conveyer belt type mechanical feeding system for axial flow (paddy thresher)	Department of Farm Machinery and Power Engineering and Department of Renewable Energy Engineering	Application in amended examination
3	201911040489	Magnetic field assisted freezing process for horticultural produce	Department of Processing and Food Engineering	Awaiting for examination
4	201911040938	A Process For Bioethanol Production From Industrial Graded Wheat Grains Using An Alpha Amylase	Department of Microbiology	IN ORDER FOR GRANT UNDER SECTION 43,AWAITING NBA APPROVAL
5	201911051580	Ready to use zinc phosphide bait for rodent management and method of preparation thereof	Department of Zoology & Orion Organic Pvt. Ltd.	Application in ammended examination
6	202011013203	Mobile Thermoelectric Refrigeration System	Department of Processing and Food Engineering	Awaiting for request of examinaton
7	202011018197	Tractor-operated Seeder For Mat Type Paddy Nursery	Department of Farm Machinery and Power Engineering	Awaiting for request of examination



8	202011023656	Process for preparing Red Bell Pepper Kulcha and Product Thereof	Department of Food Science and Technology	Awaiting request for examination
9	202111017325	Fermentative bioprocess for kojic acid production from kinnow waste	Department of Microbiology	Complete specification filed
10	202111019252	An autonomous system for 2-wheel paddy transplanter	Department of Farm Machinery & Power Engineering	Complete specification filed
11	202211004923	Sensor based optimal rate controller for foliar spray of nitrogenous fertilizer	Department of Farm Machinery & Power Engineering	Complete specification filed
12	202211023114	Lacto-fermented functional metabiotic turmeric beverage and salad dressing from fermented powder	Department of Microbiology	Complete specification filed
13	202211038982	Liquid fertilizer injector	Department of Farm Machinery & Power Engineering	Provisional specification filed
14	202211069184	Straw size reduction machine	Department of Farm Machinery & Power Engineering	Complete specification filed
15	202311006571	Liquid endophytic bacterial inoculant of <i>Bacillus thauhiensis</i> PAU_43RN for enhancing the yield of cotton	Department of Microbiology (School of Organic Farming)	Complete specification filed
16	202311028033	A process for modifying whey for preparing leavened food products	Department of Microbiology	Complete specification filed
17	202311031339	A one pot synthesis method for preparation of xanthine derivatives	Department of Chemistry	Complete specification filed
18	202311031340	A one pot synthesis method for preparation of xanthine derivatives	Department of Chemistry	Complete specification filed
19	202311049990	A polymeric antimicrobial nano-composite and method of making thereof	Department of Microbiology	Complete specification filed

TECHNOLOGIES DEVELOPED AND COMMERCIALIZED

PAU has developed and recommended several technologies which have been well received by the farmers and industrialists. The list of the technologies / varieties commercialized by PAU is enlisted in Table 3.15.

Table 3.15 List of technologies/varieties commercialized by PAU 2018-2023

Sr. No.	Name of the Technology	No.
Department of Apparel and Textile Science		
1.	Mosquito Repellent Cotton Fabric Technology	1
Department of Food and Nutrition		
2.	Beetroot Powder as a Natural Colorant Technology	1
3.	Vitamin D enriched mushroom powder technology	2

Department of Farm Machinery and Power Engineering		
4.	Lucky Seed Drill Technology	2
5.	PAU Cutter-cum-Spreader	1
6.	PAU Super SMS	10
7.	Mat type nursery seeder	1
8.	PAU Smart Seeder	16
Department of Food Science and Technology		
9.	Bottling of Sugarcane Juice Technology	18
10.	Gluten Free Atta	1
11.	Multigrain Atta	2
12.	Maize Flour for Rollable Chapati	1
13.	Potato parantha/samosa mix from different varieties of potato	1
14.	Frozen Potato and Frozen Vegetables Technology	1
15.	Making and Packaging of Saag Technology	1
16.	Canning technology of mushroom	1
Department of Microbiology		
17.	Apple Cider (Vinegar)	2
18.	Brewed vinegar production from sugarcane and fruits	2
19.	Brewed Fruit Vinegar Technology	3
20.	Fruit vinegar	1
21.	Fermentation of Fruits and Vegetables with Lactic Acid Starter Culture Technology	1
22.	PAU Lacto-Fermented Functional Beverages and Pickles Technology for Turmeric and Indian Gooseberry	2
Department of Plant Breeding and Genetics		
23.	PAU BT-1 cotton seeds	1
24.	Maize Hybrid PMH 13	1
25.	Mustard hybrid PHR 126	1
26.	Maize Hybrid PMH 14	1
Department of Plant Pathology		
27.	Electric Soil Disinfector	1
Department of Renewable Energy Engineering		
28.	Advanced Domestic Solar Dryer Technology	2
29.	Evacuated Tube Collector Solar Dryer Technology.	2
30.	Agro-industrial Solar Dryer Technology	2
31.	Paddy Straw Based Biogas Plant made up of Mild Steel Sheet (Above the Ground)	10
32.	Modified PAU fixed Dome Type Janta Model Biogas Plant having capacity from 25 m ³ /day to 500 m ³ /day.	17
33.	PAU fixed Dome Type Family size Biogas Plant having capacity from 1 m ³ /day to 25 m ³ /day.	7
Department of Soil and Water Engineering		
34.	Rooftop Vegetable Nutrition Garden Model using Soilless Media Technology	8
Department of Vegetable Science		
35.	CH 27 (Chilli hybrid)	14
36.	Brinjal Hybrid PBH-4	1
37.	Pumpkin hybrid PPH-1	2
38.	PRO 7 (Onion Variety)	3
39.	Punjab Nawab Punmpkin Variety	2



40.	PBH 4	2
41.	PSM-1 (Bell pepper)	1
42.	Punjab Kheera 1	2
43.	Punjab Karela 15	1
44.	PC 161 (Carrot variety)	2
45.	CH-52 (Chilli hybrid)	2
46.	Tomato-TH-1	1
47.	Tomato-PTH-2	1
	Total	158

MEETINGS CONDUCTED BY TM & IPR CELL OF PUNJAB AGRICULTURAL UNIVERISTY

The details of meeting conducted (Table 3.16) by Technology Marketing and Intellectual Property Right Cell (TM & IPR) are as below :

Table 3.16 List of meetings held at TM & IPR Cell of Punjab Agricultural University, Ludhiana in the last 5 years.

Sr.No	Date	Major Recommendations
1.	02.08.2018	Evaluation of the technology for filing patent.
2.	14.08.2018	Commercialization of PAU Super SMS.
3.	16.08.2018	Commercialization of PAU Cutter-Cum Spreader Technology.
4.	30.08.2018	Evaluation of the Software for filing Copyright.
5.	06.09.2018	Commercialization of Maize Hybrid PMH-5.
6.	18.09.2018	Evaluation of the technology for filing the patent.
7.	25.10.2018	MoU between Welcome Crop Science Pvt Ltd & PAU, LDH for seed production of Chilli Hybrid CH-27.
8.	29.11.2018	Commercialization of Brewed Fruit Vinegar.
9.	17.12.2018	Commercialization of Brinjal Hybrid PBH-4.
10.	04.02.2019	Evaluation of the technology for filing the patent.
11.	18.02.2019	Evaluation of the Evacuated tube Collector Solar Dryer Technology for Commercialization.
12.	07.03.2019	Commercialization of Sugarcane juice bottling technology.
13.	10.04.2019	Commercialization of Evacuated Tube Collector Solar Dryer Technology.
14.	23.05.2019	Evaluation of Punjab Karela 15 (Bitter Gourd Variety) for Commercialization.
15.	31.05.2019	MoU between VNR Seeds Pvt Ltd & PAU, LDH for Punjab Karela 15.
16.	19.07.2019	Commercialization of Punjab Nawab (Pumpkin Variety).
17.	12.08.2019	Evaluation of Ready to Serve Sarson-ka-Saag Canning Technology for Commercialization.
18.	16.09.2019	Commercialization of Rooftop Vegetable Nutrition Garden Model using Soilless Media Technology
19.	03.10.2019	Commercialization of Chilli Hybrid CH-27.
20.	06.01.2020	Evaluation of the technology for filing the patent.
21.	19.02.2020	Evaluation of the technology for filing the patent.
22.	16.06.2020	Commercialization of PAU Lacto-Fermented Functional Beverages and Pickles Technology for Turmeric and Indian Gooseberry
23.	05.08.2020	Commercialization of Carrot variety PC 161
24.	03.09.2020	Commercialization of Mosquito Repellent Cotton Fabric Technology.
25.	07.09.2020	MoU between Tiwana Bee Farm & PAU, LDH for Making and Packaging of Saag Technology.
26.	30.09.2020	Commercialization of Beetroot Powder as a Natural Colorant Technology

27.	11.02.2021	MoU between National Horticultural Research and Development Foundation & PAU, LDH for Chilli Hybrid CH-27, Brinjal Hybrid PBH-3, Pumpkin Hybrid PPH-1, Muskmelon Hybrid MH-27, Onion Hybrid POH-1 and Variety PRO-7
28.	05.03.2021	Evaluation of the technology for filing the patent.
29.	24.03.2021	Commercialization of Modified PAU fixed Dome Type Janta Model Biogas Plant having capacity from 25 m ³ /day to 500 m ³ /day.
30.	30.03.2021	Commercialization of Seeds of parental lines of chilli hybrid CH-52
31.	22.07.2021	Commercialization of Maize Hybrid PMH 13.
32.	28.07.2021	Commercialization of Vitamin D enriched mushroom powder technology.
33.	26.08.2021	Evaluation of the technology for filing the patent.
34.	10.09.2021	Commercialization of Mustard hybrid PHR 126.
35.	21.09.2021	Commercialization of PAU fixed Dome type family size biogas plant having capacity from 1m ³ /day to 25 m ³ /day
36.	28.09.2021	Evaluation of the technology for filing the patent.
37.	12.01.2022	Commercialization of Mat type nursery seeder.
38.	19.04.2022	Evaluation of the Software for filing Copyright.
39.	25.04.2022	Commercialization of PAU Smart Seeder Technology.
40.	09.06.2022	Evaluation of the technology for filing the patent.
41.	16.08.2022	Commercialization of Electric Soil Disinfector.
42.	29.08.2022	Evaluation of the technology for filing the patent.
43.	15.09.2022	Evaluation of the copyright.
44.	30.09.2022	MoU between Kissan Enterprises & PAU, LDH for Gluten Free Atta
45.	17.10.2022	Evaluation of the technology for filing the patent.
46.	20.12.2022	Evaluation of the technology for filing the patent.
47.	13.02.2023	Evaluation of the technology for filing the patent.
48.	22.02.2023	Commercialization of Maize Hybrid PMH 14
49.	24.02.2023	Commercialization of Evacuated tube collector solar dryer employing conventional evacuated tubes.
50.	03.04.2023	Evaluation of the technology for filing the patent.
51.	10.05.2023	Commercialization of Apple Cider (Vinegar)
52.	25.05.2023	Evaluation of the copyright.
53.	25.05.2023	Commercialization of Potato parantha/samosa mix from different varieties of potato

6.6.3.7. CENTRAL INSTRUMENTATION UNIT

The University does not have a single Central Instrumentation Unit but several central facilities which cater to various research, analytical and other necessities of the graduate students and the faculty members. These facilities are as follows:-

1. NABL accredited pesticide residue laboratory

The NABL accredited pesticide residue analysis laboratory functions as the 'Referral Lab' for agrochemicals residue analyses at the national level. This laboratory was established in 1968 under the guidance of Dr H.R. Krueger from

Ohio State University, USA. It is equipped with latest sophisticated instruments like Gas Liquid Chromatographs (GLC), Gas Chromatograph-Mass Spectrometry (GC-MS), High Performance Liquid Chromatograph (HPLC), Liquid Chromatograph-Mass Spectrometry (LCMS/MS), Solid Phase Extraction (SPE), High Performance Thin Layer Chromatograph (HPTLC), and other accessory equipments required for preparation and processing of the samples for the analysis. The laboratory has contributed for the development and validation of simple, cost effective and reliable methodology for the estimation of pesticide residues in different commodities.



2. Food analytical laboratory

This laboratory caters to analysis of various types of raw and processed food samples with the use of several analytical equipment, including the Fibre tech, Water activity meter, Spectrophotometer, Salt Analyzer, Rapid Visco Analyzer, Differential Scanning Calorimeter, Gas Analyzer, Moisture Analyzer and Instant Analyzer. Another central facility, Food Industry Business Incubation Centre (FIBIC) was established in the year 2015. The main objective of FIBIC is to develop and upscale technologies for processing and value addition of agricultural produce, provided hands on training, incubational facilities and development of entrepreneurship skills so as to minimize postharvest losses and to manage the glut of perishable crops. This central facility has specialized types of equipment such as forced convection oven, oven stream series, burst strength analyser which are required for performing different food analysis.

3. Irradiation laboratory

The laboratory houses a Gamma Chamber (model GC 2000) established in the year 2009 which has been operational to carry out radiation breeding research for various crop plants in different departments of the university

4. Plant tissue culture and genetic transformation facility

The plant tissue culture and genetic transformation facility hosts students from various departments of the University for their post-graduate research. The facility supports research on various aspects of plant tissue culture on vegetable, horticultural, field, forest and floricultural crops. In addition, the gene transfer facility is used for incorporating biotic and abiotic stress related genes in crop plants.

5. Bioinformatics Unit

Another central facility has also been developed in School of Agricultural Biotechnology. Bioinformatics Unit hosts a sub-DIC centre funded by DBT to support

bioinformatics infra-structure and facilities. This centre is offering bioinformatics courses and training to the students and faculty. This facility is equipped with 22 computers for teaching and practical classes. Centre also hosts one 40 node high performance computing system for cutting edge research in the field of agricultural genomics. Sub-DIC was the part of International Wheat Genome Sequencing Consortium and has contributed towards generation of genetic and physical map of wheat chromosome 2A. Centre provides support in research for whole genome and transcriptome assembly and annotation projects within the University belonging to crops like wheat, rice, maize, pathogens, guava, mango, pulses, etc.

6. Natural Resource Management Laboratory

The Natural Resource Management Laboratory was established in the year 2003 as a central facility for the analysis of soils, plants, manures, water, etc. The laboratory is equipped with sophisticated analytical instruments including Inductively Coupled Argon Plasma-Atomic Emission Spectrophotometer (ICP-AES) model iCAP 6300, Inductively Coupled Plasma -Mass Spectrophotometer (ICP-MS) Agilent make 7700 series ICP-MS system, Atomic Absorption Spectrophotometer (AAS) model Avanta, Gas Chromatograph (GC), CHN Analyser and an Ion Chromatograph. These instruments have been utilized for analysis of soil, plant, water and other biological samples for research purposes and for testing on payment basis.

7. Electron Microscopy and Nanoscience Laboratory

This laboratory was established in the year 2006 out of one-time special grant of Rupees 3.5 crores by the Indian Council of Agricultural Research, New Delhi. It caters to the electron imaging and spectroscopy needs of the students of various departments of the University and other institutes across India. The laboratory houses Scanning Electron Microscope model s3400-N, Transmission Electron Microscope model H - 7650, Fluorescence microscope model DM-5000B,

Fourier Transform Infra Red Spectroscopy model thermo 6700, Atomic Force Microscope di-CP-II, Ion sputter coater and bench top evaporator facilities for analysis of material, biological and other samples.

8. Central Instrumentation Lab

College of Basic Sciences has one Central Instrumentation laboratory. The lab is equipped with UV-VIS Spectrophotometer attached with computer from Shimadzu Corporation. Water Alliance Series Column Heater and Column Heater/ Cooler from Waters Corporation, USA. In addition to these major instruments cell is also equipped with five BODs, metabolic shaker, rotary vacuum evaporator, leaf area meter, digital melting point apparatus, centrifuge, cooling centrifuge, sonicator and many more commonly used instruments.

9. Molecular Biology Laboratory

State of art Molecular Biology laboratory was established in the College of Basic Sciences and Humanities. The lab is equipped with HPLC, atomic absorption spectrophotometer, Beta scintillation counter, PCR, gel doc system, 2D electrophoresis with series of vertical and horizontal electrophoresis, refrigerated centrifuges, laminar flow, bio-photometer and deep freezers for studying biological processes, DNA amplification, characterization of the molecular markers and cloning full length genes responsible for providing various abiotic and biotic stresses, resistance to heavy metal toxicity in plants and understanding the basic metabolic regulation

and anti-nutritional factors at molecular and biochemical levels.

6.6.3.8. Global Support

Different initiatives serve to impart global support to the faculty and students:

- The University has MoU with many Agricultural Universities/ Institutes abroad as listed elsewhere. An adjunct faculty member provides coordination support in these matters.
- The alumni of the university are spread around the globe and coordinate with PAU through our Alumni cell in forging ties with top Agricultural Universities and Institutes of the world. A faculty member is designated for coordinating corporate and international affairs.
- PAU maintains a corpus fund for sponsoring faculty trainings of three months to one year in advance laboratories abroad. The details of the faculty members trained abroad under this initiative are given in Annexure V (a)
- PAU has a provision for taking Co-major advisors from faculty of advanced universities/ institutes abroad on advisory committee of the postgraduate students.
- PAU has a system of sabbatical leave (one year, with pay) for focussed academic work in advanced institutes.
- International projects serve as platform for further collaborations.

6.6.4. Extension Support

6.6.4.1. Extension Council:

As per the requirement of Model Act of ICAR, the Extension Council was constituted on 28.11.2011 by an amendment of Statutes in the meeting of Board of Management (BOM), for finalizing all the matters concerning extension. The Extension Council meeting is held twice a year.

Present composition of the Extension Council:

- Chairperson - Vice-Chancellor
- Member Secretary - Director of Extension Education

Members:

- Directors of Agriculture/Horticulture/Animal Husbandry/Fisheries and Chief Conservator of Soils, Punjab, Principal Conservator of Forests, Punjab (depending upon mandate and programmes of the University) of the Government.
- Director of Research
- All Deans
- All Additional Directors
- Associate Directors of KVK
- Two eminent persons in the Field of Extension Education
- Two progressive farmers

- Two co-opted members from related organizations
- Registrar and Comptroller as non-member invitees

Functions of the Extension Council

The Extension Council shall consider and make recommendations in respect of:

- Extension Education Programmes and Projects of the University.
- Coordination of Extension Education Activities.
- Development of Farmers' Education, Training and Advisory Services.
- Monitoring and evaluation of the Extension Education Programmes and Projects of the University.
- Any other matter referred to it by the Vice-Chancellor, Board or any other authority of the University.

Extension Council Meetings

Eleven Extension Council meetings (Table 4.1) were organised during the period.

6.6.4.2. Directorate of Extension Education

The mandate of Directorate of Extension Education is:

- Planning, organization and coordination of trainings for farmers, farm-women,

- entrepreneurs and extension workers
- Dissemination of latest research findings among farmers/farm women/entrepreneurs and extension personnels
- Feedback to the Directorate of Research

Table 4.1 Details of Extension Council meetings held in the last five years

S. No.	Extension Council meeting	Date of Meeting
1.	12 th	05.11.2018
2.	13 th	18.06.2019
3.	14 th	21.11.2019
4.	15 th	27.02.2020
5.	16 th	23.09.2020
6.	17 th	28.04.2021
7.	18 th	26.10.2021
8.	19 th	17.04.2022
9.	20 th	21.11.2022
10.	21 st	19.05.2023

Directorate of Extension Education has the following establishment:

- Director of Extension Education
- Additional Directors of Extension Education (2)

- Additional Director of Communication
- Associate Director (Skill Development)
- Farm Advisory Service Centres (FASCs)
- Krishi Vigyan Kendras (KVKs)
- Subject Matter Specialists of different departments
- Agriculture Technology Information Centre (ATIC)
- Skill Development Centre (SDC)
- Kairon Kisan Ghar
- Communication Centre

Staff Pattern

- i) **District Extension Systems:** Under Directorate of Extension Education, scientists working in different departments (Fig 4.1) are involved in the extension education activities of the University. KVKs have a strength of 126 scientists who are involved in imparting training to farmers, farm women and in-service extension personnel on various activities of agriculture and allied fields in 18 districts. Staff position of KVKs is given in Table 4.2. There is a unique system of Farm Advisory Service Centre in 15 districts of the

Table 4.2 Detail of Staff position in the KVKs of PAU.

Name of KVK	Programme Co-ordinator	Faculty	Ministerial Staff	Technical/Driver	Supporting Staff/Beldar
Amritsar	1	5	2	4	2
Bathinda	1	6	2	4	1
Faridkot	1	6	1	3	1
Fatehgarh Sahib	1	6	2	5	1
Ferozepur	Vacant	3	1	5	1
Gurdaspur	1	6	2	4	1
Hoshiarpur	1	4	1	4	1
Jalandhar	1	5	2	4	1
Kapurthala	1	5	2	5	1
Ludhiana	Vacant	5	2	4	1
Mansa	Vacant	5	2	2	1
Moga	1	5	2	4	1
Muktsar	1	4	1	5	1
Patiala	-	6	2	4	1
Pathankot	1	6	1	2	Vacant
Ropar	1	4	2	5	1
Sangrur	1	4	2	2	Vacant
SBS Nagar	Vacant	6	2	5	1

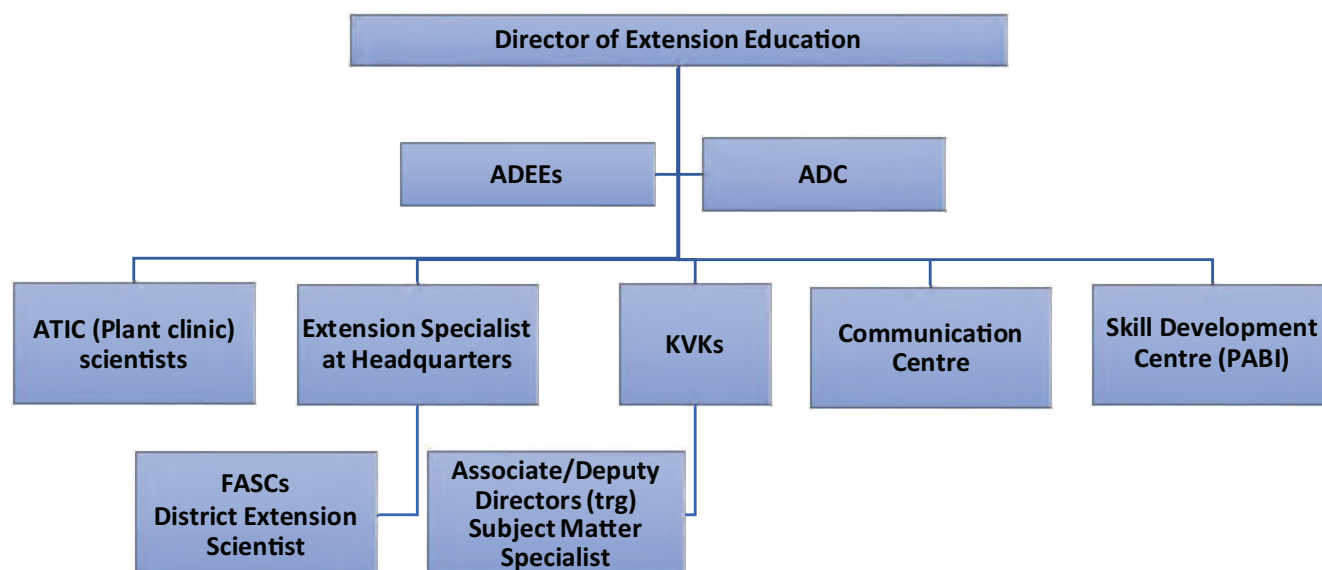
Table 4.3 Detail of Staff position in the FASCs of PAU.

Name of FASCs	Scientist	Ministerial Staff	Technical/Driver	Supporting Staff/ Beldar/ Messenger
Amritsar	2	1	1	1
Barnala	2	1	Vacant	Vacant
Bathinda	3	Vacant	Vacant	1
Faridkot	1	1	1 (Working at RHSF)	1
Fazilka	1	Vacant	Vacant	Vacant
Ferozepur	1	Vacant	Vacant	Vacant
Gurdaspur	1	Vacant	1	Vacant
Hoshiarpur	2	Vacant	Vacant	Vacant
Jalandhar	1	Vacant	Vacant	Vacant
Kapurthala	1	Vacant	Vacant	1
Patiala	2	1	Vacant	1 (working at KVK Ropar)
Ropar	2	1	Vacant	1
Sangrur	1	Vacant	Vacant	1
SAS Nagar	1	Vacant	Vacant	1
TarnTaran	3	Vacant	Vacant	Vacant

state in which 24 scientists are working (Table 4.3). The main mandate of these scientists is conducting of adaptive research trial at farmers' fields and providing feedback to the research system.

- ii) **Extension Scientists at Headquarter:** The Departments of Agronomy, Entomology, Extension Education, Plant Breeding and Genetics, Soil Science, Farm Management, Plant Pathology, Fruit Science (Pomology), Vegetable Crops, Horticulture and

Landscaping, Food Science and Technology, Food and Nutrition, Clothing and Textiles, Home Science Extension and Communication Management, Family Resource and Management, Human Development, Processing and Food Engineering, Farm Machinery and Power Engineering, Soil and Water Engineering, Economics, Forestry and Natural Resources and Zoology are associated with various extension activities of the University. There are various Subject Matter

**Fig. 4.1: Set-up of Directorate of Extension Education**

Specialists working in the field of Agronomy, Soil Science, Entomology, Plant Pathology and Farm Machinery, Fruit Science, Food Processing etc. who are directly involved in the extension activities of the University. In Agricultural Technology Information Centre (ATIC), six scientists in the discipline of Agronomy/Entomology/Plant Pathology/Animal Science/Farm Management are working to deliver technology and redress the field problems of the visiting farmers.

iii) Communication Centre: It serves as a house for providing farm information to farmers, stakeholders and public through various channels of communication i.e. publications, television, radio, YouTube, Facebook, Twitter, LinkedIn, exhibitions, audio and video cassettes, DVDs, CDs, posters etc. A total of four scientists are involved in disseminating the technologies through publications, online farm literature, T.V./Radio talk, audio/video cassettes, DVDs/CDs, posters etc. During the period under report, the Centre published more than 200 farm bulletins on different subjects of agriculture and allied fields. The Centre also published Package of Practices for crops of Punjab, twice a year, both in English and Punjabi. The Centre published 60 issues each of the two farm magazines namely Progressive Farming (English) and *Changi Kheti* (Punjabi) during last 5 years. The Directorate has *Kairon Kisan Ghar* with housing facilities for visiting farmers/farm women/young unemployed youth who are enrolled in some training at PAU. It has a strength of three scientists who are involved in imparting training to farmers, farm women and in-service extension personnel on various activities of agriculture and allied fields.

iv) Skill Development Centre: Punjab Agricultural University got the honour to establish Punjab's first Skill Development Centre in agriculture aiming for capacity building in agriculture as well as its allied sectors and bridge the gap between laboratories and farm. Skill Development Centre established at Punjab Agricultural University, under the National Skill Development Mission has been affiliated as a training provider and

Training of Trainers (TOT) programme by the Agriculture Skill Council of India (ASCI) and Food Industry Capacity and Skill Initiative (FICSI). The Skill Development Centre focused on the development of entrepreneurial skills to raise production and farm income as well as improving employment opportunities in agriculture and allied fields. The emphasis is given to equip the youth with knowledge, practical skills and its applications so that they can participate in nation's productivity. All the skill development programmes are planned, monitored, assessed, certified and followed up by National Skill Development Corporation. The Certificates of these courses are recognized throughout the country. Apart from these, more than thirty specialized training courses and two integrated crop production courses for young farmers for three months duration have been organized for farmers/farm women and rural youth. Also, about twenty in-service training programmes have been organized for the enhancement of knowledge and skills of in-service extension personnel. Monthly training camps have been conducted for the members of the Farmer's Clubs/ Associations.

v) Punjab Agri-Business Incubator: Punjab Agricultural University, Ludhiana, has been bestowed with an incubator namely Punjab Agri Business Incubator (PABI) under RKVY-RAFTAAR Agri-Business Incubator scheme of Ministry of Agriculture and Farmers' Welfare, Government of India, in March, 2019. Two programmes are being run under the Incubator with the name Uddam (Idea stage-grant-in-aid upto Rs 5 lakh) and Udaan (Expansion stage-grant-in-aid upto Rs 25 Lakh). Under both of the programmes, applications of startups from agriculture and allied sectors are being invited and shortlisted start-ups by RIC (RKVY-RAFTAAR Incubation Committee) have been provided the two months training programme and intensive technical and business mentoring. All the aspects related to startup, business, marketing, Intellectual Property, communication skills, finance and government schemes are covered in the training programme. The physical facilities provided in incubator contain the office



space, conference/meeting room, library, internet facility, laboratory assistance at PAU.

Main focus areas which have been covered under the scheme are; Functional Health & Convenient Food, Food Processing, Waste to Wealth, Farm Mechanization, Bee Keeping/ Honey Processing, Mushroom Cultivation, Agri Clinic Services, Organic Farming & Inputs, Precision Agriculture, Floriculture and Landscaping and Agri Supply Chain. In four cohorts, a total of 57 startups (21 in Uddam and 36 in Udaan) have been selected for grant-in-aid comprising Rs. 7.64 Crore so far (Table 4.4). The cohort V was launched in April 2023 and applications are invited from Punjab and its neighbouring states.

Table 4.4: Agri-business start-ups selected by PAU-PABI.

S. No.	Applica-tions	Trained Startups	Selected for funding	Amount
UDDAM (Pre-seed)	527	70	21	659 Lakhs
UDDAN (Seed Stage)	393	79	36	105 Lakhs
Total	910	149	57	764 Lakhs

Extension Coordination Mechanism: Scientists from KVKs and FASCs also act as resource persons in block and district level camps organized by the Departments of Agriculture, Horticulture, and other agencies like IFFCO, KRIBHCO, NFL or etc., The Research and Extension Specialists Workshop for *Rabi, Kharif*, Vegetable, Sericulture and Flower crops, Fruits, mushroom and agro-forestry are regularly organized each year in which extension personnel of the concerned departments participate. A State level training planning is also organized regularly in the month of February to finalize the training programme for 18 KVKs. A total of 31 such workshops were organized during last 5 years. The Directorate of Extension Education has good linkages with line departments (Figure 4.2).

Extension Programmes: A total of 7811 training courses were organized by different KVKs as well as by different training units and departments. In these trainings, numerous farmers, farm women and field functionaries of the development departments i.e. Agriculture, Horticulture, Soil and Water Conservation participated. The trainings covered various aspects of agriculture in addition to Home Science aspects like Food & Nutrition, Clothing & Textile and Family Resources Management etc. During the period under report, 38213 frontline, method and

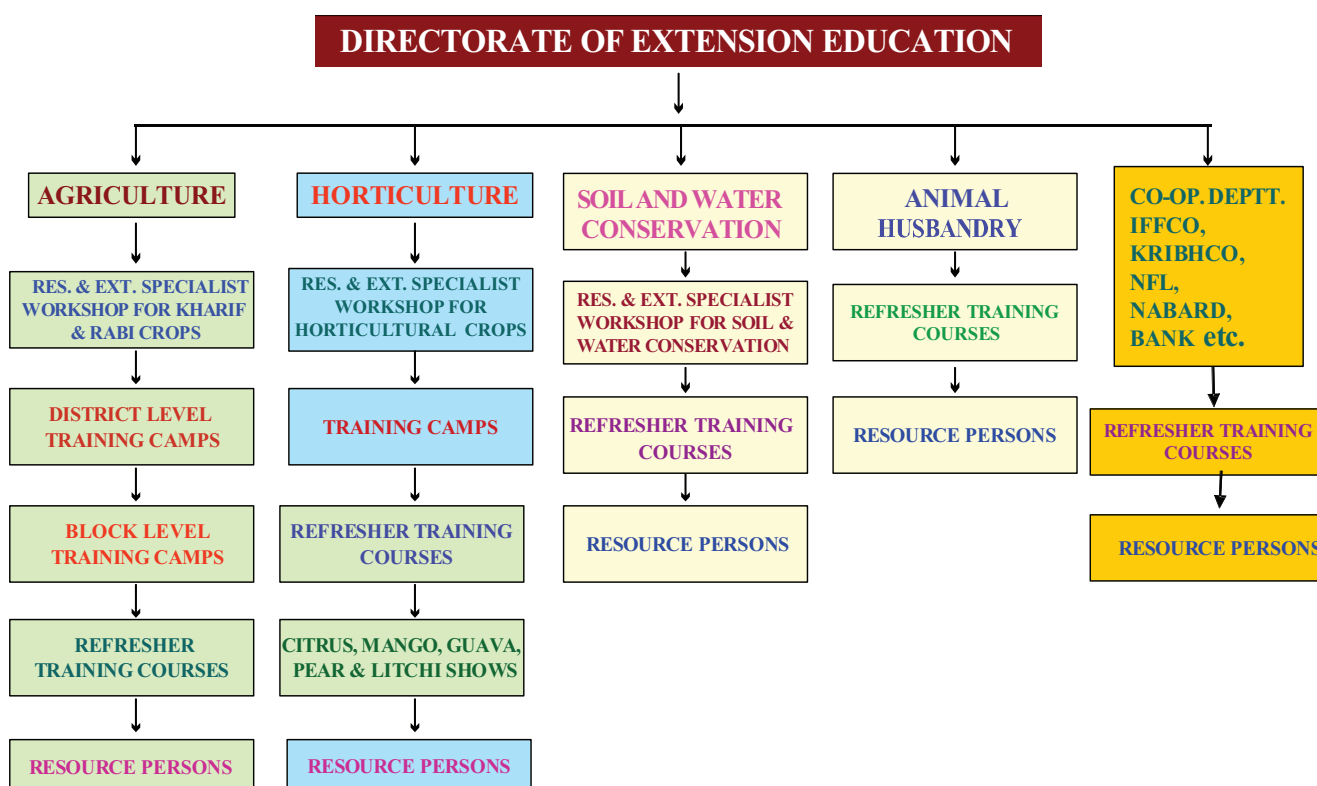


Fig. 4.2: Linkages with line departments and other agencies



Training to farmers

result demonstrations were conducted (Table 4.5). Frontline demonstrations were conducted by the Krishi Vigyan Kendra/FASC scientists on summer *moong*, mash, maize, gram, *gobhi sarson* and groundnut etc. to demonstrate production and protection technologies. Method & Result demonstrations included method of taking soil and water sample, use of tensiometer in paddy, herbicide spray technology, use of leaf colour charts for need based nitrogen application, crop residue management, happy seeder, mechanical paddy transplanter, dyeing of fabric, preparation of soaps and detergents and preparation of soft toys etc.

Extension and Technology Dissemination System: Various technologies were disseminated by organizing *Kisan Melas* on mass scale, farmers training camps, demonstrations, field days, farmer scientist interface, exhibitions, research trials, PAU kisan committee meetings, fruit and vegetable grower meetings, PAU Kisan Club meetings and other utility services (Table 4.5). Total number of *Kisan Melas* organized during the period were 70.

During Covid situation *Kisan Melas* were organized virtually. The *Kisan Mela* is considered as the best tool for technology transfer to the masses. A total of 7848 training courses were organized by different KVKs and other departments. FASCs & KVKs organized exhibitions at farmers fair, workshops, farmers-scientist interface, district-, block- and Village-level camps and at demonstration sites to motivate the farmers for adoption of latest technologies. During the period under report, 2236 exhibitions were arranged which act as excellent platform for dissemination of information among the visitors. A total of 1494 field days were organized by the extension scientists of the University at various locations throughout the state to educate the farmers about the performance of new varieties, technologies developed by the University at farmers' fields.

Farmers' Clubs and Committees: PAU has formulated many dedicated clubs, associations and committees containing progressive farmers and farm women. Regular meetings are conducted in which agricultural updates are being provided

**Table 4.5: Year-wise details of Extension programmes organized and utility services provided by PAU.**

Activity	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Kisan Melas	14	9	9	15	23	70
Workshops	5	5	6	4	6	26
Trainings	1,651	1,426	1,507	1,834	1,430	7,848
Field Days	388	281	320	345	160	1,494
Awareness Camps	1,330	1,419	408	549	748	4,454
Exhibition	827	690	99	258	362	2,236
Front line/Method/Result Demonstrations	3,226	5,363	5,299	5,418	18,907	38,213
Adaptive Research Trials	1,161	830	464	496	342	3,293
On Farm Trials	134	107	116	116	135	608
Farmers' visits	7,045	55,441	49,206	43,955	36,561	1,92,208
Telephone queries	25,627	10,100	13,402	42,906	40,590	1,32,625
Field visits	74,867	65,550	50,561	11,386	38,513	2,30,629
Advisory services to farmers	1,44,559	1,28,057	1,19,224	66,851	8,012	4,66,703
Diagnostic service	7,015	5,233	12,286	6,373	6,838	37,745
Referred samples by the extension functionaries	56	54	50	928	-	1,088
Lectures delivered/attended	3,508	3,172	3,225	3,085	3,043	16,033
Radio/TV talks	324	328	166	161	108	1,117
Exposure visit	181	177	85	143	200	786
Soil Health Card	8,896	10,565	6,102	2,569	2,488	30,620
Bio-fertilizers (acres)	20,720	72,474	31,685	42,901	3,676	1,72,456
Bioagents (acres)	10,336	7,891	7,125	1,642	-	26,994
Extension articles	318	98	460	489	420	1,785
Extension Bulletins/ Pamphlets/ Folder/ Leaflets	215	45	42	86	33	421

to them and their feedbacks are recorded to streamline the research projects. These progressive farmers are the torch bearers who help in dissemination of technology further to masses. A direct interaction is being maintained between research scientists and farmers/stakeholders from different agroclimatic zones. The list of 12 clubs/Associations and 3 committees along with their year of establishment in parenthesis is given as under:

CLUBS

1. PAU Kisan Club (1966)
2. Farm Women Wing (1983)
3. Punjab Naujwan Kisan Sanstha (1983)
4. Beekeepers Association (1991)
5. Tree Growers Association (2007)
6. Seed & Nursery Producers Association (2011)

7. PAU Flower Growers Association (2017)
8. PAU Soybean Processors Club (2017)
9. PAU Organic Farming Club (2017)
10. PAU Mushroom Grower Association (2018)
11. Crop Residue Management Association (2018)
12. PAU Aromatic and Spice Growers Association (2022)

COMMITTEES

1. PAU Farmers Committee (1970)
2. PAU Fruits & Vegetable Growers Committee (1989)
3. Agricultural Equipment Manufacturer's Committee (1995)

PAU Virtual Kisan Mela: In India, the first case of COVID-19 was reported in Kerala on 27

January 2020. The Indian Government imposed a nationwide lockdown on 24th March 2020 for 21 days, which was extended up to 30th May 2020 (a total of 68 days). After that, services were resumed in a phased manner starting on 8 June 2020, except in the containment zones. Still, there were restrictions on gatherings and movements. **The First-ever Virtual Kisan Mela was organized by PAU, Ludhiana in September 2020** in which more than 2 lakh farmers benefitted. This was the first-ever farmers' fair organized online by any

SAU in the country. The *Kisan Melas* in 2021 with a total of 6.5 lakh beneficiaries each during March and September. In March 2022, six *Kisan Melas* were organized virtually while seventh one was organized in physical mode at Bathinda.

Sarkar-Kisan Milni (Government-Farmer Meet): The first-ever *Sarkar-Kisan Milni* was organized by PAU on 12th Feb, 2023 and second *Sarkar-Kisan Milni* was organized on 11th May 2023. The Punjab Government is formulating new agriculture policy



Glimpses of Kisan Melas



Pehli Sarkar-Kisan Milni



Dooji Sarkar-Kisan Milni

in which suggestions were sought directly from the end beneficiaries of the policy, i.e. farmers. In these milnis, PAU departments and different line departments displayed their techniques in different stalls and interacted with farmers.

Food Craft Mela

PAU organised Food Industry and Craft Mela for entrepreneur trained by PAU Departments and KVKs. Various allied departments and other institutes related to Food & Craft items such as GADVASU, CIPHET, NESTLE, VERKA, MILKFED, MARKFED, Punjab Agro Industries Corporation etc. were also be invited to participate in this Mela.



6.6.4.3. Extension Planning and Technological Impact

The technologies developed at PAU sometimes may not be applicable as such in the field and

need assessment and refinement which needs to be done at farmers' fields. The problems noticed / observed by the extension staff at the time of field visits and during discussion with the development staff and farmers are passed on to the Directorate of Research for further research. Feedbacks are also provided by the field staff of the State development departments during the Research and Extension Specialists Workshops.

Frontline Demonstrations (FLDs) were arranged for pulses, oilseeds, fodders etc. on new innovations and technologies related to farmers needs especially related to their agriculture and allied fields, at their fields. Adaptive Research Trials (ARTs) were conducted at farmers' fields under different agro-climatic conditions to test the adaptability of new technologies generated by the research system. A total of 3293 ARTs were conducted at different locations to evaluate new crop varieties, production and protection technologies (Table 4.5). Some of the important ARTs were evaluation of new varieties of rice, basmati rice, wheat, sugarcane, mustard, oats, berseem and rajmash, testing of plant protection technologies including new herbicides, insecticides and fungicides.

6.6.4.4. Implementation of National Initiatives

National Initiative in Climate Resilient Agriculture (NICRA): The need for climate-resilient agriculture and efficient use of natural resources such as water and soil are brought into greater perspective by heat/cold stress and unpredictable rainfall in Punjab, which is an important food grain growing

Table 4.6 Adoption of different interventions/technologies in the adopted districts

Interventions	Percent adoption of technology in various districts			
	Bathinda	Faridkot	Fatehgarh Sahib	Roopnagar
Laser land levelling	99	98	41	58
Direct seeded rice	75	6.6	13	2
Zero tillage	65	49	2	7
Happy seeder	70	3.4	35	31
Baler cum knotter	75	58	-	3
Quality seed	70	70	-	-
Mineral mixture/uromin licks	55	55	5	66
Kitchen garden	85	85	100	72
Animal vaccination	45	64	100	70
Green manuring	14	23	7	10

state in India. National Initiative in Climate Resilient Agriculture (NICRA) was launched during February 2011 by Indian Council of Agricultural Research (ICAR) with the funding from Ministry of Agriculture, Government of India. The mega project has three major objectives of strategic research, technology demonstrations and capacity building. Assessment of the impact of climate change with formulation of adaptive strategies is the prime approach under strategic research across all sectors of agriculture, dairying and fisheries. Evolving climate resilient agricultural technologies that would increase farm production and productivity vis-a-vis continuous management of natural and man-made resources constitute an integral part of sustaining agriculture in the era of climate change. The four modules of NICRA i.e. natural resource management, improving soil health, crop production and livestock are aimed by making the farmers self-reliant. Under this project, Faridkot, Bathinda, Fatehgarh Sahib and Ropar districts were selected in Punjab. Each KVK selected one village in their respective district representing the climate vulnerability of the district. Drought and heat waves were primary considerations in the selection of districts, Bathinda and Faridkot. Frost and cold waves were primary climatic variability in Fatehgarh Sahib and Roopnagar. Under NICRA project, KVKs selected villages, held stakeholder meetings and carried out baseline surveys. KVK Bathinda selected village Kili Nihal Singh with total cultivated area of 810 hectares. KVK Faridkot selected village Pindi Balochan with a total cultivated area of 1060 hectares. KVK Fatehgarh Sahib selected the village of Badaucchi Kalan where total cultivated area was 952 hectares. KVK Roopnagar selected five villages- Rashidpur, Fatehgarh Viran, Rampur Fasse, Mohan Majra and Behrampur bet with total cultivated area of 853 hectares.

Impact analysis revealed that NICRA interventions increased resilience at the farm, household and village levels. Adoption level of natural resource management technologies such as zero-tillage, happy seeder, direct seeded rice and straw balers has increased in these four districts. Since 2012, area under zero tillage and happy seeder has been increasing day by day (Table 4.6). To improve livelihood, subsidiary occupations like dairy farm,

backyard poultry, piggery, jaggery production and protected cultivation units were established in the NICRA villages. NICRA villages functioned as model villages and became knowledge hubs/centres for out-scaling technologies in large areas.

In 2021-22, two districts, Fatehgarh Sahib and Roopnagar were replaced with new districts, Moga and Gurdaspur based on climate variability index. In the initial phase in Moga and Gurdaspur, efforts were made to generate awareness among the farmers regarding climate smart technologies developed by PAU in field and horticultural crops. Popularisation of technologies by conducting various demonstrations on short duration variety of paddy (PR 126), CRM technologies, Direct Seeded Rice (DSR), summer green gram, green manuring with sunhemp and fodder maize resulted in increase in area under these crops in village Meenia. Demonstrations were conducted on climate resilient and economically viable technologies like kitchen gardening, fruit nutrition garden, animal mineral mixture, UMMB bricks, mastitis kits and backyard poultry had total adoption by the farmers after completion of trials. Further, establishment of water harvesting unit and custom hiring centre at village level are in development phase.

Farmer FIRST Programme:

The project entitled “Technology application and upscaling for sustaining natural resources and augmenting farm income: Farmers led “market linked approach” under the Farmer FIRST programme is operational since February, 2017 under Directorate of Extension Education in two villages namely Taranji Khera and Chatha Nanhera





of Sangrur district. There is a team of total 15 members (one PI, seven CoPIs, four associated scientists, one research fellow and two senior field assistants) in this project. Main objectives of the project are as under:

- i) To assemble, integrate and assess technically feasible, economically viable, socially compatible and commercially up scalable technology options for sustainable agriculture.
- ii) To design and test suitable technologies, crop choices, networks, linkages and institutional models for marketing and value addition of agricultural produce for enhancing the income of farming families.
- iii) To analyze the impact of the technological interventions, identify factors of success/failure, suggest strategy for up-scaling of successful technologies and provide feedback to the research system of un-successful technologies for their modifications.
- iv) To build capacity of farmers and farm women to sustainable technologies and

practices as well as to promote subsidiary enterprises/secondary agriculture for income enhancement.

Various interventions are being carried out in seven modules namely natural resource management module, diversification, vegetable crops, value addition, subsidiary enterprises, livestock-based modules and integrated farming system. The farmers expressed their satisfaction with the interventions such as short duration varieties of rice for efficient water management, Direct Seeded Rice by Lucky Seed Drill, PAU Happy Seeder/Super Seeder/Smart Seeder for wheat sowing for in situ paddy straw management, green Manuring in rice-wheat cropping system, diversification with pulses and oilseeds, low-tunnel cultivation of vegetables, primary processing unit for oilseeds, pulses and vegetables, bee keeping, mushroom growing, deworming of dairy animals, mineral mixture and IFS models.

The successful mobilization of diverse groups and the subsequent building of their capacity is a crucial aspect of Farmer FIRST Project. Concrete

Table 4.7 Details of identification of farm innovators and grooming them as technology agents

Sr No	Name of technology/ Intervention	Farm Innovators	
		Chatha Nanhera	Taranji khera
	A. NRM Module		
1.	Short duration varieties of rice for efficient water management	Lakhwinder Singh	Bawa Singh
2.	Direct Seeded Rice by Lucky Seed Drill	Naib Singh	Satjeet Singh
3.	PAU Happy Seeder/Super Seeder/Smart Seeder for wheat sowing for in situ paddy straw management	Balwinder Singh	Gurmeet Singh
4.	Green Manuring in rice-wheat cropping system	Jeet Singh	Prem Singh
	B. Diversification		
5.	Rapeseed (Gobhi sarson)	Boota Singh	Hardeep Singh
	C. Vegetable Crops		
6.	New high yielding vegetable varieties/ hybrids	Mandip Singh	Jaspal Singh
7.	Low tunnel cultivation of vegetables	Vinder Singh	Hakam Singh
	D. Value addition		
8.	Primary processing unit for oilseeds, pulses and vegetables	Naib Singh	Jagseer Singh
	E. Subsidiary Enterprises		
9.	Beekeeping	Nirbhai Singh	Inderjeet Singh
10.	Mushroom production	Dara Singh	Gurmeet Singh
	F. Livestock based Modules		
11.	Deworming and feeding of mineral mixture	Jujhar Singh	Jugraj Singh
12.	Prevention against Mastitis	Sadanpreet Singh	Nirbhai Singh
	G. Integrated Farming System		
13.	Popularization and establishment of IFS models	Karamjit Singh	Lakhwinder Singh

efforts were undertaken to engage and empower farmers' groups, women groups, youth, and self-help groups, recognizing the significant contributions they bring to our project objectives. Groups were mobilised and strategies were employed to build their capacities. Remarkable progress was achieved through their active participation. Further, videos of the information regarding various successful interventions were developed to disseminate among other farmers to convince and motivate them. It includes the full-length video explaining the aim and impact of project and short videos briefing the experience and success stories of the farmers by themselves.

Farmers Information Centres (FIC), a hub to integrate the farmers and other stakeholders and dissemination of the required information and receiving the feedback were developed at the project villages. Literature in local language (Punjabi) was made available at FIC to equip farmers with the required information. Farmers-to-farmers interaction has been done through the opinion leaders. Successful farmers for each intervention were identified, who act as the opinion leaders for other farmers (Table 4.7).

Attracting and Retaining Youth in Agriculture (ARYA):

Punjab state is known for its contribution to central pool in the production of rice and wheat grains. Various studies show the stagnation in productivity of these crops resulting decline in the returns of the farmers. Rural areas predominantly occupied by poor comprise of marginal farmers and landless laborers have low income and suffer from malnutrition. To improve the household income as well as quality diet, poultry production, bee-keeping, mushroom cultivation and value addition and processing were undertaken in the ARYA Project at KVK Bathinda. Under the ARYA project, potential income generating enterprises namely bee keeping, mushroom cultivation, poultry farming and value addition & processing were promoted among rural youth by KVK Bathinda by orienting youth in entrepreneurial skills. KVK provided technical backstopping rural youth groups to establish micro-entrepreneurial units in different enterprises in the cluster villages including support for establishing market linkages. In district Bathinda, there are more than 380

beekeepers (>50,000 bee hives) are there with 17000 q/year honey production and more than 185 poultry units (>3,80,400 poultry birds) in Bathinda district. The mushroom production is 21,000 metric tons in Punjab and 65 metric tons in Bathinda. Poultry production undertaken as broiler production, layer production, contract farming and backyard poultry farming with prevailing natural resources and climatic problems.

After taking trainings, many of the trainees go for packaging of products like honey, poultry products and mushroom, *pickles*, *chutneys*, cheese, *khoa*, *gajrela*, detergents and also have brand names. This way their produce has been sold in a better manner. Non-availability of quality spawn, lengthy method of compost preparation, less demand for processed food at village level, lack of moral as well as financial support by the rural families, less knowledge about the diseases and management practices of desi birds, high cost of feed, medicines along with bigger size i.e. not fit for small scale or backyard poultry, lack of research for the improvement of backyard poultry birds and problem of marketing are the constraints hindering commercialization of these enterprises. Under ARYA project, 72 and 30 rural youths were oriented/trained/skilled in mushroom cultivation and value addition and processing respectively and 58 and 50 were oriented/trained/skilled in the poultry farming and 54 in bee keeping respectively during 2022-23.

Mera Gaon Mera Gaurav (MGMG):

Mera Gaon Mera Gaurav scheme was launched during July, 2015. It is an innovative initiative, which was planned to promote the direct interface of scientists with the farmers to speed up the lab to land process. The overall objective of this scheme is to provide farmers with the required information, knowledge and advisories on regular basis in the adopted villages. Under this scheme, a total of 55 villages out of 13 districts have been selected and scientists remain in touch with selected villages and providing information to the farmers on technical and other related aspects in a time frame through personal contacts or through media. The teams conducted 340 interface meetings/*goshtis* in which 7105 farmers participated. In order to motivate farmers to adopt new agricultural



technologies/practices, applicability, economic advantages of new technologies, scientists have conducted 3200 demonstrations at farmers' fields on various crops. The literature regarding various aspects was also distributed among farmers so that farmers can use it later. Scientists provided 1425 mobile based advisories to farmers of these adopted villages. Under this scheme, scientists also created linkages with other departments and agencies for the benefit of farmers of their adopted villages. Awareness amongst 126550 farmers was created on various agricultural technologies, practices, schemes of different departments, crop insurance, *Swachhata Abhiyan* etc.

Under this project, each KVK conducted various extension activities that included visit to village by teams, interface meeting/ *goshtis*, mobile based advisories, literature support provided, awareness created, linkages developed with other agencies, no. of demonstrations laid out, input support provided like seed, planting material, fertilizers, mineral mixture, consortium – wheat, paddy, fruit fly trap, field day on direct seeded rice and happy seeder, gram and oilseeds crops, trainings conducted like seed treatment in kharif crops and proper spray technologies for the management of insect-pests, housing management for broilers during summer and rainy season, operation and maintenance of crop residue management (CRM)

machineries, operation and maintenance of Straw Mulcher and Happy Seeder, seed treatment in *rabi* crops, working and precautions during operation of happy seeder and straw mulcher, operational working and maintenance of Happy Seeder, insect-pest and disease management in winter vegetables, IPM in paddy and basmati crop, preparation and use of mineral mixture for dairy and piggery animals, planting and management of fruit nutrition garden, control of endo and ecto parasites in dairy animals, successful cultivation of peas, training-cum-demonstration on in-situ crop residue management technologies, off-season cultivation of cucurbits, preparation of weaning foods for children.

Crop Residue Management Scheme:

Farmers burn paddy residues in the combine harvested fields to prepare fields for sowing of next crop in the narrow window between paddy harvesting and the next sowing. Punjab Agricultural University has carried out extensive research on farm machinery for in-situ paddy straw management and promoted these technologies in Punjab from 2018 to 2022 under “Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue” scheme. The University has carried out extensive research on farm machinery-based solutions for in-situ

Table 4.8 Extension activities conducted during 2018-19 to 2021-22

Extension Activities Conducted	2018-19		2019-20		2020-21		2021-22	
	Number	Beneficiaries (No.)	Number	Beneficiaries (No.)	Number	Beneficiaries (No.)	Number	Beneficiaries (No.)
Trainings	181	4,680	68	1,900	100	2,698	81	2,174
Farmer-Scientists interface	62	7,943	102	7,335	134	6,176	92	5,850
Mobilization of school & college students	88	18,040	117	21,190	33	1,030	64	11,801
Kisan Melas	18	2,55,287	19	85,134	1	100	4	4,043
Campaigns	390	32,215	150	27,080	73	6,758	89	7,609
TV/Radio Talks	78	Numerous	31	Numerous	27	Numerous	20	Numerous
Extension articles	45		103		27		22	
Bulletins/Manuals	20		9		5		78	
Literature distributed	2,20,750		2,06,624		1,91,481		1,57,056	
Wall painting (Sq Feet)	2,27,351		1,24,664		1,28,415		69,501	
Hoarding-Banners	2,592		7,994		1,395		1,111	

paddy straw management through retention or incorporation in the field. The major technologies introduced are Happy Seeder, Super Seeder, Smart Seeder, Paddy Straw Mulcher, Cutter-Cum-Spreader, Zero-till Seed-Cum-Fertilizer Drill, Reversible Mould Board Plough, Rotavator etc. PAU-KVKs reached out to all stakeholders (including farmers, school/college students, NGOs, social influencers) through trainings and demonstrations, farmer-scientist interfaces, *Kisan Melas*, campaigns, literature, mass and social media (Table 4.8).

Different rice straw management techniques were used to manage 49.91% area without burning during 2022 (Table 4.9). The in-situ residue management methods are sustainable solution for maintaining soil organic carbon, aggregate stability and porosity.

District Agromet Units (DAMU)

In Phase I, ICAR 161, farmers are enrolled for issuing agro-advisories to the farmers related to weather services (Table 4.5). Awareness is generated regarding climate through advisory service and by organizing trainings and awareness camps. Farmers are made aware of various apps related to weather like *Meghdoot*, *Mausam*, *Damini*.

Natural Farming

This project was being implemented by KVK Ropar. Under this, awareness camps, demonstrations and training camps were organized on benefits and production technologies for natural farming in Majher, Bhairon Majra, Jandla, Jhandian, Nurpur Bedi villages (Table 4.5).

Swachhta Abhiyan

Under this project, awareness and training camps were organized on microbial based agricultural waste management using vermicomposting by PAU-KVKs (Table 4.5). Farmers were imparted trainings about use, benefits and method of preparation of vermicompost.

Livelihood improvement of SC farmers

Under this scheme, fodder and livestock-based farming system-based approach for farmers were demonstrated to SC farmers (Table 4.5). The demonstrations on other recommended and latest agricultural practices and technologies developed by PAU and GADVASU such as area specific mineral mixture, vegetable kits, fodder seed, RIR birds, beetle goats, bee colonies etc. were also conducted to increase their livelihood.

Cluster frontline demonstrations on pulses and oilseeds

Under this initiative, KVKs employed cluster-based approach for conducting demonstrations on pulses

Table 4.9 Paddy straw management area (lakh ha) in Punjab

Practice	2018-19	2019-20	2020-21	2021-22	2022-23
Mulching (Happy Seeder)	4.74 (15.8)	4.98 (16.80)	3.04 (10.20)	3.04 (10.26)	2.54 (8.17)
Mulching (Smart Seeder)	-	-	-	-	2.54 (8.17)
Mulching (Surface Seeding)	-	-	-	0.30 (1.01)	0.14 (0.47)
Partial Incorporation (Super Seeder)	-	-	4.46 (14.99)	5.48 (18.48)	0.34 (1.10)
Incorporation (Chopper, Rotavator, MB, Harrow etc)	6.11 (20.4)	6.19 (20.90)	5.08 (17.08)	3.63 (12.22)	4.50 (14.47)
Collection/ Removal with balers, manually etc (including Basmati)	6.41 (21.3)	6.75 (22.80)	4.72 (15.83)	3.69 (12.44)	2.85 (9.17)
Total	17.25 (57.50)	17.92 (60.50)	17.30 (58.10)	16.14 (54.41)	5.15 (16.53)

*Figures in parenthesis denote per cent area under each technology



and oilseeds at farmers' fields (Table 4.5). Farmers have witnessed high production per unit area due to adoption of high yielding improved varieties, better production technology and integrated nutrient and management practices.

Student Ready Programme

The five constituent colleges of the university have strictly implemented various national initiatives. The Student Ready Programme launched by the Prime Minister of India and implemented as per recommendations of the Fifth Dean's Committee in all the undergraduate programmes of the college from the academic session 2016-17. The student ready programmes include the experiential learning programmes (ELP)/hands-on training, skill development training, Rural Agricultural Work Experience (RAWE), in-plant trainings/industrial attachments and students' project to inculcate the practical knowledge and skills in the students during their exposure visits and practical training on the parent institute as well as at government, semi-governments, co-operative agencies and private industries related to agricultural and allied sectors in the state.

PAU, Ludhiana, organized the RAWE programme which consists of four modules viz, RAWE 401, RAWE 402, RAWE 403 and RAWE 404. These four parts comprises the involvement of the students primarily to understand the rural situations, status of agricultural technologies adopted by farmers. The students also learn to prioritize the farmers' problems and develop skills and attitude of working with farm families for overall development in rural Punjab. This programme culminates with attachment of students in village for eight weeks and KVK attachment for five weeks (Table 4.10).

Table 4.10 Student Ready Programme undertaken through KVK attachment.

Year	No. of Students	No. of Districts	No. of Villages covered
2018-19	192	7	15
2019-20	190	12	24
2020-21	178	12	24
2021-22	195	9	16
2022-23	241	10	18

During this, students diagnose the field problems and develop a plan for the socio-economic development of the rural population. They familiarize themselves with actual village situation, organize various extension activities based on local needs, resources and problems. They are also trained to develop effective communication skills and latest extension methodologies in transfer of technology. The students popularise the various centre and state sponsored development programmes in the attached villages. They also undergo one week training at the plant clinic in PAU campus.

Nutri-Sensitive Agricultural Resources and Innovation (NARI)

NARI Projects is an important project to eliminate malnutrition in the country. The KVK Bathinda demonstrated fortified varieties of crops and new technologies and inform the local women about the products grown in the Nutri-Garden for round the year availability of vegetables and fruits, analyze the products which have high amount of nutrients, and encourage and train the rural women for use of those products. About 100 Anganwadi workers were trained by the KVK and developed as master trainers.

6.6.4.5. Innovation and Best Practices

The Punjab Agricultural University is playing a pivotal role in transferring the improved agriculture knowledge to the farming community. A number of initiatives have been taken for the use of ICT tools and spread of new agriculture practices (Table 4.11). During COVID-19 time period, PAU extensively used innovative extension methods such as mobile apps and social media like WhatsApp, YouTube and Facebook. PAU arranged for seed sale at district headquarters and smooth sowing and harvesting of crops following all SOPs and COVID guidelines. The following ICT tools are regularly used to pass the information among the rural masses.

Agricultural Technology Information Centre (ATIC):

The centre is located in Clock Tower building near Gate No.1 in PAU, Ludhiana, and is working under the guidance of Director of Extension Education. Its main objective is to address the field problems,

deliver improved agriculture knowledge and inputs under “Single Window Delivery System”. Proper remedial measures are conveyed to the farmers after thorough examination of the plant samples by a team of expert scientists. The centre is also popular among the farmers as Dr Khem Singh Gill Farmer’s Service Centre and Plant Clinic. Farmers can also get their problems resolved from home through telephone helpline 0161-2401960 Ext. 417 and e-mail plantclinic@pau.edu. The most peculiar and important feature of this Clinic is that these services are being provided to the farmers free of cost by the university (Table 4.5).

WhatsApp Groups: About 900 WhatsApp groups have been created at the district-level for the rapid transfer of agriculture knowledge to the farmers.

Farmer Portal: The University has started a Farmer Portal which has been put on the PAU website (www.pau.edu) for the benefit of the stakeholders in Punjabi language. It includes complete package of practices of the crops including seeds and planting material, production and protection technology, post-harvest management, processing, organic farming, agricultural machinery, agro-forestry, subsidiary occupation, women empowerment etc. It also includes diagnostic symptoms of various plant problems along with their remedial measures.

PAU Mobile App: PAU has prepared three mobile-based apps namely Kisan App, Farm Inputs App and Farm Machinery App which is available on Google Play store and Apple App store for the benefit of farming community. PAU Kisan App includes all production, protection and post-harvest management of various crops, fruits, vegetables and agro-forestry plants. During COVID-19 times, seed sale was successfully completed using PAU Farm Inputs App. For renting in or out the farm machinery, PAU Farm Machinery App is a useful IT tool.

Kheti Sandesh: The university has brought out a weekly digital newspaper “Kheti Sandesh” for the dissemination of important farm information to the farmers of Punjab. It sends information to farmers of the state through different WhatsApp groups. It covers diverse aspects of agriculture such as farm advisories; farm operations; information about new/revised agricultural publications and

training programmes; weather prediction; articles by scientists; stories about progressive farmers; response to queries by PAU experts, etc. This digital newspaper is sent to farmers in the form of a photo message every Wednesday. If any farmer wishes to receive this digital newspaper on his mobile, he/she can give a missed call on mobile number: 8288057707 or on helpline number: 1800-180-5100 and become a member of the WhatsApp group.

Weather Based Agro-advisory SMS: Weekly Special Agriculture Bulletin called e-bulletin is sent to the farmers of the Punjab in English and Punjabi languages through email and mobiles phones. The bulletin includes the weather forecast, weather outlook for the crops and latest Packages of Practices to be followed during the week. About 9 lakh farmers were enrolled for weather based agro-advisory services.

PAU website: The PAU activity and agriculture information is regularly updated and made available on PAU website - www.pau.edu. The Farmer Portal, PAU Mobile App., You Tube, Facebook page are also operative through the PAU website.

Table 4.11 Innovation in Extension Methodologies

ICT Technology	Number
PAU Kisan App (Subscribers)	1,02,303
PAU Farm Inputs App (Subscribers)	4,730
PAU Farm Machinery App (Subscribers)	2,988
PAU Facebook Live (Programmes)	259
PAU You-tube Live (Programmes)	259
Documentaries/Jingles	773
Farmers Portal on PAU Website (Views)	9,82,290
Digital Newspaper (Weekly) – Kheti Sandesh	9,66,000 farmers
Weather Agro-advisory	About 9 lakh farmers
Whatsapp Groups by all KVKs/FASCs (Mushroom, Bee keeping, Dairy Farming, Home Science, etc.)	900
Toll Free / Missed Call Number 1800 180 5100	5200 farmers
PAU Kisan Doots	7295

Laminated photographs/Blow ups: For the dissemination of improved agriculture knowledge to the farmers, the technology developed by the



scientists of the university has also been exhibited in the form of coloured blow ups of the live specimen of the disease/insects/ deficiencies/ weeds problems and preserved life samples for the proper understanding of queries of the farmers. Pictures depicting the symptoms of diseases and pests etc. are also available at ATIC for quick diagnosis of problems of the visiting farmers.

PAU Kisan Doots: A new service has been introduced for the quick dissemination of agriculture technology in which the farmers having e-mail facility have been enrolled as 'PAU Kisan Doots'. The messages regarding production and protection technology to be followed well in time are regularly communicated through e-mails. PAU has enrolled 7295 farmers called PAU *Kisan Doots* for the quick dissemination of agriculture of knowledge. Two e-messages are being sent weekly to these *Doots* regarding agriculture related practices through e-mail. These *doots* are further requested to spread the information to the fellow farmers through public addresses system of *Gurudwaras/Mandirs* etc. for the faster and timely spread of improved agricultural technologies.

Kisan Mobile Advisory Service (KMAS): Each KVK/FASC has also initiated the Kisan Mobile Advisory Service (KMAS) in which farmers having mobile number were registered. Flash/alert messages are sent (7-8 messages per month) to

the registered farmers (2.43 lac) for timely follow up action regarding agriculture related practices. Such farmers also reciprocate in the same fashion and make queries from the experts as and when required.

Mobile Diagnostic-cum-Exhibition Van: The ATIC is also equipped with Mobile-Diagnostic-cum-Exhibition Van for dissemination of different technologies of field, fruit and vegetable crops to the farmers with the help of KVKs and Farm Advisory Service Centre (FASCs). It is provided with all kind of audio-visual aids, CD's of different crops, LCD, Microscope, Soil and Water Testing Kits and literature for sale so that farmers may be well conversant with the need-based technology from time to time. It is being sent to the different districts of Punjab for the benefit of the farming community. For the better understanding of problems, the small documentary movies/video clips are shown to the farmers and inspection and solution to the queries of the farmers are rendered on the spot.

Extension Vans: Six Bolero Vans were purchased by the University for creating the awareness among farmers in the adoption of latest improved agriculture practices and management of crop residue. These vans are equipped with audio visual aids, CD's of different crops, LCD, public address system and literature for sale. These

Table 4.12 Details of year-wise machines tested and revenue generated as test fee of machines

Year/ category wise machine	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Land development, tillage and seedbed preparation equipment	6	4	11	6	14	41
Sowing and planting equipment	3	2	4	10	3	22
Inter-cultivation equipment	2	0	0	1	0	03
Harvesting and threshing equipment	1	3	4	2	2	12
Equipment for residue management	16	7	12	15	7	57
Others	4	5	2	2	1	14
Total	32	21	33	36	27	149
Revenue generated (Rs.)	25,30,270	29,94,028	28,00,548	24,53,868	62,01,056	1,69,79,770

vans are being used to create awareness among the farmers for burning crop residue and timely management of weeds, yellow rust in wheat and cotton whitefly.

Touch Screen Kiosk (Agriculture Information Booth): ATIC has a computerized Kiosk called information booth, which depicts the production and protection technology of *rabi* and *kharif* crops from sowing till harvesting. The Kiosk has information stored in its computer on all fields, vegetable and fruit crops. This system operates through internet and any user can know detailed information on varieties, fertilizers, irrigation, plant protection, measures etc. of any crop and

other information by clicking on the menu and the information is displayed on the screen of the Kiosk.

6.6.4.6. Consultancy/Certification / Testing

PAU is involved in testing various machines and agro-chemicals as indicated in Table 4.12, 4.13 and 4.14. PAU provides free of cost consultancy/ advisory to farmers and other line departments but has given paid consultancy to various firms as indicated in Table 4.15.

Agricultural machines testing

Farm Machinery Testing Centre, Department of Farm Machinery & Power Engineering, Punjab Agricultural University, Ludhiana, has tested a total

Table 4.13 Details of revenue generated (in Rupees) from soil and water sample testing

Department	2018-19	2019-20	2020-21	2021-22	2022-23
Soil Sample testing					
Soil Science	4,10,510	4,23,850	3,00,600	4,20,100	4,84,150
KVKs	1,45,510	1,76,720	94,300	1,87,800	1,39,500
Water Sample testing					
Soil Science	38,750	70,900	95,000	27,250	30,300
KVKs	27,280	51,412	28,890	42,240	72,100

Table 4.14 Details of revenue generated (in Rupees) from product testing

Department	2018-19		2019-20		2020-21		2021-22		2022-23	
	No.	Revenue generated	No.	Revenue generated	No.	Revenue generated	No.	Revenue generated	No.	Revenue generated
Soil Science	1	62,3875	4	75,52,246	4	69,98,201	3	39,68,443	5	21,89,450
Agronomy	15	1,32,74,504	15	1,09,15,000	7	59,00,000	15	97,59,500	21	1,84,96,500
Entomology	7	34,96,300	7	36,78,912	16	83,19,000	12	67,74,000	13	77,15,820
Plant Pathology	7	52,00,000	11	46,50,000	14	52,50,000	26	1,04,50,000	33	1,60,50,000
RRS Faridkot	114	51,08,500	113	59,54,326	100	35,64,625	93	45,07,824	92	42,46,150

of 149 machines of different types such as land development, tillage and seed bed preparation machines, sowing and planting machines, inter cultivation machines, harvesting and threshing machines, equipment for residue management etc. from year 2018-19 to 2022-23. Total revenue generated during the above-mentioned period as a test fee of machines was Rs. 1,69,79,770/- (Rs. one crore sixty-nine lakh seventy-nine thousand

seven hundred seventy only) and year-wise detail is given in Table 4.12.

Soil and water testing

Soil and water testing facility for farmers is provided at Department of Soil Science, PAU Regional Stations and all the KVK's at a subsidized rate. The revenue generated over the last five years is provided in Table 4.13.



Product testing

The university provided testing facility for different products like agrochemicals, fertilizers, plant growth promoter, etc. The details of number of testing projects over the last five years is given in Table 4.14 and detailed list annexed (Annexure IV)

Consultancy projects:

During the period under report, the consultancy projects undertaken by the faculty and revenue generated are listed below (Table 4.15).

Table 4.15 Consultancy projects and revenue generated

Year		Amount (Rs.)
2018-19	1. Consultancy Service Participation in Punjabi Movie 'Mar Gaye O Loko' & 'Ashkey'	1,65,200
	2. Consultancy Project Landscaping Project (GNE LDH)	81,000
	3. Consultancy Project Landscaping Project	59,000
2019-20	1. Participation in three Movies "Kitty Party" "Teriyan Meriyan Herapheryan' and Naukar Vohti Da'	3,42,200
	2. Technical Assessment of Project Leaders ' associated with client organization M/s Mahindra & Mahindra Limited, Mumbai	25,960
	3. Capacity Building Contact Development and delivery on Farm machinery' associated with client organization M/s Mahindra & Mahindra Limited, Mumbai	4,60,200
	4. Inclusion of Consultancy Project on "Consultancy Service Landscaping Project"	64,900
	5. Consultancy Services for Pre and Postharvest Management of Mango'	2,36,000
	6. Consultancy Services for Landscaping of Biodiversity Park in Jalandhar Division	1,71,100
	7. Participation in two Movies "Yaaran Dian Paun Baaran" & 'Daddy Cool Munday Fool 2'	2,36,000
2020-21	1. Capacity Building Contact Development and delivered on Farm Machinery	1,77,000
	2. Consultancy Project for Landscaping of Biodiversity Park in Sangrur	59,000
	3. Horticultural Consultancy Project of Phulkari Gardens Attari NH-3 Punjab	41,139
	4. One Acre sample Cactus Garden at Attari NH-3, Punjab	29,500
	5. To enhance the beauty of Ranjit Sagar Dam Project Site at Pathankot	29,500
2021-22	1. Capacity Building Contact Development and delivered on Farm Machinery	23,600
	2. Horticultural Consultancy Project of Phulkari Garden at Attari NH-3, Punjab	18,871
2022-23	1. Landscaping of IIMR Campus at Ladhowal, Ludhiana, Punjab	88,500
	2. Professional fee for the Impact Assessment of Crop Residue Management Programme	3,18,600

6.6.5. Faculty and Staff Development

Agriculture being the backbone of Indian economy, the human resource needs to meet various activities related to agricultural development which is critical to attain country's goals towards rural development, employment generation and host of related activities leading to sustainable growth and development.

The conventional agriculture is rapidly transforming itself to a highly skilled and knowledge intensive occupation for fulfilling growing food demands of increasing human population and to meet emerging challenges of improving yields and product quality, food safety, global competitiveness in marketing, conserving depleting natural resources, withstanding adverse impacts of perceptible climate change and increasing farmer's income in view of escalating production costs.

In this scenario, competent human resource is the backbone of any agricultural institution of higher learning to satisfactorily achieve its envisaged aims and objective and continuously improve academic and research excellence. Punjab Agricultural University has well trained, dynamic and highly motivated faculty for effective curriculum delivery and student development.

6.6.5.1. Recruitment and Promotional Avenues

Classification of University employees

Employees of the University are classified into different categories viz. Administrative, Teaching and Non-Teaching. Administrative cadre includes positions like Vice Chancellor, Registrar, Directors, Deans, Comptroller, Librarian, Estate Officer, and Chief Engineer. The teaching cadre includes Professors, Associate Professors and Assistant Professors and its equivalent cadres in research and extension education as well as includes position like Assistant Librarian. Non-teaching category is divided in to four groups viz. group A, B, C and D according to pay scales under different cadres. Chapter IV of the Act and Statutes of the University provides details about the following

Classification of Teachers

As per Statute 4.1 teachers of the University are classified as:

Professor, Associate Professor, Assistant Professors or their equivalents (Scientists, Extension Specialists) responsible for conducting and guiding teaching, research and research extension programmes.

- i) Any other employee of the University declared as 'teacher' by the Vice Chancellor on the recommendations of the Academic Council



Classification of Non-Teaching Employees

- a. Employees of the University other than officers and teachers shall belong to either:
 - i. The University cadre; or
 - ii. The cadre of the University officers under whom the post is administratively placed.
- b. Each cadre shall consist of
 - i. Group A : All the posts in the grade pay of Rs.5000/- and above and all the posts existing in group A (irrespective of the monetary limits of grade pay) will remain in group 'A'.
 - ii. Group B : All the posts ranging between the grade pay of Rs. 3800-4999.
 - iii. Group C : All the posts ranging between the grade pay of Rs.1900-3799.
 - iv. Group D : All the posts below the grade pay of Rs.1900.

Faculty Strength

Punjab Agricultural University has six constituent colleges namely College of Agriculture, College of Agriculture at Ballawal Saunkhri, College of Horticulture and Forestry, College of Agricultural Engineering and Technology, College of Community Science and College of Basic Sciences & Humanities awarding degrees at bachelor's, master's and doctoral level. The two Directorates,

the Directorate of Research and Directorate of Extension Education coordinate research and extension activities of the University respectively. To achieve its envisaged mandate of imparting quality education in agriculture and its allied branches, undertakes location specific research in priority research areas and transfer of technology to end users through extension network. The University has a total faculty of 792 with 269 Professors/equivalent, 126 Associate Professor/equivalent and 397 Assistant Professor/equivalent (Table 5.1) against approved faculty strength of 1331. Overall, 33.96% of existing faculty in the ranks of Prof./ equivalents, 15.91% as Associate Prof./ equivalents and 50.13% as Assistant Prof./ equivalents.

Faculty distribution across the colleges/directorates

College of Agriculture: The College of Agriculture is one of the six constituent colleges of Punjab Agricultural University. This College had its roots in the Punjab Agricultural College and Research Institute, Lyallpur (now Faisalabad, Pakistan). In 1963, the College of Agriculture had five departments viz. Agronomy, Extension Education, Horticulture, Plant Breeding and Soils and now there are 12 departments viz., Agronomy, Climate Change & Agricultural Metrology, Entomology, Extension Education, Food Science & Technology,

Table 5.1 Current faculty strength College/Directorate wise and Cadre wise

Name of College / Directorate	Faculty Position			Total Faculty
	Professor & Equivalent	Associate Professor & Equivalent	Assistant Professor & Equivalent	
College of Agriculture	95	36	132	263
College of Agriculture, Ballawal Saunkhri	1	0	0	01
College of Horticulture and Forestry	34	11	27	72
College of Agricultural Engineering & Technology	35	19	27	81
College of Community Science	12	7	16	35
College of Basic Sciences & Humanities	46	13	56	115
Dean Post Graduate Office	0	0	1	01
Directorate of Research	21	18	61	100
Directorate of Extension Education	22	20	72	114
Director Student Welfare	1	1	2	04
Estate Office	1	0	0	01
Library	1	1	03	05
Total	269	126	397	792

Plant Breeding & Genetics, Plant Pathology, Soil Science and, and two schools viz. Agricultural Biotechnology and Organic Farming. The College of Agriculture imparts resident instructions in different disciplines of agriculture for developing human resources in agriculture. Besides, it lays thrust on carrying out research in agriculture and allied fields and disseminating the research findings among the farmers of the Punjab state for providing the security of sustainable livelihood to them. The college is offering bachelor's degree in four programmes, Master's Programme in 10 disciplines and Doctoral programme in 9 disciplines. The college had adopted 5th Deans' Committee curricula from academic session 2016-17 and BSMA recommendations for PG curriculum in 2022-23. The present faculty strength of the College is 263 including 95 Professors/equivalents, 36 Associate Professor and 132 Assistant Professor.

College of Agriculture, Ballowal Saunkhri: PAU College of Agriculture, Ballowal Saunkhri located at Ballowal Saunkhri, Near Balachaur, District SBS Nagar, Punjab is the youngest college of the six constituent colleges of Punjab Agricultural University. The College was established at its present site in the year 2021. PAU already has Regional Research Station at this place since 1982 to cater the research needs of the Kandi region of Punjab. This College of Agriculture offers B.Sc.(Hons) Agri. 4-year degree programme. The sprawling campus situated in the Shivalik Foothills offers an excellent academic atmosphere. The college is committed to impart world class higher education in agricultural sciences to the youth in order to expand quality human resources in agriculture leading to holistic development of under-developed regions of Punjab. The College of Agriculture, Ballowal Saunkhri, imparts resident instructions in different disciplines of agriculture for developing human resources in agriculture. The college presently offers bachelor's degree.

College of Horticulture and Forestry: With the increasing significance of horticulture and forestry in the largely field crop based agriculture in the state, The College of Horticulture and Forestry was carved out of the College of Agriculture. The College was established in 2019 with the Departments of Fruit Science, Vegetable Science, Forestry & Natural Resources and Floriculture &

Landscaping. Fruits and vegetables being rich source of nutrition, can provide much needed crop diversification and enhanced employment through processing and value addition. Forestry and floriculture represent environmental and aesthetic aspects besides being of economic importance. The College of Horticulture and Forestry aims to strengthen teaching and research in all these areas. The quality human resource produced would help to turn drive rapid developments in this sector. Presently, the College offers one Bachelor's degree course, four Masters' degree programmes and three doctorate level programmes. The present faculty strength of the College is 72 including 34 Professors/equivalents, 11 Associate Professors and 27 Assistant Professors.

College of Agricultural Engineering & Technology:

The College of Agricultural Engineering & Technology earlier named as College of Agricultural Engineering was established in the year 1964. In addition to imparting education in various aspects of agricultural engineering, the College has also played a leading role in solving the problems of the farmers and the industry by undertaking problem-oriented research and speedy technology transfer. The College has seven departments viz. Farm Machinery and Power Engineering, Processing and Food Engineering, Soil and Water Engineering, Civil Engineering and Mechanical Engineering, Electrical Engineering & Information Technology and Renewable Energy Engineering. The college offers B. Tech. (Agril. Engineering) 4-year programme. Besides, it also offers M.Tech. programmes in the disciplines of Farm Machinery and Power Engineering, Processing and Food Engineering, Soil and Water Engineering, Computer Science and Engineering, Remote Sensing and GIS, Civil Engineering (Hydrology and Water Resources Engineering/ Structural Engineering) and Master in Computer Applications. The college also offers Doctorate programmes in various disciplines including Energy Science and Technology, Farm Machinery and Power Engineering, Processing and Food Engineering, and Soil and Water Engineering. The present faculty strength of the College is 81 including 35 Professors/equivalents, 19 Associate Professors and 27 Assistant Professors.



College of Community Science: The College of Home Science, established in 1966 to cater to the need of empowering rural and urban women to contribute to family economy and improve their quality of life, was rechristened as the College of Community Science in 2019. The College houses five departments viz. Apparel and Textile science, Family Resource Management, Food & Nutrition, Extension Education & Communication Management, and Human Development & Family studies within position faculty strength of 35 teachers including 12 Professors, 07 Associate Professors and 16 Assistant Professors. Besides qualified faculty in its various fields, the College has Nursery School Teachers, and Creche Supervisors. The College is currently offering B.Sc Hons. degree in Community Science and in Nutrition and Dietetics, Masters in six disciplines i.e. Apparel & Textile Science, Family Resource Management, Food & Nutrition, Extension Education & Communication Management and Human Development & Family studies.

College of Basic Sciences & Humanities: Keeping in view the significance of basic sciences for proper understanding and development of different areas of agriculture and allied fields, a School of Basic Sciences and Humanities was conceived which subsequently led to the establishment of College of Basic Sciences and Humanities in October, 1965. Close interaction between the basic and the applied sciences has added a new vigour to agricultural education and research. At present, the College has eight departments viz., Agricultural Journalism Languages & Culture, Biochemistry, Botany, Chemistry, Agricultural Economics & Sociology, Mathematics, Statistics and Physics, Microbiology, and Zoology apart from a School of Business Studies. The college has 115 faculty members who hold specializations in their respective fields and include 46 Professors, 13 Associate Professors and 56 Assistant Professors.

Directorate of Research (DR) The Directorate of Research is headed by the Director of Research who is assisted by four Additional Directors of Research (ADR) in the areas of Crop Improvement, Natural Resource and Plant Health Management, Horticulture and Food Science, and Farm Mechanization and Bio-energy,

Director (Farms) and Associate Director (Seeds) apart from Directors/In Charges of the Research Stations/Seed Farms. In addition to the Research Farm at the main campus at Ludhiana, seven research farms and 3 fruit research stations of the University are located in different districts of the state representing various agro climatic zones.

Directorate of Extension Education: The Directorate of Extension Education shoulders with State Department of Agriculture/ Horticulture/ Animal Husbandry, semi-government organizations (KRIBHCO, IFFCO, ETC.), input supplying firms, Banks and many other government and Non Government Organizations (NGOs)/ progressive farmers. The Directorate of Extension Education has the faculty strength of 114 that includes 22 Professors, 20 Associate Professors and 72 Assistant Professors.

Faculty distribution in teaching, research and extension education

The current faculty distribution in teaching, research and extension education domains reflects that 23% faculty is in teaching, 59% in research and 18% in extension education (Table 5.2). Apart from this, the faculty on the teaching, research or extension side also devote one-third time to other fields. In addition to this, faculty also guides postgraduate and PhD research, irrespective of the fact that he/she belongs to teaching, research or extension position.

Faculty Recruitments and Promotions:

A. Direct recruitment, promotion & retirements off acuity over last 5 years

Most of the faculty in the university were initially recruited through direct selection and later on promoted as Associate Professor/equivalents through career advancement scheme (CAS). The recruitments of faculty are being done regularly and promotions under CAS for faculty are being regularly carried on. About 169 Faculty promotions including 73 from Associate Professor to Professor and 96 from Assistant Professor to Associate Professor were made during this period as given below in Table 5.3.

Table 5.2 Distribution of current faculty in Teaching, Research and Extension

Sr. No.	Name of College / Directorate	Teaching	Research	Extension
1.	College of Agriculture	43	209	11
2.	College of Agriculture, Ballawal Saunkhri	1	0	0
3.	College of Horticulture and Forestry	18	51	3
4.	College of Agricultural Engineering & Technology	33	43	5
5.	College of Community Science	23	10	2
6.	College of Basic Sciences & Humanities	56	55	4
7.	Dean, Post Graduate Studies	1	0	0
8.	Directorate of Research	0	100	0
9.	Directorate of Extension Education	0	0	114
10.	Directorate of Student Welfare	4	0	0
11.	Estate Office	1	0	0
12.	Library	5	0	0
	Total	185	468	139

Table 5.3 Year wise Direct Recruitment and Promotions of Faculty and Higher Positions over last 5 Years

Category	Recruitment/ Promotion	2018-19	2019-20	2020-21	2021-22	2022-23
Statutory Officer		4	3	2	4	-
ADR/ ADC/ ADEE		-	3	3	1	-
Head		11	3	9	0	13
Professor/ equivalent	Direct	0	0	0	0	0
	Promotion	2	10	32	-	29
Associate Professor / Equivalent	Direct	0	0	5	2	0
	Promotion	1	57	21	-	17
Assistant Professor	Direct	36	64	68	-	1
	Promotion	90	47	61	-	62

Recruitment and Promotion Procedures

Details of selection process are given in Sub section (1) of Section 15 of the University Act

The Appointment of Vice Chancellor

- (a) The Board may either take up the matter on its own or elect a Screening Committee of three persons. The Committee shall select its own chairman. The Committee may advertise and/or obtain suggestions from such other persons, institutions and agencies as it may deem fit.
- (b) On receipt of applications and/or suggestions mentioned in Clause (a) above, the Committee shall prepare a list of names of candidates for scrutiny. On the basis of this list, the

Committee shall recommend at least three names to the Board in order of preference unless the number of eligible candidates is less than three.

Recruitment Process for Academic and other Administrative Officers

For recruiting the best possible talent, the vacant positions in the University are advertised in the national as well as in regional newspapers and details are given on University website (www.pau.edu). The recruitment of the teachers is done by duly constituted committees by the Vice Chancellor of which he is the chairman. The other members of the committee include the subject matter experts, ICAR nominee etc. The selection is done on the basis of merit as determined by



interview and the score card developed for the purpose.

The Deans / Directors / Registrar / Comptroller / Librarian / Estate Officer/Chief Engineer/ ADRs/ ADEE/ ADC/Controller of Examination/HODs are appointed on tenure basis for a period of four years or till retirement which ever happen to be earlier. Head of Departments shall be selected out of the Professors in the concerned discipline of that department as well as Professors of the same discipline working in the University.

Direct recruitment for teachers

- a) The detailed recruitment procedure for faculty is as under:-
 - i) The Vice Chancellor shall have the post advertised with such qualifications as may be laid down by him on the recommendations of the Academic Council.
 - ii) After advertising the post and receiving the applications, the Vice Chancellor shall appoint a Selection Committee to make recommendations.
 - iii) The Selection Committee shall have the following composition:-
 - (i) Vice Chancellor Chairman
 - (ii) Academician Members (to be nominated by the Chancellor)
 - (iii) Three outside experts in the concerned subject/field out of the list approved by the Board of Management on the recommendations of the Vice Chancellor
 - (iv) Dean/Director concerned
 - (v) Head of the Department concerned
 (At least four members including two outside Experts must constitute the quorum)
 - iv) The Chairman of the Selection Committee or his nominee shall scrutinize all the applications and prepare a list of the candidates who shall be either called for interview or considered in absentia.
 - v) After interviewing the candidates or considering them in absentia, as the case may be, the committee shall recommend, as far as possible, at least three persons in order of preference.

- vi) In the case of appointment of Professors and Associate Professors and other teachers of equivalent rank, the Vice Chancellor shall, on receipt of recommendation of the Selection Committee, consider the same for acceptance. Where the Vice Chancellor decides to accept the recommendation of the Selection Committee, he will on behalf of the Board of Management, approve the appointment. The panel recommended by the Selection Committee shall be valid for a period of six months from the date of interview. Provided that if there is any representation against such appointment, addressed to the Vice Chancellor or when there is lack of unanimity in the meeting of the Selection Committee, only then the matter will be placed before the Board.

Faculty promotion policy

Career advancement procedure and its implementation for all categories is as per UGC/ICAR guidelines. Academic Performance Indicator (API) scores and its proforma have been developed by the University taking into consideration the nature of job of faculty working in various disciplines and other responsibilities entrusted to them. Career Advancement Scheme (CAS) for Teachers Effective from 1.1.2009. The teachers to be considered for promotion to Assistant Professor, Associate Professor and Professor/equivalent under the new Career Advancement Scheme effective from 1.1.2009 from stage 1 to stage 2, grant of pay scale of Rs.15600-391 00+AGP 7000/-; stage 2 to stage 3, grant of pay scale of Rs.15600-391 00+AGP 8000/-; stage 3 to stage 4 as Associate Professor in the pay scale of Rs.37400-67000+AGP 9000/- and stage 4 to stage 5 as Professor and equivalent in the pay scale of Rs.37400-67000+AGP Rs.10,000/- respectively, may apply as per the performa of CAS as per under mentioned (Table 5.4) qualifications and service conditions.

Scales in the AGP of Rs 7000/-, 8000/-, 9000/- and 10,000/- have been converted to Level 11 (68,900), level 12 (79,800), Level 13A (1,31,400) and Level 14 (1,44,200) respectively with effect from 01/01/2016 due to implementation of revision of pay scales in respect of teachers.

Table 5.4 Promotion of teachers under Career Advancement Scheme (CAS)

S.No.	Promotion of Teachers through CAS	Services Qualification	Other conditions
1	Assistant Professor/ equivalent with AGP Rs.6000 to Assistant Professor/ equivalent with AGP Rs.7000 Level 10 (57,700) to Level 11 (68,900)	Assistant Professor with AGP Rs.6000 and completed 4 years of service with Ph.D. or 5 years of service with M.Phil./ M.Tech./ M.Sc. (Agri.), or any professional Master programme with 4 years duration Bachelor's degree. or 6 years of service for the rest (not having Ph.D./ M.Phil. degree, etc.)	Two training courses of 2-3 weeks duration.
2	Assistant Professor/ equivalent cadres with AGP Rs.7000 to Assistant Professor/ equivalent with AGP Rs.8000 Level 11 (68,900) to Level 12 (79,800)	Assistant Professor with completed service of 5 years in AGP Rs.7000	One training course of 2-3 weeks duration.
3	Assistant Professor/ equivalent with AGP Rs.8000 to Associate Professor/ equivalent to Rs.9000 Level 12 (79,800) to Level 13A (1,31,400)	Assistant Professor with 3 years of completed service in AGP Rs.8000.	One training course of one week duration. At least 3 publications since the teacher is placed in AGP Rs.7000/- or equivalent in old pay scale.
4	Associate Professor/ equivalent with AGP Rs.9000 to Professor/ equivalent with AGP Rs.10000 Level 13A (1,31,400) to Level 14 (1,44,200)	Associate Professor on completion of 3 years service in AGP Rs.9000 and possessing Ph.D. degree in the relevant subject.	At least 5 publications since the teacher is placed in AGP Rs.8000 or equivalent in old pay scale.

Other Human resource (Administrative, technical and supporting)

A. Non teaching staff strength

Apart from faculty there are 1327 non teaching staff of different categories against sanctioned strength of 2673 posts working at main university campus and outstations for providing necessary administrative, financial and technical support to the academic, research and extension programmes of the university.

B. Recruitment and Promotion of non-teaching staff

Direct recruitment and promotions of different categories of non-teaching (administrative, ministerial technical and supporting) staff in the University is governed by Recruitment and Promotion (R&P) Rules for each cadre framed in accordance with the University act and statue. The qualifications for the recruitment to the posts of A, B, C and

D category employees, selection procedure and composition of the selection committee shall be as per provisions in Chapter 5.7 of PAU Statues and amendments made thereof from time to time.

Procedure for promotions/recruitments of non-teaching staff

The appointments by promotion shall be made on the basis of seniority-cum-merit. The appointments by direct recruitment shall be made strictly on merit.

The appointment of group 'A' employees excepting those mentioned in Schedule Part-IV (a & b) shall be made by the Vice Chancellor on behalf of the Board of Management. Seventy five per cent of the posts shall be filled by promotion. If suitable persons are available subject to the requirement of passing the prescribed departmental examination/test, if any, for the post held by the employee concerned, and the rest by direct recruitment from the open market, the employees of the University will also



be eligible for appointment:’

In case of group ‘A’ employees mentioned in Schedule Part-IV (b), the appointment shall be made by the Vice Chancellor by 100 per cent promotion subject to the requirement of passing the prescribed departmental examination/test, if any, for the post held by the employee concerned.

Manner of appointment by direct recruitment

The following procedure shall be adopted for making appointment to group ‘A’ posts by direct recruitment.

Ordinarily the selection committee consists of the following:

- (a) The Registrar
- (b) The Comptroller
- (c) The Dean, Postgraduate Studies
- (d) Any other person or persons nominated by the Vice Chancellor.

6.6.5.2. Participation of faculty in Symposia/ workshops:

As a component of its continual human resource development policy, the University encourages its faculty to participate in national and international conferences, symposiums, workshops, training programmes, review meetings etc. being organized in India and abroad. The University also sponsors its faculty for overseas trainings and participation in international summer and winter schools conducted in reputed institutions and research laboratories abroad to expose them to best research technologies, methodologies, facilities and modern research tools in advanced areas of research. Such trainings not only develop the expertise of University faculty in specific

advanced areas of research and technology but also help them to formulate and operate new research projects in emerging fields.

Participation of University faculty in National and International scientific events

During 2018-19 to 2022-23, the university faculty attended 294 national and 95 international trainings. The faculty also attended 464 national and 88 international conferences/ workshops/ symposia/ seminar etc. The yearwise distribution of all such events is given in Table 5.5. A comprehensive list of all such events is given in Annexure V.

6.6.5.3. Incentives for Excellence / Faculty Recognition

The university is in the process of formulating fresh rules and regulations as per the ICAR guidelines for adoption of the ICAR-Best Teacher Award in the University. In addition there are different incentives/honour which are in place to duly recognize the faculty for their contributions.

- a) **Vice-Chancellor’s Appreciation Certificate:**
The Vice-Chancellor of the University awards appreciation certificate to individual scientists/ group of scientists for the outstanding contributions in academics, research or extension during a particular year.
- b) **Dr G S Khush Distinguished Professor Chair:**
This award is presented in recognition of a distinguished teacher in College of Agriculture and College of Horticulture and Forestry, PAU in view of excellence in research, teaching or extension activities. The award is granted for a maximum period of four years.

Table 5.5 Year wise - participation of the university faculty in National and International Seminars / Symposia / Conferences / Trainings / Workshops / Conventions / Consultancy / Special Assignments etc.

Activity	2018-19	2019-20	2020-21	2021-22	2022-23	Total
Trainings						
• National	25	64	62	63	80	294
• International	13	8	1	12	27	95
Workshop/Conferences/Symposia/seminar etc						
• National	43	122	74	91	134	464
• International	12	23	13	18	22	88

- c) **Prof Manjeet S. Chinnan Distinguished Professor Chair:** Prof Manjeet Singh Chinnan distinguished professor chair is created and selection is based solely on the basis of merit. The teachers/ scientists who have minimum 6 years service as Professor are eligible for the Chair. The selected Professors are given Rs.25,000/- per annum for four years, on the basis of screening and evaluation of the applications by the committee approved by the Vice Chancellor.
- d) **Best Teacher Award in Agricultural Higher Education:** The award is conferred every year. The applications are invited by the Dean, Post Graduate Studies (Coordinator as per rules). The Coordinator will receive the nomination from all the Deans and thereafter, all nominations will be put up to the Judgment Committee for its final recommendation. The Vice Chancellor will approve one name recommended by the Judgment Committee.
- e) **S. Devinder Singh Bansal Distinguished Scientist Award:** The award is presented in recognition of an Engineering Scientist selected each year from the faculty of College of Agricultural Engineering & Technology and among those in Agricultural Engineering disciplines at outstations, in view of his/ her excellence in research, teaching and extension activities. The applicant should have served on faculty of the College of Agricultural Engineering & Technology or in Engineering discipline at other establishment of PAU for a minimum period of 8 years. The selected teacher/ scientist will receive Rs 30,000/- as cash award.
- f) **Distinguished Scientist Award:** The award is presented as recognition to one professor, or equivalent scientist selected each year from the PAU faculty in view of his/ her excellence in research, teaching and extension activities. The applicant should have served on faculty of the PAU as Professor or equivalent for a minimum period of 8 years and must be actively involved in research/ teaching/ extension education. The selected teacher/ scientist shall receive Rs 30,000/- as cash award and also a citation.
- g) **Best Outstation Scientist Award:** The award is given for outstanding work in teaching/ research/ extension annually. The concerned Director/In-charge of outstation may nominate a teacher in the prescribed proforma. The Director of Research will recommend research teachers/seed producing scientists and Director of Extension Education will recommend the extension teachers and respective Deans will recommend the teachers involved in teaching side at outstations. A core committee is approved by the Vice Chancellor. The recommendations of the said committee are submitted to the Vice Chancellor for approval.
- h) **Dr Hardyal Singh Gill Distinguished Professor Chair in Weed Science:** The Chair is a recognition of a distinguished teacher of the PAU for strengthening research capabilities in weed science in PAU, Ludhiana. The award is open to all teachers actively engaged in weed science research. The nominee should have served PAU for a minimum of 8 years as professor or equivalent and must be actively engaged in research in weed science.
- i) **Dr M. S. Randhawa Best Book Award:** The entries of the books published during a calendar year are invited among faculty members for this prize by the Additional Director of Communication annually. For judging the best book, the entries are placed before the committee constituted as per rules contained in PAU Calendar. The recommendations of the committee are submitted to the Vice Chancellor for final approval.
- j) **Hans Raj Pahwa Memorial Award:** The applications for the award are invited by the Dean, College of Agriculture after every two years. The award is open to all faculty members who are actively engaged in teaching, research or extension in breeding, production, protection, nutrition etc. in the discipline of Horticulture (Pomology or vegetable or floriculture). A Core Committee is approved by the Vice Chancellor for the selection of the award, which is the final authority to finalize the award.



- k) **S. Gurcharan Singh Nihal Singh Wala Award:** The applications for the award are invited by the Dean, College of Agriculture after every five years. The award is open to all the teachers of PAU (teaching, research or extension) in the discipline of Horticulture (Pomology). A Core Committee is approved by the Vice Chancellor for the selection of the award, which is the final authority to finalize the award.
- l) **Dr Satwant Kaur Memorial Best Extension Worker Award:** The award is given to a teacher for outstanding contributions in extension education after every four years. A Core Committee was approved by the Vice Chancellor for the selection of the award, which is the final authority to finalize the award.
- m) **Smt. Harpal Kaur Memorial Award:** The applications for the awardee are invited by the Director of Research in September after every four years. The award is given to the outstanding scientist in the discipline of (i) Vegetable breeding (ii) breeding in other crops (iii) Pomology and vegetable production. A Core Committee is approved by the Vice Chancellor for the selection of the award, which is the final authority to finalize the award.
- n) **Dr Harcharan Singh Sandhu Memorial Award:** The biennium award is open to all teachers (teaching/ research/extension) in the discipline of Agronomy. The nominations are invited by the Dean, College of Agriculture in the prescribed proforma after every two years. The Award committee recommends one name out of the nominations received. The recommendations of the award committee are submitted to the Vice Chancellor for approval.
- o) **Award of Plaque & Merit Certificate:** The applications are invited by the Registrar office from the faculty in recognition of their outstanding research, teaching and extension work through the controlling officers every year. A Core Committee is approved by the Vice Chancellor for the selection of the Award, which is the final authority to finalize the award.

6.6.5.4. Capacity Building and Training

Capacity building events/activities were organized for the University faculty, field extension workers, industry and farmers/ fruit and vegetable growers. The faculty in the University is motivated and encouraged for professional growth by providing an environment conducive to carry on the academic pursuits. The teachers are encouraged to provide consultancies to private sector organizations. Faculty members are also provided the necessary financial assistance for participation at national and international (wherever possible) level academic activities. The in-service faculty can avail study leave to improve their qualifications. A number of MoUs have been signed with national and international agencies for the benefit of faculty to improve their competencies through foreign trainings. There is a provision of sabbatical leave for the faculty to work in international laboratories. A brief details is given in Table 5.6 and complete list of events related to capacity building including summer/ winter schools, CAFT trainings, workshops/seminar, etc. organized at PAU (year wise) has been given in Annexure VI.

The capacity building activities for stakeholders include technical sessions, Seminars/ webinars/ Talks by experts, Winter/ Summer schools/Short as well as long duration Trainings, Workshops, Demonstrations/ Mela (other than Kisan Mela), Scientist Farmer Stakeholders meet. PAU organizes trainings for the farmers and farm women at its main campus and all its regional KVK's. The details of the trainings are finalized at the start of each year in the form of a training calendar and the details are provided month wise on its web page. A Skill Development Center has been imparting vocational trainings for Capacity Building/ Skill up-gradation of farmers and extension functionaries. The trainings were organized for quality seed grower, gardener, organic grower etc. Training of Master Trainers (ToMT) in agriculture and allied subjects. i.e. Beekeeper, Organic grower, Agriculture extension service provider, Bulb Crop Cultivator, Solanaceous Crop Cultivator, Gardener, Asstt. Gardener, Nursery worker, Pesticide and fertilizer applicator, Green house operator, Micro Irrigation, Technician tractor operator, Tractor mechanic etc. were organized under Skill Development Centre at PAU. These trainings were

Table 5.6 Capacity Building and Trainings

	2018-19	2019-20	2020-21	2021-22	2022-23
Scientist Farmer Stakeholders meet	6	6	2	2	16
Demonstrations/ Mela (other than Kisan Mela)	1	2	-	1	1
Workshops	8	6	3	6	24
Short duration Trainings	10	21	3	41	29
Winter/ Summer schools/ Trainings	6	4	-	-	1
Technical sessions	17	7	1	9	21
Seminars/ webinars/ Talks by experts	19	27	5	41	16
Total	67	73	14	100	108

provided to farmers, farm women, school dropout and youth of all categories (General/ SC /OBC). During the period under report a total of 362 such

activities were organized with a distribution of 67, 73, 14, 100 and 108 during 2018-19 to 2022-23.

6.6.6. Student Development

6.6.6.1. Scholarships/Stipends

PAU awards merit scholarship to one student for every seven students admitted to UG and PG programmes each. These merit scholarships are dispersed on the completion of each semester. In addition to PAU merit scholarships, other scholarships have been instituted by various organisations, industry and alumni for UG and PG programmes. The details of these scholarships are as given below:

University Scholarships: Awarded to meritorious students of undergraduate programmes on the basis of performance in the entrance examination/qualifying examination valued at Rs. 500/- p.m. The number of scholarships is determined by the Academic Council from time to time.

Marketing Board Scholarships: The Punjab State Agriculture Marketing Board awards merit-cum-means scholarships at the rate of Rs.750/- p.m. district-wise and for Kandi area for meritorious undergraduate students of the COA and COAET. These scholarships are awarded to the students hailing from rural areas of the Punjab state on fulfilment of prescribed conditions. The scholarship is awarded one each for each of the district of Punjab and Kandi Area.

ICAR Scholarships: The ICAR awards National

Talent Scholarships for its nominees, based on AIEEA-UG conducted by the ICAR, for undergraduate programmes for full degree duration subject to fulfilment of prescribed conditions. The value of scholarship is Rs. 1000/- p.m.

Dr G.S. Khush Scholarships: Dr Gurdev Singh Khush Foundation awards scholarships @ Rs. 1200/- per student per month (Rs. 14,400 per annum lumpsum) to the students pursuing various undergraduate degrees. The scholarship is awarded only to the rural students who have passed matric from school located in rural area of Punjab.

Dr S.K. Vasal Scholarship: This scholarship @ 1500/- per month is awarded to one M.Sc. student with the highest OCPA in the discipline of Plant Breeding and Genetics.

Mrs Jaswant Kaur Bindra w/o Dr Onkar Singh Bindra Scholarship: This scholarship @ 3000/- per month plus contingency grant of Rs. 5000/- per annum is awarded to one M.Sc. student with the highest rank in the admission list from the discipline of Entomology.

Shri Bal Krishan Vaid Merit Scholarship: This scholarship @ 1000/- per month is awarded to one meritorious student each from 1st, 2nd, 3rd and 4th year class of B.Sc. Agri. (Hons) 4-year programme.

Dr G. S. Grewal Memorial Fellowship: This fellowship @ Rs. 2000/- per month is awarded to two M.Sc. students on merit basis (one each from 1st and 2nd year) from the discipline of Chemistry.

Dr S.S. Guraya Memorial Fellowship: This fellowship @ Rs. 1500/- per month shall be awarded to two M.Sc. students on merit basis (one each from 1st and 2nd year) from the discipline of Zoology.

Mrs Jaswant Kaur Bindra w/o Dr Onkar Singh Bindra Fellowship: This fellowship @ Rs. 4000/- per month plus contingency grant of Rs. 10000/- per annum is awarded to one Ph.D. student with the highest rank in the discipline of entomology.

College of Agriculture Alumni Association Scholarships: Alumni Association of the College of Agriculture awards scholarships @ Rs. 1000/-p.m. on merit basis, one each for each of the class of B.Sc. Agri. (Hons) 6-year programme.

Plant Pathology Alumni Medal with Cash Prizes: Plant Pathology Alumni Medal with Cash Prize of Rs.25,000/- is awarded to the meritorious student of M.Sc. Plant Pathology for excelling in academics.

Alumni Gold Medal for Excellence in Academics in Chemistry/Biochemistry: The Medal is instituted by Alumni batch of B.Sc. (Hons) programme (1970-74) of Chemistry/ Biochemistry. It is awarded to the student obtaining highest OCPA in M.Sc./ Five Year Integrated M.Sc. (Hons) programme in chemistry/ Biochemistry.

Alumni Cash Award for Excellence in Research in Chemistry/Biochemistry: The Cash Award is instituted by Alumni batch of B.Sc. (Hons) programme (1970-74) of Chemistry/ Biochemistry. It comprises of a certificate and Rs.10,000/- and is awarded to a student showing excellence in research conducted in M.Sc./Five Year Integrated M.Sc. (Hons) programme in Chemistry / Biochemistry.

Sports Scholarships: PAU awards scholarships not only for the academic performance of the students but various scholarships have been instituted based on the excellence in the sports arena. Brief descriptions of such scholarships are listed as follows:

The University awards sports scholarships @ 500/- p.m. on fulfillment of prescribed conditions. Four scholarships are awarded for major games,

i.e. Hockey, Football, Athletics & Cricket and six scholarships are given for minor games, i.e. Basketball, Badminton, Table Tennis, Cycling, Handball, Volleyball, Lawn Tennis, Kabaddi, Weight Lifting, Aquatic, Shooting and Roller Skating.

Punjab Govt. Scholarships: The Punjab Govt. also provides assistance to students subject to fulfilment of prescribed conditions under the following schemes: i) Post-Matric Scholarship scheme (Govt. of India); ii) Scholarship scheme for backward class students; iii) Fellowship scheme under State Scheduled Castes Welfare Department; iv) Scholarship for students belonging to Ex-criminal Tribes; v) National merit scholarship scheme; vi) State merit scholarship scheme; vii) Scholarship for Teachers wards; viii) Scholarship scheme for the wards of Terrorists/1984 riots affected families; ix) Grant for the wards of serving/exserviceman; x) Centrally Sponsored Scheme of Post Matric Scholarship to SC students; xi) Post-Matric Scholarships for OBC Students; xii) National Overseas Scholarship Scheme for SC Students for Higher Studies abroad; xiii) Central Sector Scholarship Scheme of Top Class Education for SC Students.

Lata Mahajan Chinnan Sports Scholarship for Women: Scholarship in the name of Lata Mahajan Chinnan for Five Women Best Sportspersons of the University @ Rs. 1000/- per month.

Shri Amarpal Singh Sandhu Cash Award: Three cash awards have been instituted in the name of Shri Amarpal Singh Sandhu. Cash Award of Rs. 5,000/-, Rs. 3,000/- and Rs. 1,000/- are awarded to first, second and third Best Athlete (M) of University at the time of Annual Athletic Meet of the University.

Lata Mahajan Chinnan Cash Award for 1st, 2nd and 3rd Best Athlete and also a Gold Medal for Best Athlete: Three cash awards have been instituted in the name of Lata Mahajan Chinnan. Cash Award of Rs. 5,000/- Rs. 3,000/- and Rs. 1,000/- are awarded to first, second and third Best Athlete (W) of University at the time of Annual Athletic Meet of the University. Also a Gold Medal is awarded in the name of Lata Mahajan Chinnan to the Best Athlete (W) of the University at the time of Annual Athletic Meet of the University.

Devinder Singh Bansal Memorial Cash Prize: Cash award of Rs.1,000/- instituted in the name



of Devinder Singh Bansal. It is given to the Best Cyclist of the year.

Sardar Arjan Singh Bhullar Cash Award: Cash award of Rs. 5,000/- instituted in the name of S Arjan Singh Bhullar is given to the Best Hockey Player of the year.

Lt. Triveni Singh Thakur Cash Award: Two cash awards of Rs. 5000/- instituted in the name of Lt. Triveni Singh Thakur are given to each Men and Women best athlete.

Sardar Harpreet Singh Kalsy Cash Award: Cash awards, in the name of Late S. Harpreet Singh Kalsy, has been instituted for Best Table Tennis player (men and women) with the cash prize of 2500/- each. These awards have been started from the academic year 2020-21.

Gurbachan Singh Bajwa Cash Award: Cash awards in the name of Late Dr. Gurbachan Singh Bajwa have been instituted for Best Athlete (Men) and Best Athlete (Women) with the cash prize of Rs. 5000/- each. These awards have been started from the academic year 2022-23.

Piara Singh Parmar Memorial Society awards: The society has instituted the following Medals, Sports Fellowships and financial aid in the memory of Piara Singh Parmar, a meritorious M.Sc. student of Agronomy and a National Level Handball player.

Two Sports Fellowships : Two Sports Fellowships of Rs. 25,000/- are awarded to Outstanding Sports Persons excelling in any game at the state level or above.

Financial Aid: Nine deserving needy students from the College of Agriculture, College of Basic Sciences & Humanities and College of Agricultural Engineering & Technology are given financial aid of Rs.20,000/- each to facilitate their studies.

Need based financial support is also extended to the students through Students' Aid Fund and Alumni funds available at college and university level. Students are encouraged and prepared to compete for national and international fellowships and funding opportunities to get admissions in other universities. The detail of the various scholarships on by the students is given below (Table 6.1 & 6.2).

6.6.6.2. Extra and Co-curricular Activities

PAU has ensured that sports and Co-curricular activities are embedded in the busy academic schedule of the students so as to achieve the goal of developing students with multifaceted personalities. The spirit of participation, competition and companionship is promoted by organizing inter college youth festival, athletic meet and game wise tournaments at University

Table 6.1 Scholarships earned by students (Year-wise 2018-23)

Year	University Merit Scholarship	NTS	Other scholarships	PAU Other scholarships	PG scholarships/ fellowships (ICAR/ CSIR/ UGC/ INSPIRE / ICMR/ others)
2018-19	194	130	74	56	130
2019-20	356	144	49	73	181
2020-21	404	99	39	76	113
2021-22	404	155	34	107	118
2022-23	432	137	38	79	104

Table 6.2 Total scholarships earned by students in five years (College wise)

Year	University Merit Scholarship	NTS	Other scholarships	PAU Other scholarships	PG scholarships/ fellowships (ICAR/ CSIR/ UGC/ INSPIRE / ICMR/ others)
COA	845	287	131	235	333
COHF	113	43	15	14	19
COAET	202	162	26	41	88
COCS	281	68	16	44	90
COBSH	349	105	66	67	97

level. Such activities are a regular feature in the University and are included systematically in the academic calendar of PAU. These activities are instrumental in identifying the talent in the concerned domains. Talent identified through these activities is further nurtured by preparing the students for various competitions and youth festivals outside the University. PAU prepares its sportspersons and artists to represent the University in Inter Zonal and National Level competitions organized by Association of Indian Universities (AIU), Indian Council of Agricultural Research (ICAR) and Youth Welfare Departments of State/National Government. For administering these activities a well defined structure is in place. This structure includes appointing Presidents of various sports and games at College and University Level. Besides, the Presidents for Dance, Drama and Music Club (DDMC) and Literary clubs are in place for each college.

NCC/NSS/NSO Units

Enrollment for National Sports Organization (NSO), National Service Scheme (NSS) and National Cadet Corps (NCC)

It is mandatory for each Bachelor's degree level student to participate in one of the three programmes run by the University, i.e., NSO/NSS/NCC, in first and second year of the educational program. The foreign nationals are exempted from this enrollment. Enrollment in these programs is formalized through the concerned Dean and Director Students' Welfare and the record maintained in the personal files of the students by the University.

National Service Scheme (NSS)

NSS program targets at connecting the volunteers with the community by inculcating a sense of social and civic responsibility. This platform helps and participants to practice and promote national integration and social harmony. By being part of social service initiatives, the students develop leaderships qualities and are better equipped with the skills required to deal with the situations of emergency and natural disasters. NSS programme at PAU has special focus on providing social services in rural areas and the students work to support the needy people for enhancing their standard of living.

National Service Scheme (NSS), which works on the motto of 'NOT ME BUT YOU' inculcates the spirit of voluntary service among the student and brings our academic institutions closer to the society. This programme for the students integrates knowledge and desirable actions for community development. NSS programme aims to inculcate the idea of social welfare in students and to provide service to society without bias. Details of activities carried by NSS are given in Table 6.3.

Activities against social evils

- The NSS volunteers visited different villages of Punjab and conducted awareness rallies on Crop Residue Management. Face to face meeting with farmers as well as groups of farmers were also done to convince them for not burning paddy straw with the involvement of Krishi Vigyan Kendras. In addition, literature related to 'No to stubble burning' was also distributed among the farmers in the form of pamphlets and handbills. Farmers were sensitized about harmful effects of paddy straw burning (Fig.6.1) and were motivated to stop stubble burning in their fields. They were explained about alternative options/techniques available for paddy straw utilization and management.
- The awareness regarding a variety of social issues such as adoption of organic farming, HIV/AIDS awareness, warning against ill effects of drugs, judicious use of ground water, road safety and environmental pollution are spread among masses through banners, posters distribution of literature, hand bills and interactions with rural as well as urban people at the campus during the Kisan Melas held in March and September every year.
- NSS volunteers participated in Poster Making and Essay Writing Competitions on International Biodiversity Day, World Environment Day and depicted the steps required for HIV/AIDS awareness, warning against ill effects of drugs, judicious use of ground water and environmental pollution.
- Rallies were organized to advocate the eradication of social evils like drug addiction, child labour, communalism, HIV/AIDS awareness. Rallies for promoting clean and

Table 6.3 Students in National Service Scheme

Year	Total Volunteers enrolled	One day regular activity camps	Seven days Special camps	Extra Camps under NSS as special Events	Blood Donation Camps	Participation in				
						NAC	Pre-RD parade Camp	RD Parade Camp	BCS	NYF
2018-19	649	20	1	4	1	3	2	1	1	1
2019-20	681	20	1	3	-	-	1	1	-	-
2020-21	569	-	-	-	-	-	-	-	-	-
2021-22	590	10	1	2	-	-	1	-	-	-
2022-23	673	20	0	-	-	-	1	-	-	-

NAC : National Adventure Camp, Pre-RD Parade Camp : Pre-Republic Day Parade Camp, RD Parade Camp : Republic Day Parade Camp, BCS : Bhartiya Chhatra Sansad, NYF: National Youth Festival



Fig. 6.1 Village level rally organized by the NSS against straw burning – November 2022



Fig. 6.2 Cleanliness campaign organized on the PAU campus, February 2023

some trees in PAU campus beautification (Fig. 6.2).

Environment Conservation

- Plantation of around 2000 saplings was carried out at University Campus and the University Seed Farm, Ladhawal under guidance of Department of Forestry & Natural Resources.
- Under national initiatives related to Swachh Bharat Abhiyan, NSS volunteers participated in Swachh Bharat Abhiyan and cleaned various places of PAU. Under Clean India 2.0 campaign, every NSS volunteers collected 1.5 kg waste from PAU campus.
- Guest lecture on “Balihari Kudrat Vaseha” delivered by Padma Shri Sant Balbir Singh Seechewal, Member of Parliament and famous environment activist.
- Campus beautification & cleanliness drive was conducted. Students painted bottom of

Blood Donation and Health Awareness Activities

- Blood Donation Camps were organized in collaboration of Red Cross Society and Civil Hospital, Ludhiana. The NSS volunteers also donate blood to the needy patients in local hospitals as and when needed.
- Health awareness workshop was conducted by Dr Kunal Dhall, Onco Surgon, DMCH, Ludhiana and Dr Bhupinder Singh, Cardiologist, AIIMS, Ludhiana
- Organized Mediation and Mental Health campaign under ‘Har Ghar Dhyam’ of Ministry of Culture, GOI
- Organized International Yoga Day

Training on Traffic Regulation and Educating citizens:

- NSS volunteers of the university participated in Training on Traffic Regulation and Educating Citizens of Ludhiana regarding Traffic Rules

and Regulations. This training was organized by Ludhiana Traffic Administration at Traffic Park, Near Bus Stand, Ludhiana.

Republic Day and Independence Day Celebration

- These national days are celebrated by NSS Volunteers of PAU with great enthusiasm.

National Cadet Corps (NCC)

NCC program at PAU is instrumental in developing character, camaraderie and discipline. Besides, it infuses the spirit of adventure and the values of selfless service amongst the cadets.

- Apart from attending a compulsory annual training camp, every cadet enrolled in NCC is required to participate in 40 hours of parade each semester. The enrolled students are required to participate in 75% of the parades as minimum.
- During the Independence Day and Republic Day celebrations on the University campus, NCC cadets present a guard of honour to the Chief Guest of the occasion. To inculcate the qualities of serving others, NCC cadets are deputed during Kisan Melas at PAU to help and guide the farmers and other visitors. These cadets actively participate in various events such as Swachh Bharat Abhiyan, National Yoga Day and Annual Athletic Meet of the University every year. The accomplishments of NCC cadets are presented in Table 6.4.
- Mr. Gurarshbir Singh (GL-2016-A-001-BVI) participated in Republic Day Parade in 2019 and 2020 at New Delhi as NCC Horse Riding Cadet. He has won a number of events at the Horse Riding competitions held on the eve of Republic Day. His laurels at national level

include Gold medal in HACKS BOYS NOVICE, Runner Up in overall TENT PEGGING in Dr. Roop Jyoti Sharma Trophy and Bronze medal in TENT PEGGING BOYS NOVICE. He also secured 3rd position in Jumping Normal in The Delhi Horse Show at the Army Equestrian Centre, New Delhi in 2021-22. Ms Abheet Aulkah (GL-2017-A-002-BVI) won the Bronze Medal in Horse Riding at State Level Competition.

6.6.6.3. Health Facilities

To meet the medical needs of students, faculty and staff, PAU has University Health Centre in the campus on an area of 16604 sq.ft. Facilities available at PAU Health Centre (Fig. 6.3) are:

- OPD facility with 3 medical officers Clinical laboratory
- 24 beds
- Radiology – X-ray unit
- Biochemistry – Autoanalyzer, Cell counter and other biochemistry tests
- Ambulance



Fig. 6.3 Radiology section at the PAU Health Centre

Table 6.4 Number of cadets passed 'B' and 'C' Certificate examination from 2018-19 to 2022-23

College	College of Agriculture		College of Agriculture Engineering & Tech		College of Home Science		College of Basic Science		College of Horticulture and Forestry		Total	
	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'
2018-19	13	14	3	5	-	-	-	-	-	-	16	19
2019-20	6	11	4	2	2	-	-	-	-	-	12	13
2020-21	15	4	8	4	1	2	-	-	-	-	24	10
2021-22	5	6	7	7	2	-	3	-	2	-	19	13
2022-23	8	1	4	3	2	2	11	-	6	1	31	07
Total	47	36	26	21	7	4	14	0	8	1	102	62



6.6.6.4. Sports and Cultural Facilities

PAU has the state of art facilities for Sports and Games. Sports infrastructure in the University includes Synthetic hockey surface (Astroturf) with floodlights, Cycling Velodrome and swimming pool. These landmark facilities are at par with the specifications of international competitions. Besides, the University provides excellent sports facilities to the students in form of Athletics Track, Lawn tennis Courts, Handball Courts, Volleyball Courts and Basketball Courts. PAU also has a Cricket Ground and a number of Soccer Play fields. Indoor Modern Gymnasium facility (39000 sq.ft) contains table tennis arena, badminton courts, bodybuilding and weight Lifting facilities. Besides, student hostels also have appropriate sports facilities. Table 6.5 provides the details of sports infrastructure at PAU.

University has an open air theatre for organizing the cultural events. This open air theatre has been recently converted into an all weather facility with

a total seating capacity of 5000. Table 6.6 provides a glimpse of various sports events organized at PAU. University students have brought laurels in various sports activities. Details of such recognitions and achievements are given in Table 6.7.

Along with academics and sports, PAU is also known for inculcating the festive spirit in the students by means of providing them a platform for participating and excelling in the arena of cultural activities. Details of various cultural events organized by PAU are given in Table 6.8. Propelled by these events PAU students have won a number of recognitions and positions in the cultural activities. A glimpse of such achievements is provided in Table 6.9. Stronger cultural roots are the cause for a balanced and sound personality. PAU students are encouraged to nurture the traditions and are provided a platform for showcasing their talent. Table 6.10 presents the achievement of PAU students in this regard along with the laurels in various national/state events.

Table 6.5 Sports and Games Facilities

Sports	Infrastructure			Whether as per Standard Specifications	
	Name	Type	Number	Yes	No
Indoor					
Badminton	Court	Wooden	3	Yes	-
Weight Lifting	Stage	Multi-station Gym, Single Station exercises + free weights	Separate gym for boys & girls	Yes	-
Table Tennis	Hall	Cemented	5	Yes	-
Shooting	Hall	Cemented	1	Yes	-
Outdoor					
Athletics	Track	Grassy	1	Yes	-
Cricket	Field	Grassy	1	Yes	-
Cycling	Velodrome	Cemented International Level	1	Yes	-
Football	Field	Grassy	2	Yes	-
Handball	Court	Clay	2+1 (flood light)	Yes	-
Hockey	Field	Astroturf + Grassy	1 + 2	Yes	-
Kabaddi	Court	Clay	1	Yes	-
Aquatic	Pool	Outdoor	1	Yes	-
Tennis	Court	Clay + Cemented	2 + 3	-	-
Water Polo	Pool	Outdoor	1	-	-
Basketball	Court	Cemented	2+1 (flood light)	Yes	-
Volleyball	Court	Clay	2+1 (flood light)	Yes	-

Table 6.6 Sports events organized at PAU

Sr. No.	Year	Event
AIU/ICAR Zonal/National Level		
1.	2018-19	XIX All India Inter Agri Sports & Games Meet
PAU Inter College event		
1.	2018-19	53rd Annual Athletic Meet of PAU
		PAU Inter College Tournament
		Annual NSO Coaching Camp
		International Day of Yoga
2.	2019-20	54th Annual Athletic Meet of PAU
		PAU Inter College Tournament
		Annual NSO Coaching Camp
		International Day of Yoga
3.	2020-21	PAU Inter College Tournament
		Annual NSO Coaching Camp
4.	2021-22	55th Annual Athletic Meet of PAU
		PAU Inter College Tournament
		International Day of Yoga
5.	2022-23	56th Annual Athletic Meet of PAU
		PAU Inter College Tournament
		Special NSO Coaching Camp
		Annual NSO Coaching Camp
		International Day of Yoga

Table 6.7 Participation and Recognitions of students (ICAR Inter Agri Sports & Games Meet and others)

Year	Event	Competition All India Inter-Agricultural University Sports & Games Meet	North Zone Inter-University	All India Inter-University	National	International
2018-19	Handball				Gold Medal	
	Handball				Participation	
	Hockey				Participation	
	Kabaddi				Participation	
	Roller Skating			Gold medal Silver Medal Bronze Medal		
	Handball		4th position	4th position		
	Basketball (M)	Gold Medal				
	Handball (M)	Gold Medal				
	Volleyball (M)	Gold Medal				
	Basketball (W)	2nd position				
	Badminton (W)	3rd position				
	5000M Walk (M)	1st position				
	1500M (W)	2nd position				
	800M (W)	2nd position				



	110M Hurdles (M)	2nd position				
		Runner-up trophy in Athletic (M)				
		Winner of Overall Games Trophy (M)				
		Winner of Overall Team Championship				
2019-20	Athletics (M)					Participation
	Power Lifting (M)				Participation	
	Power Lifting (M)				Participation	
	Handball (W)				Participation	
	Athletics			Participation (Khelo India)		
	Basketball (W)	2nd position				
	400M (M)	1st position				
	4 X 100M Relay (M)	1st position				
	800M (W)	1st position				
	1500M (W)	1st position				
	800M (M)	2nd position				
	200M (M)	3rd position				
		Best Athlete in Women Category				
2020-21	Roller Skating (M)				Participation	
2021-22	Roller Skating (M)				Silver Medal Bronze Medal	
	Handball (W)				Bronze Medal	
	Handball (W)				Bronze Medal	
	Hockey (M)				Bronze Medal	
	Hockey (M)				Participation	
	Shooting (M)				Participation	
	Shooting (M)				Participation	
	Shooting (W)				Participation	
2022-23	Handball (W)				Bronze Medal	
	Athletics (M)				Bronze Medal	
	Shooting (M)				Participation	
	Shooting (M)				Participation	
	Shooting (M)				Participation	
	Shooting (W)				Participation	
	Handball (M)				Participation	
	Table Tennis (W)	Gold Medal				
	400M (M)	1st position				
	100M (W)	1st position				
	200M (W)	1st position				
	Long Jump (W)	1st position				
	200M (M)	2nd position				
	100M (M)	2nd position				

	800M (W)	2nd position			
	1500M (W)	2nd position			
	5000M (W)	2nd position			
		Overall Runners Up in team games (women category)			



Fig. 6.4 XIX All India inter Agricultural Universities sports and games meet 2018-19, held at PAU from 2-5 January, 2019

Table 6.8 Events organized at PAU from 2018-19 to 2022-23

S.No.	Year	Event
National/AIU/ICAR/State level		
1	2018-19	North Zone Level Post Graduate Students Elocution Contest on the topic "Transforming Agrarian Economy : Innovative Solutions through Science & Technology" was organized by Directorate of Students' Welfare under the aegis of National Academy of Agricultural Sciences (NAAS) & Indian Council of Agricultural Research (ICAR), New Delhi on 24th August, 2018 at PAU campus
2	2018-19	A five day "Punjab Kala Utsav" was organized at Punjab Agricultural University, Ludhiana in collaboration with Punjab Art Council (Government of Punjab), Chandigarh from 24th to 28th September, 2018. In this event, a State Level Inter-College Cultural Procession competition was organized and selected events of Theatre, Music, Fine Arts & Dance were performed by various artists
PAU Inter-College level		
1	2018-19	PAU Inter-College Youth Festival for the session 2018-19 was organized by Directorate of Students' Welfare from 25th October to 3rd November, 2018 at PAU campus. Students from constituent colleges & institutes of PAU participate in the events pertaining to Dance, Music, Fine Arts, Literary, Theatre & Heritage
2	2019-20	PAU Inter-College Youth Festival for the session 2019-20 was organized by Directorate of Students' Welfare from November 1 to 8, 2019 at PAU campus. Students from constituent colleges & institutes of PAU participate in the events pertaining to Dance, Music, Fine Arts, Literary, Theatre & Heritage



3	2020-21	Online Poetry (Live) competition was organized by Directorate of Students' Welfare, Punjab Agricultural University, Ludhiana on November 1, 2020. Twenty four students from the constituent colleges & institutes of PAU participated in this online event. Topics for the event were 'IF', 'NATURE' and 'FAMILY'.
		Online Elocution Competition was organized by Directorate of Students' Welfare, Punjab Agricultural University, Ludhiana on December 03, 2020 to mark 'Agriculture Education Day', observed to commemorate the Birth Anniversary of Bharat Ratna Dr Rajendra Prasad, the first President of Independent India. The topic for Elocution Competition was 'Importance of Agricultural Education and Innovation for Farm Prosperity'.
		Online Competition of Poster Making event was organized by the Directorate of Students' Welfare on June 8, 2021 for the students of constituent colleges/institutes of Punjab Agricultural University, Ludhiana. Topic for the Poster Making event was "Environment Conservation"
		Online Competition of Cartooning event was organized by the Directorate of Students' Welfare, on July 25, 2021 for the students of constituent colleges/institutes of Punjab Agricultural University, Ludhiana. Topic for the cartooning event was "Online Exams".
4	2021-22	PAU Inter-College Youth Festival for the session 2021-22 was organized virtually by Directorate of Students' Welfare from November 11 to 14, 2021. Students from constituent colleges & institutes of PAU participate in the 20 events pertaining to Dance, Music, Fine Arts, Literary & Theatre.
		PAU Talent Harvest Heritage Festival was organized by Directorate of Students' Welfare on April 20, 2022 for the bonafide students at PAU campus. During the event competition of 9 Heritage Events was conducted. Stalls by the students of ELP (Experiential Learning Programme) of PAU were also displayed on this occasion for the faculty/students/employees. Cultural programme was presented by the PAU students during the prize distribution function
		On the occasion of Environment Day, the Directorate of Students' Welfare, Punjab Agricultural University, Ludhiana organized two days Photo Exhibition on "Nature" by Renowned Photo Artist S. Janmeja Singh Johal on June 8-9, 2022 in the Students' Home at PAU campus. On this occasion, Fine Arts competitions of Photography, Poster Making & Cartooning were conducted for the bonafide students of PAU. An expert talk was also organized during the event
		The Directorate of Students' Welfare, Punjab Agricultural University, Ludhiana organized competition of Creative Writing & Elocution events for the bonafide students of Punjab Agricultural University, Ludhiana on July 12-13, 2022 at PAU campus
5	2022-23	PAU Inter-College Youth Festival for the session 2022-23 was organized by Directorate of Students' Welfare from November 11 to 18, 2022 at PAU campus. Students from constituent colleges & institutes of PAU participate in the events pertaining to Dance, Music, Fine Arts, Literary, Theatre & Heritage.



Fig. 6.5 Annual Athletic meet of PAU



Fig. 6.6 March Past at XIX All India inter Agricultural Universities sports and games meet 2018-19

Table 6.9 Participation & Recognition of students in ICAR/AIU Inter University Festivals/Punjab State & others from 2018-19 to 2022-23

Year	Event	AIU National Inter-University Youth Festival, GOI	AIU North Zone Inter-University Youth Festival, GOI	ICAR All India Inter-Agri Universities Youth Festival, GOI
2018-19	Group Mime Poster Making		Bronze Medal 4th position	
	Group Mime	Participation		
	Group Song Indian Patriotic Group Song Extempore Skit Collage Making			Silver Medal Silver Medal Silver Medal Silver Medal Bronze Medal
2019-20	Mimicry Collage Making Group Song Indian Rangoli		Bronze Medal 4th Position 5th Position 5th Position	
	Mimicry	Participation		
	Group Song Indian Patriotic Group Song Light Vocal Solo Spot Painting			Gold Medal Gold Medal Gold Medal Gold Medal
2022-23	Quiz Elocution One Act Play Debate Skit Mime Installation Cartooning Mehandi Literary Category		Silver Medal Silver Medal Bronze Medal Fourth Position Fourth Position Fourth Position Fourth Position Fourth Position Fifth Position Overall Second	
	One Act Play Elocution Quiz	Silver Medal Bronze Medal Participation		
	Group Song Indian Folk Dance Boys Mono Acting			Silver Medal Bronze Medal Bronze Medal



Fig. 6.7 PAU Inter College Youth Festival (Oct-Nov 2018)



Fig. 6.8 Punjab State Inter University Youth Festival 2021-22 held at LPU, Phagwara



Table 6.10 Participation & Recognition of students in National/Punjab State Inter University Festivals & others from 2018-19 to 2022-23

Year	Even	National Youth Festival, GOI	Punjab State Inter-University Youth Festival, GOP
2019-20	Mono Acting Pihri Making Gidhha Chikku Making Debate Collage Making Quiz Bhangra Mime Mehandi Nala Bunna Phulkari		Gold Medal Gold Medal Silver Medal Silver Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal
2020-21	Panel Discussion Elocution Sculpture Making Creative Writing		
	Panel Discussion Panel Discussion Creative Writing	Gold Medal Bronze Medal Bronze Medal	
2022-23	Pihri Bunnah Naale Bunnah Chikku Bnauna Mitti de Khidone Bnauna Lammi Hek Wale Geet Phulkari Kadna Pakhi Bunnah Eenu Bnauna Gidhha Group Folk Song Installation Bhand		Gold Medal Gold Medal Silver Medal Silver Medal Silver Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal



Fig. 6.9 PAU Contingent for 36th North zone Inter University Youth Festival 2022-23



Fig. 6.10 Punjab State Inter University Youth Festival 2022-23 held at Punjabi University Patiala



Fig. 6.11 All India Inter Agricultural Universities Youth Festival 2022-23

6.6.6.5. Student Counseling & Placement Cell

A central University Counseling & Placement Guidance Cell (UCPGC) has been set up in the University. This cell provides placement and counselling services to all the students of University. UCPGC works both with the students and the potential recruiters for actualizing the final placements. UCPGC conducts various activities such as soft skill development, personality development and mock interviews for making the students industry ready (Table 6.11). Special sessions on resume writing and interview skills are also organized. UCPGC maintains liaison with the industry for knowing their job requirements and for facilitating the interactions between potential employees and potential recruiters. UCPGC maintains database of final year students so as to apprise them regarding various job opportunities. Online means are used for informing the students regarding various job openings obtained from the industry. A structured procedure for approaching the organizations and dissemination of job related information is in place. Students are also guided for preparing themselves for various competitive exams at National/International Level. UCPGC also provides career counselling services to the University students for making right career choices. Need based advice is also extended to the students interested to have their own business startups. Table 6.12 presents the job placements facilitated by UCPGC.

The Mode and Mechanism followed for the placement activities are as follows:

- Associate Director has been appointed for administering the activities of UCPGC. The university has also appointed Placement

Coordinators for all the constituent colleges, who act as a liaison between the students and the central Placement Cell.

- The university contacts all the prospective organizations which have the potential to recruit the University graduates by extending an invitation. Job description is obtained from the prospective employers in a structured format and the same is shared with the eligible students. Subsequently, the list of the aspirants (obtained on the basis of the response from the eligible students) is shared with the prospective employer and final phases of the placement process are undertaken.
- Some companies contact the university directly with their requirements and after getting the details, the same are shared with the students and applications are invited.
- Students are regularly updated about the various opportunities available in the Public Sector organizations and are guided to apply accordingly.
- Frequent Seminars, expert lectures and Interactions are organized for the student to provide them the information on career opportunities.

UCPGC also provides supportive services to students who face different types of problems while pursuing their studies in campus. Counselling cell specifically addresses the educational and vocational problems and generally addresses relationship issues, interpersonal problems, peer pressure, stress and anger issues. The main objective is to

Table 6.11 Workshops and Events for honing Personality and Soft Skills of the students

Topics	2018-19	2019-20	2020-21	2021-22	2022-23
Personality Development	8	18	14	14	04
Communication Skills	6	12	06	12	04
Soft Skills	2	14	04	08	04
Entrepreneurship Skills	3	08	04	12	--
Career Counseling	3	10	04	08	--
Team Building	4	12	06	14	04
Resume Crafting	4	14	06	12	02
Mock Interviews, GD	2	10	08	10	--
National and International Competitions	2	16	240	302	04
Mental Wellness	1	10	104	08	05
Total	35	124	396	400	27

Table 6.12 Campus Placement Record of the University during 2018-23

Year	PSU	Private	RF/TA	Self	Higher	Total
2018-19	67	64	33	17	118	299
2019-20	103	82	38	20	128	371
2020-21	60	73	32	23	173	361
2021-22	48	82	41	19	187	377
2022-23	41	66	42	18	144	311

capacitate students to manage their routine issues through life skill education. Illustrative material like posters, handbook- psychological first aid, leaflets, pamphlets and displays are prepared and disseminated to the students. Workshops are conducted to facilitate them in getting first-hand experience related to self-management and social management. For imparting better life skills, interactive sessions for the students are also organized

by inviting the experts such as academicians and practitioners from the domain.

Students' Hostels

Currently around 2650 students are residing in PAU hostels (Table 13 & 14), One hostel is exclusively available for the international students. This hostel has all the modern amenities and also provides the option of cooking for international students. All the



Fig. 6.12 Plantation Drive at Hostel No.5

Table 6.13: Hostel-wise capacity status of the PAU Boys' hostels

Sr. No	Name/No. of the Hostel	Capacity	Area (Sq. ft.)	Wi-Fi	CCTV	No. of cubicles	No. of two-seater dormitories	No. of three-seater dormitories	No. of four-seater dormitories
1	Hostel no. 1	204	48400	Yes	Yes	83	-	-	30
2	Hostel no. 2	204	48400	Yes	Yes	84	-	-	30
3	Hostel no. 4	213	54754	Yes	Yes	54	-	53	-
4	Hostel no. 7	155	47229	Yes	Yes	155	-	-	-
5	Hostel no. 13	192	40650	No	Yes	-	78	-	-
6	Hostel no. 15 (Dr MS Kang Boy's hostel)	210	55400	No	Yes	-	51	36	-
7	International Students Hostel	60	10658	Yes	Yes	24	18	-	-
Total		1238							

Table 6.14 Hostel-wise capacity status of the PAU Girls' hostels

Sr. No	Name/No. of the Hostel	Capacity	Area (Sq. ft.)	Wi-Fi	No. of cubicles	No. of two-seater dormitories	No. of three-seater dormitories	No. of four-seater dormitories
1	Hostel no. 5	138	-	Yes	74	64	-	-
2	Hostel no. 6	218	-	Yes	Nil	13	64	Nil
3	Hostel no. 10	90	-	Yes	-	-	30	-
4	Hostel no. 11	554	24712	Yes	30	6	16	116
5	Hostel no. 12	164	17110	No	Nil	16	32	9
6	Hostel no. 14 (Amrita Pritam Girls' Hostel)	144	17796	Yes	Nil	Nil	48	Nil
7	Hostel no. 16	108	-	Under process	-	-	36	-
Total		1416	-	-	104	99	226	125

hostels are equipped with secured with connectivity indoor games (Table Tennis, Carom, Badminton etc.) Each hostel has a common room with LED Television with local cable connectivity. Besides, magazines and newspapers are made available to the hostel residents. Directorate of Students' Welfare has also undertaken a campaign entitled "Mera Hostel Mera Ghar" so as to provide a homely environment to the hostel residents. Under this campaign various hostels events such as cultural nights, DJ nights and other recreational activities are organized.

6.6.6.5 Disabled Friendly Facilities

PAU has deep concern for the comfort of differently abled students, faculty and staff persons and has made proper arrangements to provide facilities in the college premises and other buildings to avoid any inconvenience to them. Ramps are constructed for providing easy access to the multi story buildings. Wheel chairs are made available for the movement in the buildings and sections of the university. Special arrangements are also made in the washrooms for the comfort and convenience of differently abled persons.

6.6.7. Infrastructure

PAU main campus is spread across an area of 1222 acres at Ludhiana and with an off-campus area of 5742 acres in various parts of the state. The university has six constituent colleges, viz. College of Agriculture, College of Agricultural Engineering & Technology, College of Community Science, College of Basic Sciences & Humanities, College of Horticulture and Forestry and College of Agriculture Ballawal Saunkhri, besides Institutes of Agriculture at Gurdaspur and Bathinda. The university has seven Research Stations, located at Ballawal Saunkhri (Shaheed Bhagat Singh Nagar), Gurdaspur, Faridkot, Bathinda, Abohar, Kapurthala and Dyal Bharang (Amritsar) and three Fruit Research Stations, situated at Gangian (Hoshiarpur), Bahadurgarh (Patiala) and Jallowal & Lesriwal (Jalandhar). For the seed production of new varieties university has five Seed Farms, located at Naraingarh (Fatehgarh Sahib), Ladhowal (Ludhiana), Nabha (Patiala), Usman (Taran Taran) and Birsikhan wala (Faridkot).

6.6.7.1. Physical facilities including administrative building and lands

The physical facilities available with university are given below (Table 7.1)

Administrative Buildings: The main campus at Ludhiana is very well laid out. The main Administrative Building is named after the first

Vice Chancellor of the University, Dr P.N. Thapar, ICS. This building has a floor area of 54311 sq. ft. and houses offices of Vice Chancellor, Registrar, Comptroller, Dean of Postgraduate Studies, Director of Research, Estate Officer and the Chief Engineer and their establishments.

Table 7.1 Institutional area of the University

Institutional details	Area (Acres)
Total area of the main campus	1222.00
i. Colleges and residential buildings	531.00
ii. Farms	691.00
Total area with Regional Research Stations	1683.47
Total area with KVKs	533.47
Total area with Seed Farms	3380.38
Total area with Fruit Research Stations	124.68
Total Institutional Area	5742.00

The Directorate of Extension Education is established in the Dr Khem Singh Gill Farmers' Service Centre. It has an area of 25992 sq. ft and was established in 1999 with the main objective to provide "Single Window Delivery System." The Centre addresses the field problems of visiting farmers. The other activities include sale of farm literature, quality seed and bio-fertilizers (Rhizobium culture). Similarly, the Directorate of Students Welfare operates from the dedicated building in the campus and exclusively caters to the sports, games, cultural and literary activities of

the students as well as providing accommodation facility to the students in university hostels.

The five constituent colleges (Table 7.2) of the university are located on the main campus. The offices of the Deans and their establishments are located in the respective buildings of each college.



Thapar Hall

Table 7.2 College wise infrastructure

Sr. No.	Name of the College	Building	Area (sq. ft.)
1.	College of Agriculture	Main building Departmental and associated buildings	674890 307674
2.	College of Horticulture & Forestry	Dean Office Dr KS Aulakh Examination Hall-cum-lecture Theater complex	3606 17222
3.	College of Agricultural Engineering & Technology	Main Building Implement Shed	165110 17115
4.	College of Basic Science & Humanities	Main Building New Wing & SBS building	62014 41795
5.	College of Community Science	Main Building	60480

Classrooms and Laboratories

Each college is provided with sufficient number of classrooms, teaching and research laboratories, seminar rooms, committee rooms and computer rooms. In addition to well furnished classrooms, there is sufficient number of state-of-the-art Smart Classrooms in each college equipped with multimedia projector, computer with power back-up, interactive board, internet connectivity and

recording facilities. There are facilities available to facilitate video-conference in College of Agricultural Engineering & Technology, College of Community Science, and College of Basic Sciences & Humanities. Each classroom can accommodate 60-65 students but each class has 40-50 students with 2 practical groups of 20 – 25 students each. The UG laboratories are usually 24' x 36' or 24' x 48', thus there is sufficient space for each student to carry out the practicals.

Examination halls: The university has two Examination Halls. The main examination hall can accommodate 400 students. A new examination building has been constructed with five classrooms on first floor (capacity 250) and two examination halls on ground & 2nd floor which can accommodate around 500 students during examinations.



Examination Hall

Instructional Farms: The University has revised and implemented the course curricula as per the recommendations of Vth Deans' Committee at undergraduate level and as per the recommendations of National Core Group constituted by ICAR at the postgraduate level. The post graduate curricula was further revised as per the recommendations of BSMA committees in 2021. The new curricula have laid more emphasis



Earn while you learn



Table 7.3 Research and Instructional Farm Area (acres)

Sr.No.	Name of the department	Research Area	Nursery area/	Teaching Area	Building and Screen houses	Total area
1.	Agronomy	42.0	-	-	27.0	69.0
2.	Climate Change & Agrometeorology	5.0	-	-	0.25	5.25
3.	Entomology	6.50	-	-	6.10	12.60
4.	Forestry & Natural Resources	35.0	-	7.0	-	42.0
5.	Fruit Science	78.0	10.0	5.0	7.0	100.0
6.	Vegetable Science	28.0	2.0	-	1.0	31.0
7.	Floriculture & Landscaping	6.0	-	8.0	-	14.0
8.	Plant Breeding & Genetics	205	18.75	-	6.0	229.75
9.	Soil Science	55.0	-	-	2.0	57
10.	School of Organic Farming	24.0	-	1.0	-	25.0
11.	Farm Machinery & Power Engineering	58.0	-	-	-	58.0
12.	Soil and Water Engineering	14.0	-	1.0	1.55	16.55
13.	Genetics and Biotechnology	35.0	-	-	-	35.0
14.	Botany	0.75	-	-	-	0.75
15.	Others	-	-	-	-	83.0
	Total					778.9

on practicals; therefore, the University has strengthened/created instructional farms (Table 7.3) in the prioritized areas. The area of Practical Crop Production farm is 42 acres. A group of 4 students is given 1 acre to perform all agronomic practices and is managed by students as “Earn while you Learn”.

Green house, Glass house, Poly house: The university has created infrastructure in the form of green/glass/poly/net houses at the main campus as mentioned in the Table 7.4. In addition the regional research stations and KVKs also have their own facilities for protected cultivation trials and demonstrations.

Table 7.4 Number of green/glass/poly/net houses

College	Green House	Glass House	Poly House	Net House
College of Agriculture	24	8	18	54
College of Horticulture & Forestry	38	3	10	20
College of Agricultural Engineering & Technology	-	-	7	1
College of Basic Sciences and Humanities	-	2	-	-

Auditoria

The University has several auditoria of different capacities suited for various kind of uses (Table 7.5). Each auditorium is equipped with the latest audio- visual equipment, comfort table seating arrangement, air-conditioning, stage lighting and sound systems.

Table 7.5 Seating Capacity of Auditoria at PAU

Name of Auditorium	Capacity (Seats)
Pal Auditorium	617
Shaheed Bhagat Singh Auditorium	120
Jacob Hall	200
Open Air Theatre	3600
Manmohan Singh Auditorium	1052
MS Randhawa Library Auditorium	70
Kulwant Singh Virk Auditorium	64
Wheat auditorium	190

Students’ Hostels

At present, around 2475 students have been accommodated in the hostels at PAU (Table 7.6). There is one hostel exclusively for international students with all the modern facilities. All the hostels have secured Wi-Fi internet connectivity.

Table 7.6 Hostels at PAU and their capacities

Sr. No.	Name of Hostel	Capacity	Area (sq. ft.)	Wi-Fi	Cubicles	Two seater dorms	Three seater dorms	Four seater dorms
Boys Hostels								
1.	Hostel No. 1	204	48400	Yes	83	-	-	30
2.	Hostel No. 2	204	48400	Yes	84	-	-	30
3.	Hostel No. 4	213	54754	Yes	54	-	53	-
4.	Hostel No. 7	155	47229	Yes	155	-	-	-
	Hostel No.13	156	105000	No	-	90	-	-
5.	Hostel No. 15 (Dr.M.S.Kang Boy's Hostel)	111	1068	Yes	-	50	36	-
Girls Hostels								
6.	Hostel No. 5	138	72000	Yes	74	32	-	-
7.	Hostel No. 6	218	1100	Yes	-	13	64	-
8.	Hostel No. 10	90	16830	Yes	-	-	30	-
9.	Hostel No. 11	531	24712	Yes	29	06	15	123
	Hostel No.12	153	21260	No	-	17	30	8
10.	Hostel No. 14 (Amrita Pritam's Girl's Hostel)	141	17796	Yes	-	-	43	2
11.	Hostel No. 16 (Dr. Satwant Kaur Mann Girl's Hostel)	108	-	Yes	-	-	36	-
Boys and Girls Hostel								
13.	International Students Hostel	53	10658	Yes	23	15	-	-
	Total	2,475	-	-	502	223	307	218

Indoor games (table tennis, carom, badminton etc.) are available in the hostels. Each hostel has a common room with an LED television (Local cable TV), magazines and newspapers. Adequate housekeeping staff has been provided for proper cleanliness and upkeep of the hostel premises and rooms.

University Residential Areas –Buildings

Different categories of houses for all classes of the employees available on the campus are given in Table 7.7, but the number is not sufficient and

Table 7.7 Details of Residential accommodation at PAU

Sr. No.	Name of the Building	No. of Units	Plinth area (Sq. Meter)
1.	V.C. Residence	1	483
2.	House VI Type	14	4478
3.	House VII type	14	3187
4.	House VIII Type	32	7289

5.	House IX Type	52	9884
6.	House X Type	126	14585
7.	Haathi Complex	90	8637
8.	House XII Type	92	7103
9.	Flat XII Type	36	2843
10.	House XIV Type	120	7804
11.	Flat XIV Type	90	6689
12.	S.R.F. Quarters	52	3382
13.	Farm superintendent quarters	3	922
14.	Pavate House	24	2007

consequently a large number of faculty and staff live out-side the campus.

Guest Houses

The University has well furnished guest houses (Table 7.8) for accommodating national and international visitors. The Kairon Kisan Ghar is the guest house meant for the accommodation of

farmers and trainees who come to the University to attend different training programmes.

Table 7.8 Details of Guest house at PAU

Sr. No.	Name of Guest House	No. of rooms
1.	Sutton House	4
2.	Parker House	96
3.	Dr DS Athwal International Scientist Centre	13
4.	Kairon Kisan Ghar	50
5.	Sukhdev Singh Bhavan / Faculty House	2

Other important facilities

Museum of Rural Life of Punjab – The Museum was conceived by Dr M S Randhawa, ICS and former Vice Chancellor of the University. It has rare collection of articles depicting rich cultural heritage of Punjab. The museum assumes much importance since the rural Punjab is changing fast. The old traditions and customs, which were rampant till the last decade, are now losing their grandeur with the intervention of the technology. Women fetching water in *gaggars* (the bronze pot) from the village well are no more seen. Old bronze utensils are now antique pieces. Spinning is no more done. Women do not embroider phulkari. In the fields, with the arrival of advanced technologies, the electric motors and pumps have replaced the *Dhingli* and *Charsa*. All such traditional items, which once lent charm to the Punjabi culture, are now nowhere to be seen. But the Museum preserves them all for those who still want to cherish the old, lovely memories as well as for those who are anxious to know about rural Punjab.

Dr Uppal Water and Power Resources Museum



Museum of rural life of Punjab

– The Museum was conceived by Dr H L Uppal, Professor Emeritus, formerly Chief Engineer, Department of Irrigation, Punjab. It was established in 1977. The Uppal Museum depicts the outdoor and indoor models of physiographical features of north western India. The Outdoor model is created by the mixture of cement and concrete, which shows the territories of Himalaya surrounded by hills and the passageway of famous rivers like the Ravi, Beas and Sutlej. The Indoor Model is created on scale (Vertical as well as horizontal scales), which shows relatively large area about 7,60,000 sq.km, covering several states of north-west India including Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, Uttarkhand and parts of Rajasthan and Western Uttar Pradesh. Heights of physical features on the model are marked by enamel paints of different colours and the different features of the model are shown by appropriate arrangements of light (florescent tubes, floodlight, neon light). The museum provides the demonstration of physiographical diversity and offer land and water resources of North West India. This Museum is useful for the students, researchers and planners to get the acquainted with the knowledge of our natural resources.

Off-campus infrastructure

Regional Research Stations & Fruit Research Stations

The off-campus Regional Research Stations (RRS) are a primary component of multi-location testing of the technologies developed under different research programs at the University. The RRS are under the direct administrative control of the Director of Research. The distribution of the Regional Research Stations is such that they collectively represent the different agro-climatic conditions of the state (Table 7.9). All field technologies, be it varieties of different crops, production and protection technologies or machines etc. are tested at the Regional Stations with focus on crop niche areas. The diverse testing environments reveal the potential of any technology to be recommended for a specific area/agro-climate or its wider adaptability across the state.

Crop specific focus of the Regional Research Stations is apparent from the fact that the core

breeding, agronomic and protection technologies of that crop are carried out at the off-campus station. RRS Faridkot and Bathinda cater to research on cotton, Kapurthala on sugarcane, Gurdaspur on lentil, urdbean, mango & litchi. RRS Ballowal Saunkri, located in the foothills of the

Table 7.9 Location and area off-Campus Research Areas of PAU

Sr. No.	Location	Area (acres)
1.	Ballowal Saunkhari	338.62
2.	Abohar	207.25
3.	Khanaura (Hoshiarpur)	36.00
4.	Atwal Farm, Hoshiarpur	104.00
5.	Dyal Bhanargh, Amritsar	49.02
6.	Bathinda (Main)	90.00
7.	Jodhpur (Bathinda)	53.63
8.	Ruldu Singh Wala (Bathinda)	18.98
9.	Jiwan Singh Wala (Bathinda)	23.59
10.	Shekhupura	50.01
11.	Gurdaspur	172.88
12.	Faridkot	63.33
13.	Kapurthala	401.16
14.	Kheri (Sangrur)	75.00
	Total	1683.47

Shivalik hills focuses on development / testing of varieties and matching production and protection technologies for the arid climate of that zone. Regional Fruit Research Stations (Table 7.10) focus on specific fruit species of their region/zone. Well realizing the importance of the Regional Research Stations, they have been strengthened in terms of scientific manpower from all relevant subjects for a multidisciplinary approach.

Table 7.10 Location and area of Fruit Research stations of PAU

Sr. No.	Location	Area (acres)
1	Gangian (Hoshiarpur)	47.88
2	Bahadurgarh (Patiala)	51.8
3	Jallowal & Lesriwal (Jalandhar)	25.0
	Total	124.68

University Seed Farms: The university has seed farms well distributed throughout the state (Table 7.11). Seed being the most critical component of the adoption and success of a variety, the seed farms have been equipped with adequate staff, machinery and equipment to produce quality

seed which is the Hallmark of PAU. The farms are under the administrative control of the Associate Director (Seeds), who reports to the Director of Research. The seed crops at the USF's are regularly monitored by the breeders of different crops and monitoring teams of the Assoc. Director (Seeds).

Krishi Vigyan Kendras (KVKs): First KVK was established at Gurdaspur during 1982-83 and presently, 18 KVKs are being run by PAU in different districts of the State (Table 7.12). Each KVK has been provided with a Project Coordinator along with six Subject Matter Specialists (SMSs). The SMS from the discipline of Animal Science, Home Science and Agricultural Engineering are mandatory for every KVK. Other three SMSs are deployed from the disciplines of Agronomy, Soil Science, Plant Pathology, Entomology, Fruits Science, Vegetable Science, Agroforestry, Food Science, Technology, Agricultural Extension and Agricultural Economics depending on specific requirement of the district.

KVKs are fully financed by the Indian Council of Agricultural Research (ICAR), New Delhi and are working as per the objectives and guidelines of the ICAR. The mandate of KVK's is to impart training to the farmers and unemployed rural youth in agriculture and allied disciplines; to impart training to the farmers and unemployed rural youth with the objective of increasing agricultural productivity and bringing youth in subsidiary occupations to supplement the family income; to organize frontline demonstrations in various crops to generate production data and feed-back information and to collaborate with scientists of Regional Research Stations and the State Extension Personnel in 'On-Farm testing', refining and documenting technologies for developing region specific sustainable land use system. On the whole, the KVKs act as front line extension agency rather than ground level extension agency. These kendras are largely engaged with on-campus activities and have limited outreach to farmers.

Each KVK has a farm area utilized for raising foundation/certified seed and provides live field demonstrations for the trainees. At present, KVKs impart practical oriented trainings ("Learning by Doing") in diversified areas of agriculture, hybrid seed production, cultivation of aromatic



and medical plants, dairy, poultry, bee-keeping, vermicompost, fishery, piggery, mushroom growing, IPM, nursery raising (horticultural, vegetables and flower plants), repair and maintenance of farm machinery, self employment of rural youth etc. Besides, training to rural women in income generating programmes like stitching, embroidery, knitting, soft toy making, soap making, fruit & vegetable preservation, food and nutrition is also provided at these centres.

Table 7.11 Location and area of Seed farms of PAU

Sr. No.	Location	Area (acres)
1.	Faridkot	1220
2.	Ladhowal	1250
3.	Nabha	493.78
4.	Naraingarh	371.6
5.	Usman – Taran taran	45.0
	Total	3380.38

Table 7.12: Location and area of KVKs of PAU

Sr No	Location	Area (acre)
1.	Amritsar	19.05
2.	Bathinda	25.0
3.	Faridkot	40.0
4.	Ferozepur	30.68
5.	Fatehgarh Sahib	20.32
6.	Gurdaspur	25.0
7.	Bahawal, Hoshiarpur	48.83
8.	Noormahal, Jalandhar	25.0
9.	Kapurthala	37.0
10.	Samrala, Ludhiana	29.06
11.	Mansa	21.15
12.	Budh Singh wala, Moga	26.15
13.	Goniana, Sri Mukatsar Sahib	49.98
14.	Langroya, Nawa Shahr	42.21
15.	Rauni, Patiala	38.24
16.	Ropar	25.0
17.	Kheri, Sangrur	25.0
18.	Pathankot	25.8
	Total	533.47

6.6.7.2. IT Infrastructure

Internet and Wifi Facilities

PAU has well established network of internet and Wifi facilities in the colleges, offices, hostels, guest

houses and administrative buildings. PAU has University Data Centre (UDC) to cater IT services in the campus. University Data Centre is hosting core engine for the fibre network of around 20 kilometers. Earlier HP-1000 System was in use but presently the work is done on Personal Computers.

The infrastructure of erstwhile computer centre, was upgraded and now it is part of Department of Electrical Engineering & Information Technology. The present set up includes thin client nodes for virus free internet zone. University Data Centre is providing and maintaining the essential Information Technology (IT) services viz. distribution of internet, e-mail and web server. Secured and smooth Wi-Fi connectivity is also provided to all hostels and departments through this centre. Information Technology services are regulated with back-up power supply to ensure maximum uptime.

The Student Academic Management System (SAMS)

The University also has in place an in-house developed Learning Management System for management of academic activities of the students. The Student Academic Management System (SAMS) has been developed by the Department of Electrical Engineering and Information Technology. The software system is developed and is in place for the benefit of the students, their advisors, instructors, Deans of the respective colleges and the academic assistants.

It helps in online registration, payment of fees, keeping record of the students' progress, allotment of courses, result submission etc. The access of the system is provided at various levels. The system helps in keeping track of the students academic progress, courses cleared, dissipation of information and providing notifications. It helps as a management tool in educational institution. The examples of various panels developed are illustrated in the following figures (Fig 7.1 and 7.2).

6.6.7.3. Students and Staff Amenities

In addition to the infrastructural facilities for sports and cultural activities available in the campus. PAU has also developed the facilities for recreation and entertainment of the students, faculty and staff members.

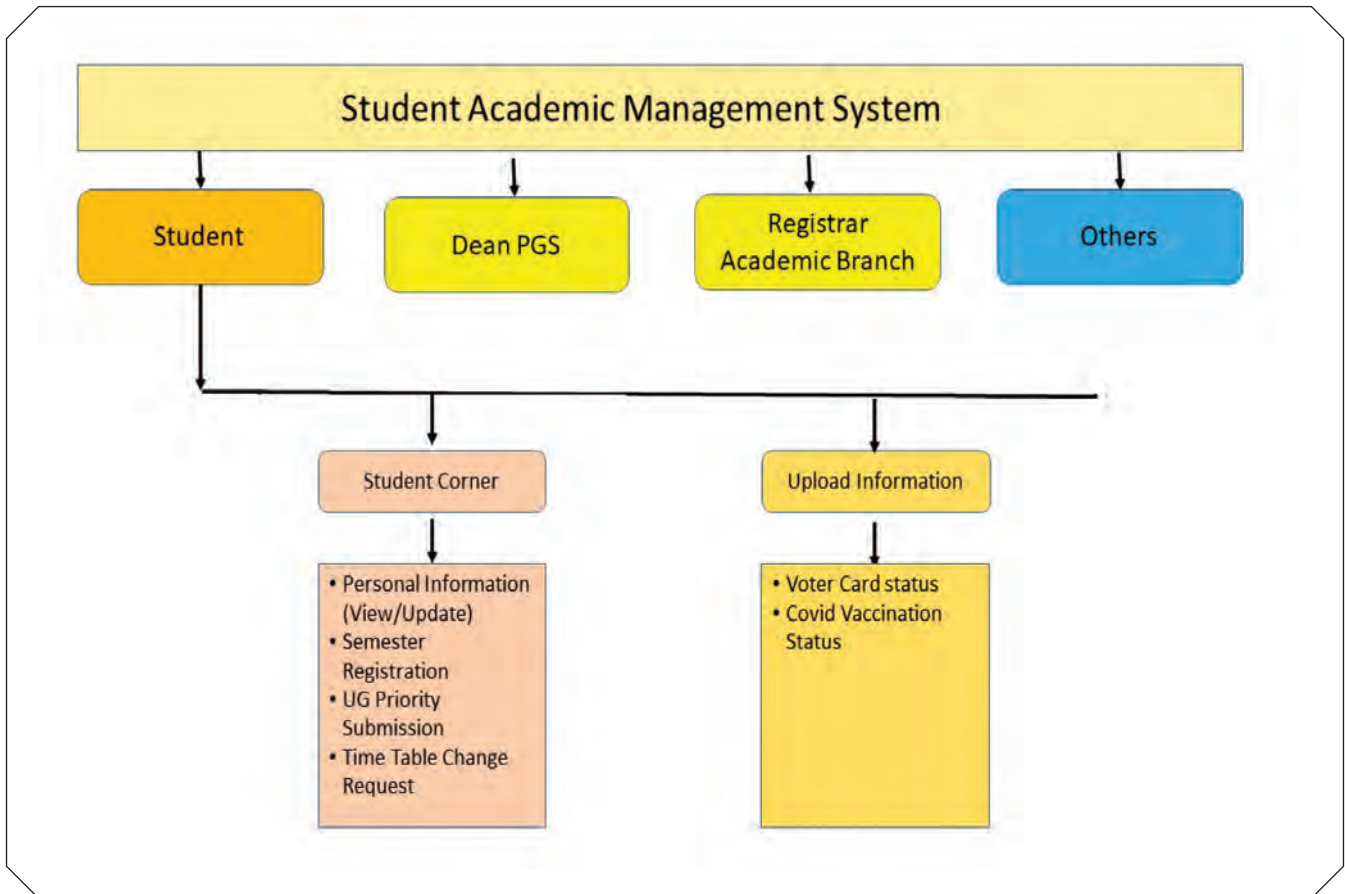


Fig. 7.1 SAMS - Students aspects

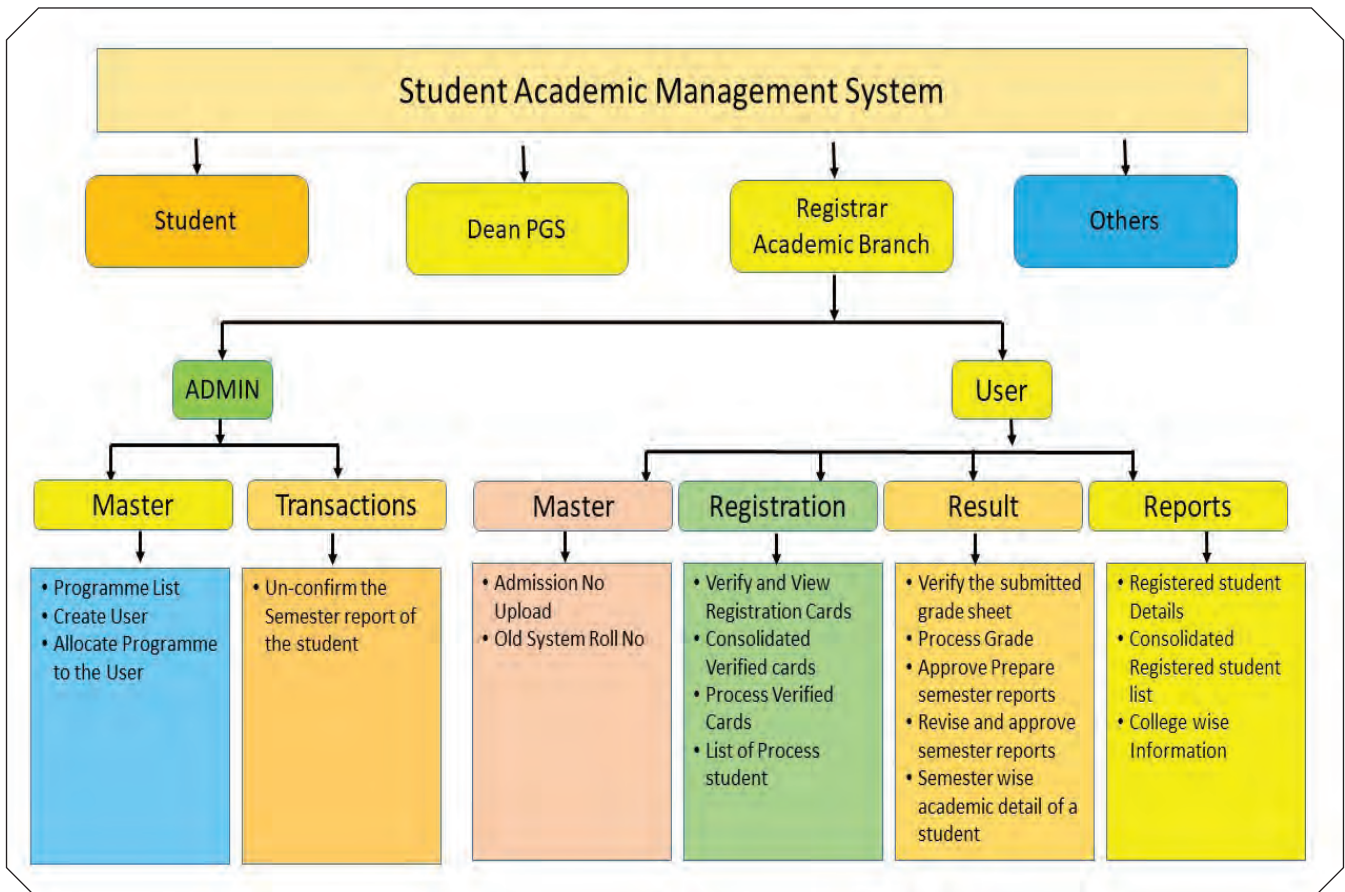


Fig. 7.2 SAMS-Registrar and Academic Branch aspects



Students’ Home: The Students’ Home building developed as a fully fledged central hub of activities for the students of PAU. The primary objective of the Students’ Home is to utilize spare time of the students in the best possible manner by providing various facilities for their knowledge, comfort and relaxation. The Building of Students Home consist of a large glazed reading room with comfortable sofas and tables for the sitting arrangement and latest magazines and news papers in English, Punjabi and Hindi. It has an auditorium with sitting capacity of 110 persons for organizing functions, seminars and parties of students and staff members. Art exhibitions are also arranged for students and staff from time to time. Two canteens cater to the needs of the students, staff members and their guests by providing them hot and cold drinks, sweets and snacks at reasonable rates. Stationary items and photostat machines are also provide within the complex. A free of cost internet facility is also available for the students.

Faculty Club: Also known as Dr Sukhdev Singh Bhawan, it houses recreation rooms furnished with indoor games, physical fitness rooms for men and women separately, a billiards/ snooker room, a reception lounge and two furnished retiring rooms, a banquet hall and a cafeteria.

Staff Club: It is located in the building of Parker House, a University Guest House. It is furnished with a recreational hall, dining hall, a canteen-cum- cafeteria and a reception room.

Community Centre for Staff: It is located near the staff quarters. It is primarily used by the staff for organizing social functions like marriages of wards and also to celebrate religious festivals, like Lohri, etc. It has a hall with a capacity to accommodate about 200 – 250 individuals and also a kitchen. It also has lawns to organize bigger functions.

University Petrol Pump: PAU has a petrol pump within the campus allotted by Indian Oil Corporation which operates from 7 am to 7 pm throughout the year. This facilitates the easy availability of petrol,

diesel and lubricants required for the university vehicles, tractors and farm machinery. In addition faculty and students can also avail the facility for their personal vehicles.

On-campus Banks: The university has the branches of three nationalised banks (State Bank of India, Bank of Baroda and Axis Bank) operating on campus. These banks also have ATMs within the campus. These facilitate financial transactions for faculty, staff and students as well as provide additional facilities such as loan facility, bank lockers and insurance.

On-campus post office: The availability of a post office on-campus, allows the students and staff as well as families residing at PAU to avail easy access of postage facility, post office bank, etc.

Child care centre: The university has three child care centres i) Early childhood care centre ii) Day care centre and iii) Nursery school for optimum development of children of PAU staff. Along with providing support to working mothers, these centres provide conducive and stimulating environment to toddlers.

In addition to the above, amenities relating to university health centre, sports infrastructure, workshop, maintenance units, etc. have been described in section 6.6.1.5. PAU also has a mini market with shops catering to daily needs of the staff and students and various other facilities listed below (Table 7.13).

Table 7.13 Details of other amenities at PAU

Sr.No.	Name of the Building
1.	Cafeterias (University Cafeterias Amul and Verka) and Canteens
2.	Recreational and sporting facilities (Clubs, gym, playground, swimming pool etc.)
3.	Market/Banks/Post office
4.	Gurudwara Sahib
5.	Health Centre
6.	Landscape nursery
7.	Herbal garden

6.6.8. Financial Resource Management

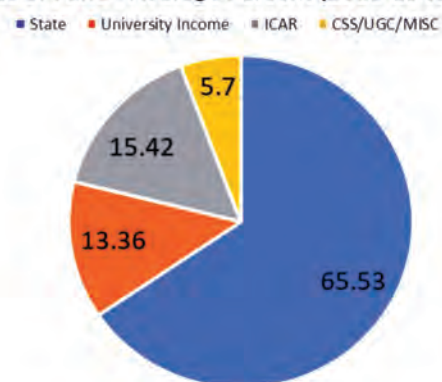
6.6.8.1. Budget Allocation

SOURCES OF FUNDS

The source of fund for university has increased from Rs 595.73 crores in 2018-19 to Rs 621.13 crores in 2022-23, depicting an increase of 4.26% (Table 8.1). The increase is mainly on account of state funding which has increased from Rs 380.05 crores in 2018-19 to Rs 416.73 crores in 2022-23 (an increase of 9.65%). The funding from ICAR has actually decreased from Rs 101.44 crores in 2018-19 to Rs 83.81 crores in 2022-23, which is a decrease of 17.38%. The average of last five years (2018-19 to 2022-23) depicts that 65.53% funding is on account of state schemes (both plan and non-plan). In addition, 15.42% funding is from ICAR schemes followed by 13.36% from internal resource generation. Rest 5.70% is sourced from centrally sponsored / UGC / Misc schemes. The

grants from State Government, ICAR, CSS, UGC and other Miscellaneous funding agencies is utilized towards the payments of Salary, Contingency, TA etc.

Sources of Fund - Average Percent (2018-19 to 2022- 23)



EXPENDITURE DETAILS

Table 8.2 depicts the expenditure incurred from 2018-19 to 2022-23 by university. The overall

Table 8.1 Source of Funds (2018-19 to 2022-23) (Rs Crores)

Year	State	University Income	ICAR	CSS/UGC/Misc	Total Funds
2018-19	380.05	81.11	101.44	33.13	595.73
2019-20	379.75	85.88	97.43	32.18	595.24
2020-21	401.56	82.05	91.16	33.65	608.42
2021-22	422.01	76.27	96.77	36.80	631.85
2022-23	416.73	82.44	83.81	38.15	621.13
Average (last 5 years)	400.02 (65.53%)	81.55 (13.36%)	94.12 (15.42%)	34.78 (5.70%)	610.47

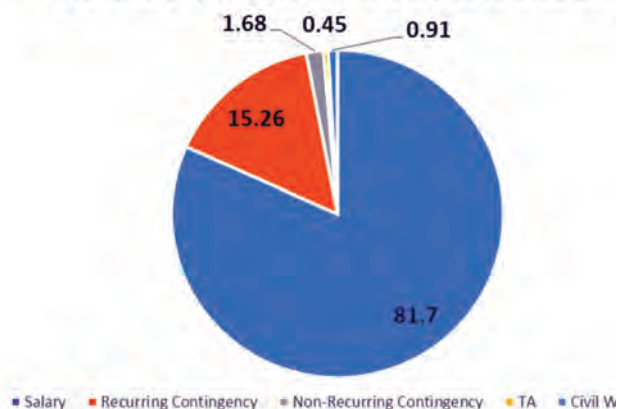


Table 8.2: Expenditure Details (2018-19 to 2022-23) (Rs Crores)

Year	Salary	Recurring Contingency	Non-Recurring Contingency	TA	Civil Works	Total Expenditure
2018-19	425.14	83.19	7.84	2.11	4.97	523.25
2019-20	454.76	82.23	9.82	2.51	5.27	554.59
2020-21	492.53	93.62	9.62	2.43	5.44	603.64
2021-22	484.00	86.50	10.00	2.94	5.00	588.44
2022-23	540.12	102.2	11.94	3.34	5.95	663.55
Average (last 5 years)	479.31 (81.70%)	89.55 (15.26%)	9.84 (1.68%)	2.67 (0.45%)	5.33 (0.91%)	586.69

expenditure incurred has increased from Rs 523.25 crores in 2018-19 to 663.55 crores in 2022-23 (an increase of 26.81%). The major expenditure heads are salary, recurring contingency, non-recurring contingency, travelling allowance and civil works. Analysis of expenditure reveals that 81.70% on an average in last 5 years has been incurred on salary, followed by 15.26% on recurring contingency. Rest 3.03% is incurred among heads of non-recurring contingency, TA and civil works.

Expenditure - Average Percent (2018-19 to 2022-23)



6.6.8.2. Finance Committee

Schedule of Meetings of Finance committee is provided in Table 8.3

Table 8.3 Finance Committee Meeting

Year	Finance Meeting	Date of Meeting
2019	223	22.01.2019
	224	29.03.2019
	225	29.05.2019
	226	28.08.2019
	227	29.11.2019
2020	228	26.02.2020
	229	30.03.2020
	230	19.06.2020

	231	31.08.2020
	232	11.11.2020
2021	233	25.03.2021
	234	7.05.2021
	236	16.12.2021
2022	237	30.03.2022
	238	31.08.2022
2023	239	16.01.2023
	240	27.03.2023
	241	5.06.2023

6.6.8.3. Internal Resources Generation

Punjab Agricultural University realizes income from different sources (Table 8.4) that mainly include fees (application fees, tuition fees and examination fees); scale of books and publications; other fees (including consultancy and day care fees); hospital and museum income; kisan mela rent; license fees, bank interest; shops rent; sale of scrap / trees and vehicles; sale of products (farm products, vegetables, fruit, livestock, seeds etc); testing fees; training fees and miscellaneous income. The generation of internal resources has largely remained stable and it has changed from Rs 81.11 crores in 2018-19 to Rs 82.44 crores in 2022- 23, depicting a meagre increase of 1.64%. The income realized from different sources is utilized for seed production, nursery plants and publication of literature for extension activities and other emergent needs of the University. The funds generated by various activities in different colleges are deposited with the central facility of the University and are further utilized for the conduct of different activities of undergraduate and postgraduate research and especially for the conduct of research experiments in the fields and laboratories. These funds are further utilized for academic purposes, maintenance and smooth

working of different scientific instruments, purchase of consumables etc. Some funds are also utilized for various activities of students' viz., conduct of educational tours, teaching aids and for capacity building etc.

Table 8.4 Internal Resource Generation

Year	Internal Resource Generation (Rs Crores)
2018-19	81.11
2019-20	85.88
2020-21	82.05
2021-22	76.27
2022-23	82.44

6.6.8.4. External Funding

The Scientists of the University regularly compete for projects both from international and national funding agencies. Most of these projects are inter disciplinary and in collaborative mode with other departments within the University and national and international institutes. The number of externally funded projects (national and international) under progress in different years is given in the table 8.5.

Table 8.5 Adhoc Projects Under Progress (2018-19 to 2022-23)

Year	National Projects	International Projects	Total Projects
2018-19	146	7	153
2019-20	163	10	173
2020-21	145	8	153
2021-22	153	11	164
2022-23	139	10	149

University gets external funding in the form of Ad-Hoc projects from various sources (Table

Table 8.6 External Funding (in Rs)

Schemes	2018-19	2019-20	2020-21	2021-22	2022-23
UGC	4,53,814	0	0	0	0
CSS	18,17,12,619	20,28,67,273	16,04,81,305	22,07,15,291	24,32,36,911
MISC	11,79,37,788	10,67,89,973	14,27,70,294	12,03,49,824	12,77,23,913
MISC FC	2,68,63,083	1,21,11,058	2,97,73,760	2,14,43,273	89,30,135
ICAR	101,43,95,957	97,43,36,147	91,15,89,920	96,77,04,563	83,81,19,755
NHM	42,92,500	0	35,00,000	55,00,000	16,50,000
Total	134,56,55,761	129,61,04,451	124,81,15,279	133,57,12,951	121,96,60,714

8.6). The external funding has decreased from Rs 134.56 crores in 2018-19 to Rs 121.97 crores in 2022-23, decrease of 9.36%. The most significant contributors are ICAR schemes and CSS. The list of competitive projects granted during the report period are annexed at Annexure VII.

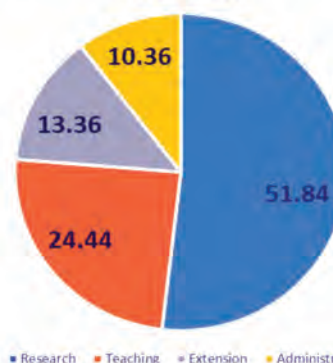
6.6.8.5. Financial Powers Delegation to Deans / Heads

To improve the system efficiency adequate financial autonomy has been provided down the hierarchy. The details of delegation of financial powers is given in the Annexure VIII.

6.6.8.6. Finance Utilization

As per activity wise expenditure, University spends heavily on Research activities (Table 8.7). In last five years that is from 2018-19 to 2022-23, the expenditure has been mainly employed for research (51.84%), teaching (24.44%) and extension (13.36%). Only 10.36% funds have been provided for general estate and administrative expenses. The budgetary estimates for teaching has been increased from 23.22% in 2018-19 to 25.57% in 2022-23. Estimates of finance utilization for carrying out general administration have decreased from 11.05% in 2018-19 to 9.71% in 2022-23.

Activity Wise Average Percent Expenditure (2018-19 to 2022-23)



**Table 8.7 Activity wise Budget Estimates (in %)**

S.No.	Budget Allocation to Activity	2018-19	2019-20	2020-21	2021-22	2022-23	Average
1	Research	51.99	51.61	51.75	52.09	51.78	51.84
2	Teaching	23.22	23.65	24.93	24.83	25.57	24.44
3	Extension	13.74	13.66	13.25	13.19	12.94	13.36
4	General Administration, Estate and Others	11.05	11.08	10.07	9.89	9.71	10.36

6.6.9. Accomplishments

6.6.9.1. Awards for the University

- Punjab Agricultural University was adjudged the Best State Agricultural University and Third Best among Agriculture and Allied Sector Category by NBA, Ministry of Education (MOE), GOI in 2023.
- The University got the best award for excellence in Agri- during 2021-22 by Agri Food India Awards 2021.
- The University was conferred with the Green and Clean Campus Award during 2020-21 by National Agricultural Higher Education Project (NAHEP) of ICAR.
- The Punjab Agricultural University was ranked 192nd in the 6th Annual US News Best Global Universities rankings for the year 2020. The PAU is the only University from India to have made it to the prestigious list in the field of agricultural sciences.
- Former Vice Chancellor, PAU Dr Baldev Singh Dhillon, was awarded Padma Shri, one of the highest civilian honours of India, by the President of India Sh Ram Nath Kovind at Civil Investiture Ceremony, held at Rashtrapati Bhavan, New Delhi, in 2019. Dr Dhillon was awarded in the field of Science and Engineering (Agriculture).

- The Punjab Agricultural University secured the first position among State Agricultural Universities and the second position among Agricultural Universities and Institutes in the ranking of Agricultural Universities 2019 by the ICAR, New Delhi.

Awards to the Colleges of the University

College of Agriculture

The Punjab Agricultural University's Centre of All India Network Programme on Organic Farming was awarded the Best Centre Award 2018-19 during the Annual Group Meeting, held at Port Blair from November 12-14, 2019.

College of Basic Sciences & Humanities

Department of Microbiology has won National Level Best Department award during the 2020-21 by Microbiologists Society, India.

College of Agricultural Engineering & Technology

COAETian Innovators B.Tech Students Team with Faculty Advisors Dr Satish Kumar Gupta, Dr Rohinish Khurana got All India Rank-2 In TIFAN-2022 (Technology Innovation Forum for Agricultural Nurturing-National level student competition organised by SAE India and John Deere).

College of Community Science

The Ludhiana Chapter of Nutrition Society of



India, embedded in the Department of Food and Nutrition, College of Community Science, PAU, received “Best Chapter Award” consecutively for two years i.e. 2021-22 and 2022-23, for its outstanding contributions to advancing nutritional awareness. The award for 2022-23 was given at the 55th Annual Conference of the Nutrition Society of India held at Hyderabad on Nov 25-26, 2023.

Punjab Agricultural University has the distinction of producing eminent scientists who have excelled in their respective fields both at the national and international level. The contributions of its faculty

members in research, teaching and extension have been recognized in the form of following awards during the past five years (Table 9.1 & Annexure IX).

Student Awards

ICAR Jawaharlal Nehru Best Thesis Award

- Mr Rajbir Singh (L-2016-A-8-D)- College of Agriculture
- Mr Ejaz Ahmed Dar (L-2013-A-02-D)- College of Agriculture

Table 9.1 Best AICRP/ Research Centres / Departments

Sr.No.	Department	Award	Period	Agency
1.	Plant Breeding and Genetics	Best All India Coordinated Research Project (AICRP) Maize Centre Award	2018-19	Indian Institute of Maize Research (IIMR)
2.	Soil and Water Engineering	Best All India Coordinated Research Project (AICRP) Centre Award 2018	2018-19	ICAR- Central Institute of Post-harvest Engineering and Technology (CIPHET), Ludhiana.
3.	Plant Breeding and Genetics	Appreciation Award	2019-20	AICRP on Fodder Crops and Utilization (AICRP- FCU)
4.	School of Organic Farming	Best Centre Award	2018-19	Annual Group Meeting of AICRP, held at Port Blair
5.	The Krishi Vigyan Kendra, Bathinda	Best NICRA - KVK Award 2019	2018-19	National Innovations on Climate Resilient Agriculture (NICRA) - Technology Demonstration Component of ICAR
6.	Farm Machinery and Power Engineering	‘Outstanding’ performance of AICRP on Farm Implements and Machinery	2019-20	AICRP on FIM, Bhopal
7.	Krishi Vigyan Kendra, Sangrur	Best KVK Award	2019-20	“Annual Zonal Workshop of KVKs” of ICAR-ATARI, Zone-1
8.	Krishi Vigyan Kendra, Amritsar	Second Best KVK Award 2020	2020-21	Zonal Workshop of ATARI
9.	Department of Plant Breeding and Genetics (Maize Section)	Chaudhary Devi Lal Outstanding All India Coordinated Research Project (AICRP) Award 2019	2020-21	ICAR
10.	All India Coordinated Research Project (AICRP)	Commendation Certificate	2020-21	Central Agroforestry Research Institute, Jhansi
11.	Microbiology	Best Department Award 2021	2021-22	Microbiologists Society, India.
12.	Vegetable Science	Best AICRP Center Award 2021	2021-22	39th Group Meeting of AICRP (Vegetable Crops),
13.	Soil and Water Engineering	Best Centre Award-AICRP- PEASUM	2022-23	ICAR
14.	School of Organic Farming	Best Centre Award (on-station)	2022-23	ICAR- IIFSR, Modipuram, Meerut
15.	Krishi Vigyan Kendra, Bathinda	Best National Innovations on Climate Resilient Agriculture (NICRA) KVK Award 2019	2019-20	Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad

16.	Krishi Vigyan Kendra, Jalandhar	Braja Gopal Sharma Memorial All India Outstanding Agricultural Extension Award 2019	2019-20	Society of Advancement of Human and Nature (SADHNA), YS Parmar University of Horticulture and Forestry, Solan
17.	Krishi Vigyan Kendra, Jalandhar	Best KVK Award 2020 of Punjab	2019-20	ICAR-Agricultural Technology Application Research Institute (ATARI), Ludhiana, Zone-I
18.	Krishi Vigyan Kendra, Moga	Best Presentation Award during the "Annual Zonal Workshop of KVKs" of Zone-I,	2019-20	GB Pant University of Agriculture and Technology, Pantnagar, Uttarakhand
19.	Krishi Vigyan Kendra, Jalandhar	Best KVK	2020-21	Zonal Workshop of ICAR Agricultural Technology Application Research Institute (ATARI)
20.	Krishi Vigyan Kendra, Ropar	Certificate of Appreciation	2021-22	International Rice Research Institute-South Asian Regional Centre, Varanasi
21.	Krishi Vigyan Kendra, Ropar	Second best KVK of Zone-1	2021-22	ICAR-Agricultural Technology Application Research Institute (ATARI) zone- 1
22.	Plant Breeding and Genetics	Certificate of Appreciation	2022-23	AICRP (FCU), IGFR, Jhansi under the aegis of ICAR, New Delhi

Prime Minister Fellowship

Twenty seven students of PAU have bagged the prestigious Prime Minister Fellowship for Doctoral Research during the last 5 years.

Jawaharlal Nehru Memorial Fund Award from ICAR

- Mr. Kuppuraj (L-2019-A-62-D), a Ph.D. research scholar, has been awarded the prestigious Jawaharlal Nehru Memorial Fund-JNMF fellowship for his doctoral research.
- Ms Wajhat Un-Nisa (L-2019-A-57-D) bagged Jawaharlal Nehru Memorial Fund Award from ICAR.
- Mr Gurkaranbir Singh (L-2016-AE-187-M) received the National Award from the Indian Society for Technical Education for the Best M.Tech. Thesis in Agricultural Engineering

6.6.9.2. Accreditation Report from ICAR/ Other Agencies

Recognizing excellence of the University in education, research and extension, the PAU was accredited by the ICAR in the year 2019 till 2024. The University has scored overall a score of 3.595

equivalent to Grade 'A+'. The detailed action taken report of the accreditation is as per Annexure X.

6.6.9.3. Inter Institutional Standings

During the report period, PAU has ranked among the top State Agricultural Universities in India. The rankings released by ICAR and by NIRF-2023 by NBA, Ministry of Education (MOE), GOI is summarized in Table 9.2

Sports/Cultural Activities

2019-20

- The contingent of 42 members from Punjab Agricultural University, Ludhiana participated in 35th North Zone Inter-University Youth Festival organized by Guru Nanak Dev University, Amritsar in collaboration with Association of Indian Universities (AIU), New Delhi from December 25 to 29, 2019. PAU students won Bronze Medal in Mimicry, 4th Position in Collage Making and 5th Position in Group Song Indian & Rangoli.
- The contingent of 27 members from Punjab Agricultural University, Ludhiana participated in 20th All India Inter-University Youth Festival, 2019-20 organised by Indira Gandhi




NATIONAL AGRICULTURAL EDUCATION ACCREDITATION BOARD
 Indian Council of Agricultural Research, New Delhi

Certificate of Accreditation

Considering Self Study Reports submitted by the University and subsequent verification and recommendations of the Peer Review Team, the National Agricultural Education Accreditation Board (NAEAB), ICAR, New Delhi hereby grants accreditation to the **Punjab Agricultural University, Ludhiana and its Constituent Colleges** from 1st April 2019 to 31st March 2024, with a score of 3.59 equivalent to "A+" grade.

- College of Agriculture
- College of Basic Sciences & Humanities
- College of Agricultural Engineering & Technology
- College of Community Science

September 2020, New Delhi


 (R.C. Agrawal)
 Deputy Director General (Agri. Edn.), ICAR
 and Vice-Chairman, NAEAB


 (Trilochan Mohapatra)
 Secretary, DARE & Director General, ICAR
 and Chairman, NAEAB


 Ministry of Education
 Government of India



Certificate

NATIONAL INSTITUTIONAL RANKING FRAMEWORK



INDIA RANKINGS 2023

Punjab Agricultural University, Ludhiana
 Ranked 3 in Agriculture and Allied Sector Category


 CHAIRMAN, NBA


 MEMBER SECRETARY, NBA

Table 9.2 Ranking of PAU at National Level

Sr.No.	Award	Period	Awarding Agency
1.	The Punjab Agricultural University secured the first position among State Agricultural Universities and the second position among Agricultural Universities and Institutes	2019-20	Ranking of Agricultural Universities 2019 by the ICAR, New Delhi
2.	The Punjab Agricultural University secured the second position among State Agricultural Universities and the fifth position among Agricultural Universities and Institutes	2020-21	Indian Council of Agricultural Research (ICAR) rankings 2020.
3.	Punjab Agricultural University was adjudged the Best State Agricultural University and Third Best amongst Agriculture and Allied Sector Category	2022-23	NIRF-2023 by NBA, Ministry of Education (MOE), GOI.

Krishi Vishwavidyala, Raipur (Chattisgarh) in collaboration with Indian Council for Agricultural Research (ICAR), New Delhi from 8th to 12th February, 2020. PAU won Gold Medal in Group Song Indian, Patriotic Group Song, Light Vocal Solo & On the Spot Painting.

2020-21

- Punjab Agricultural University, Ludhiana, won Gold Medal In Panel Discussion, Bronze Medal In Panel Discussion and Bronze Medal In Creative Writing during National Inter University Youth festival organized by Ministry of Sports & Youth Affairs, Government of India

2022-23

- Team of PAU students won Silver Medal in One Act Play and Bronze Medal in Elocution event during 36th National Inter-University Youth Festival 2022-23 organised by the Association of Indian Universities under the aegis of Ministry of Sports & Youth Affairs, Government of India, at Jain University, Bangalore, during February 24-28, 2023.
- Punjab Agricultural University, Ludhiana won Silver Medal in Group Song Indian and Bronze Medal in Group Folk Dance & Mono Acting during 21st All India Inter- Universities Youth Festival 2022-23 organized by Indian Council for Agricultural Research (ICAR), New Delhi from March 13-17, 2023.
- The achievements of PAU during XXI All India Inter- Agricultural University Sports & Games Meet for the session 2022-23 from from February 20-22, 2023.
- Gold Medal in Table Tennis.
- Harshaan Singh Mashiana (COH&F) got 1st

position in 400M & 2nd position in 200M events in Athletics

- Jobanjit Singh (COA) got 2nd position in 100M event in Athletics
- Harleen Kaur (COCS) got 1st position in 100M, 200M & Long Jump events in Athletics
- Harmeet Kaur (COBS&H) got 2nd position in 800M, 1500m & 5000M events in Athletics

6.6.9.4. Socio-economic impact

Punjab, an agrarian state, has taken big strides forward in agriculture and is considered as one of the most developed and productive state having around 82 per cent of its geographical area under highly intensive and mechanized agriculture with high cropping intensity.

Crop diversification: Different multiple crop sequences viz., rice-wheat-summer moong, maize-potato-onion, summer groundnut- potato-bajra (fodder), maize-potato-summer mungbean, maize-wheat-summer mungbean, maize-potato-spring maize, maize-vegetable peas-spring maize etc. recommended at large scale for diversification of rice-wheat in Punjab continue to sustain cropping intensity around 189 % besides providing additional income. Diversification of rice-wheat cropping system with some remunerative and feasible cereals, Bt cotton, pulses and oilseeds based alternative cropping systems generated more employment along with higher profits and sustainability of natural resources. An one-hactare integrated farming model showcased at the PAU provided a net income of Rs. 4.96 lakh per annum. Basmati rice based cropping systems further improve the socio-economic condition of the farmers as these systems provide more economic returns and also earn foreign exchange.



The total production of fodder has been increased to the level of 71.0 million tonnes in Punjab. On the basis of the present fodder production level, we have been able to provide more than 30 kg of green fodder per animal daily.

The release of 24 varieties / hybrids of vegetables and the adoption of production technologies in vegetable crops led to increase in area from 2.74 lakh hectare to 3.23 lakh hectare and production from 54.4 lakh MT to 64.4 lakh MT during the last five years in the state. Correspondingly, nine varieties of fruit crops were released during the period; area under fruit crops went up from 86.8 thousand ha to an estimated 96.7 thousand ha and the fruit production increased from 1857 thousand tonnes to 2142 thousand tonnes. Horticultural crops are not only more water conserving than conventional rice-wheat system, but also provide higher incomes and nutritional security. Economically weaker or resource-poor sections of the society are increasingly using their skills in horticulture as a means to increase income and more broadly to improve their livelihoods by supplying fruits and vegetables, fresh or processed, to high-value local and urban markets. The rising demand for horticultural produce creates opportunities for generating income activities for small-scale farmers and entrepreneurs in rural and peri-urban and urban settings. Besides, developing new varieties and technologies for sustainable horticulture production in the state and also provides quality nursery plants to the growers, the university also imparts training to unemployed youth to enhance their skill and get employed in the horticulture sector.

The diversification of agriculture through agro forestry i.e. tree farming on /around farmlands helps in integration of tree species with agricultural crops, will not only help in conservation of precious natural resources like ground water and soil and increasing the tree cover which is presently 2.2 % of its total geographical area but will also prove to be an alternate, sustainable and economically viable land use system as compared to sole agricultural crops especially rice and wheat. Furthermore, the possibility of linking the environmental amelioration services of agro forestry under the international protocols in the field of conservation of natural resources and

global warming have to be explored to take the advantage of flow of technology and money from one corner to another by setting up equitable market system for these goods and services. The success of two important exotics (eucalyptus and poplar) on private lands is the result of efforts by this university and farmers. With the production of quality planting material for the farmers and strong extension linkages with the stakeholders, agro-forestry has become the popular land use system in Punjab. Fast growing clones of eucalypts and poplar are grown on large scale along with other traditional tree species and the university is also working on new potential tree species (toon, sohanjana, jortor, ghamar, neem, etc.) which can be grown on agricultural landscape of Punjab.

Farmers are made aware about latest PAU technologies through conduct of FLDs, ARTs, trainings, group meetings and campaigns regarding sale of recommended varieties in the villages. Adoption of new varieties directly benefits the farmers in terms of increased productivity.

Crop protection: Weeds reduce crop yields to the tune of 20 to 50 per cent or even more depending upon their intensity and type. At present about 95 per cent of rice sown area in the state is treated with herbicides resulting in a net gain of approximately Rs 9.95 crores per annum. Apart from huge monetary benefits, the technologies also result in huge labour savings. The availability of non-chemical approaches like crop rotation, adjusting date of sowing, selection of quick growing cultivars, closer spacings, straw mulch encourages farmers toward adoption of organic farming and intervention of more profitable crops like vegetables in their cropping systems. For insect pest management in agricultural crops, the use of new green and blue chemistry chemicals recommended by the university ensures better safety towards the non-target organisms including the humans and natural enemies of the pests, in addition to reduction in soil, water and environmental contamination caused by conventional insecticides. The use of biological control agents for insect pests management like *Trichogramma chilonis* maize helps minimize the insecticide usage on crop, thereby, reducing the adverse affects of chemicals on soil, water and environment. The mechanical control of

insect pests like passing of jute/coir rope over rice helps preserve the natural enemy fauna in rice ecosystem. The natural enemies provide an effective control of insect pests during the early stages of crop, there by reducing the pesticide load on the crop. Skilled labour is not required for its execution; even, the farmers' family members can practice it successfully. The recommendations regarding management of plant diseases enhanced the production of various field crops which in turn raised the economic level of the farmers and ultimately helped in improving the buying capacity which conclusively lead to improved socio-economic status. Developing eco-friendly technologies for crop stress management is one of the major thrusts of the university research. Pesticide use in the state went down from 5543 tons in 2018-19 to 5376 tons in 2021-22.

Tissue culture unit of the university produces elite disease free planting material in vitro for commercial purpose. The unit has invitro plant production capacity of approximately five lac plants around the year. The micro propagation protocols for banana, sugarcane, potato can be used for mass multiplication of plant material. The feasibility of proposed model has been demonstrated by producing more than one lac sugarcane plants that were readily accepted by sugar mills and farmers from across North India. The facility provides excellent opportunity as a start-up unit for entrepreneurs' who are interested in production of breeder seed.

Crop residue management: The area under paddy crop that was managed without burning went up from 16 % in 2017 to an estimated 49 % in 2022. The machinery developed by the PAU for in-situ management of paddy straw continues to predominate the machinery base recommended by the government of India. The university continues to refine technologies, Surface Seeder being the latest machinery in this regard. The university continues to develop short duration and low biomass varieties to address time and straw load related constraints.

Micro-irrigation: The university continues to devise micro-irrigation technologies for increasing number of crops. Micro-irrigation coverage in the state is about 54.2 thousand ha.

Climate change resilient crop production: The University also focuses on research related with the impact of climate change on crop productivity. The experiments are planned to manage and alleviate the effect of heat and water stress on different field crops. It has also created an inventory on agrometeorological data for use in the research of different disciplines to improve research quality under changing climatic conditions. It also provides crop specific pre-harvest yield forecast every *kharif* and *rabi* season. These research efforts are of great help to improve the crop production technologies and sustain crop productivity in the region. It also provides weather forecast and agro-advisory for timely management of agricultural operations to save crops from adverse weather conditions. SMS alerts are disseminated for use by the farming community for timely decision making in view of impending weather conditions.

Social Issues: Weddings in Punjab are lavish and the scale of expenses keeps on touching new highs every season. From décor to dishes to dresses, suddenly every aspect acquires a heightened social significance. The wastefulness is more an act of societal pressure than a conscious choice.

'Saade Viah, Saade Bhog, Na Karza, Na Chinta Rog' (Simple Weddings, Simple Ceremonies; No debt, No worries) --- the message given by the Department of Agricultural Journalism, Languages and Culture, PAU has evinced massive response from farmers of the state. About 200 village panchayats mainly in cotton belt of Punjab have adopted resolutions not to splurge on weddings and other social ceremonies.

6.6.9.5. International Collaboration

The university currently has 12 MoUs with various international institutions and research organizations (Annexure XI).

Academics

- PAU has adopted a unique system of including Co-major advisors from other universities/institutions or foreign universities. At present, 15 faculty members from International institutes are Co-major advisors for Master's and Doctoral students.
- Ms Neha Aggarwal, bagged Commonwealth Split Site Scholarship (Commonwealth Scholarship Commission)



Table 9.3 Items received through CSR-Scheme – Estate Office

Sr. No	Name of the item	Number	Organization donated	Date	Cost (Lac)	Controlling Officer
1.	Ambulance	1	ICICI Foundation	Mar 2023	15.2	CMO, PAU Health Centre
2.	E-Rickshaw	2	Avon Cycles Pvt. Ltd.	Dec 2018	2.5	Security Officer
3.	E-Rickshaw	2	Avon Cycles Pvt. Ltd.	Nov 2022	2.5	Security Officer
4.	Barricades	10	Vardhman Special Steels Ltd.	April 2023	0.75	Security Officer
5.	Iron Benches	20	Vardhman Special Steels Ltd.	Feb 2023	1.6	Security Officer
6.	Iron Benches	30	Vardhman Special Steels Ltd.	May 2023	2.4	Security Officer
7.	Dustbins	51	ICICI Foundation	June 2023	11.0	Asstt. Estate Officer
8.	Pet Bottle Crusher Machine	1	Grasim Industries Ltd.	June 2023	2.9	Installed in Students Home area
9.	Sanitary napkin incinerators	7	ICICI Foundation	April 2023	0.6	Installed in Girls Hostel
10.	Waste Collection E-Vehicle	2	ICICI Foundation	Feb 2024	10.6	Asstt. Estate Officer

Table 9.4 Funds received through CSR-Scheme – Estate Office

Sr. No.	Name of Organization	Date	Funds (in Lac)	Controlling Officer
1.	Bank of Baroda	Dec 2022	5.0	CAU Misc-194
2.	State Bank of India	July 2023	12.0	CAU Misc-194
3.	Bank of Baroda	Jan 2024	2.0	CAU Misc-194

Table 9.5 Work done by the Donors through their resources

Sr. No.	Name of Organization	Year	Funds (in Lac)
1.	Trident Group	2023	15.0
2.	Mrs. Bector Food Specialties Ltd	2023	10.0
3.	Happy Forgings Ltd	2023	10.0
4.	Sunview Builders	2023	10.0
5.	Chandigarh Bottlers & Distillers Ltd	2023	10.0

- Ms Arushi Arora (L-2018-A-45-D) was awarded SERB - Purdue University Overseas Visiting Doctoral Fellowship by Science and Engineering Research Board (SERB), India and Purdue University, USA.
- Ms Heena Rani (L-2018-BS-75-D) received SERB - Purdue University Overseas Visiting Doctoral Fellowship from Science and Engineering Research Board (SERB), India and Purdue University, USA.
- Students from different colleges went abroad in reputed colleges for pursuing higher studies.

Research

- PAU has been a member of the “International Wheat Genome Sequencing Consortium” for physical mapping and sequencing of wheat chromosome 2A. It was the lead centre in the country.
- PAU collaborated with International Rice Research Institute, Manila, Philippines, on March 9, 2020 for F1 seed generation by crossing six donors with recipient (PR 126 and MTU 1010), F1 advancement to F2 seed, and field screening of F2 for DSR relevant traits

and selection of lines with better seed vigor and establishment from deeper soil depth

- Sixteen international collaborative research projects were sanctioned/ implemented during the report period (Detailed list given in Annexure XII).

6.6.9.6. Fund Raising through CSR

PAU has well established linkages with the industrial organisations. Collaborative project activities as mentioned below (Table 9.3, Table 9.4, and Table 9.5) have been carried out with industry partners under their Corporate Social Responsibility (CSR) initiatives.

Further, to enhance the scope of project activities and collaborations with the industry under CSR initiatives, a unit of Corporate Relations and International Linkages has also been established at university level.

CSR funding - Estate organization is regularly contacting different agencies that could fund PAU activities through CSR Funding. The prominent ones are Ambulance for PAU Health Centre, E-rickshaws for farmers and students, barricades for traffic control on campus, sanitary napkin incinerators for girls' hostels, dustbins, etc.

In addition, the business houses and bank branches stationed at PAU Campus are helping PAU to upgrade the infrastructure (PAU Market, Students' Home area etc.) through their CSR funding.

E-rickshaws: To help visitors and students, e-rickshaws are made available at the entry gates of the PAU campus. Recently two more e-rickshaws are added to the already functional four. The process to procure four more e-rickshaws has been initiated. In addition to helping visitors and



students with easy movement, it also reduces the number of vehicles on campus and helps to make campus pollution free.

Parking area: A new parking has been developed behind the Thapar Hall to accommodate about 90 cars. All employees (officers, office and supporting staff) working in Thapar Hall are parking their vehicles in the new parking area. PAU have developed parking areas near almost all the main entry gates to accommodate visitors during mega events. In the recently held 'Kisan mela' more than two lakh farmers visited campus and more than 20,000 four wheelers came to PAU. The security staff in coordination with District Police staff efficiently managed the vehicles and farmers.



6.6.9.7. Alumni Support

PAU has strong bonding with its Alumni settled in India and all over the world. PAU alumni are working in the leading organizations at various levels and have brought many laurels to their Alma Mater. PAU has active Alumni Associations at both university and college level. The alumni meets are being organized on regular basis to get valuable inputs from the alumni members to build the institution and deliver our duties. Alumni data base is updated regularly through online web portals developed, personal contacts and using other IT tools. The active participation and contributions (financial and in any manner) made by the alumni members in achieving the professional excellence at PAU are acknowledged at every level to motivate other alumni members to get connected with the institution.

Two foundations namely "Dr Khush Foundation" and "Chinnan Foundation" have been established by Alumni at university level to carry out institutional development activities including

GLIMPSES OF ALUMNI MEETS AT PAU



research contingency, travel grants, merit scholarships for proficiency in academics and sports, creating facilities for the students etc. Grants of Rs. 350 lakhs and Rs. 40.51 lakhs have been received under Dr Khush Foundation and Chinnan Foundation respectively. Another Aluminus, Dr. O.S. Bindra has contributed Rs. 33.36 lakhs. Dr Hardyal Singh Gill's family has donated Rs. 20.00 lakhs for establishment of "Dr Hardyal Singh Gill Distinguished Professor Chair in Weed Science". Dr AS Bansal has donated Rs. 70 lakh for awards and medals for the faculty and students of College of Agricultural Engineering and Technology. Mr Viney Kaushal has deposited Rs 10 lakh for institution of scholarship to be named as "Viney and Kumud Kaushal Scholarship". Dr. Charanjit Kaur Hira and Mrs Apinder Kaur Grewal has deposited seed money for providing financial support to masters students of College of Community Science. Another alumnus, Dr. Rippen Gill Jassal of College of Community Science

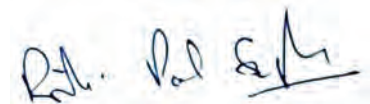
has deposited amount for instituting medal to promote participation of UG students of College of Community Science in curricular and co-curricular activities. Thirty three alumni have donated total sum of Rs 5.25 lakh for constitution of "Alumni Medal and Cash Prize for Excellence in Zooloy". The alumni members have also made significant contributions in the PAU Endowment Fund.

Funds are also raised by the alumni associations to carry out the following activities for the development of students and institution.

- Scholarship/financial aids to the needy students
- Merit scholarships
- Travel grants
- Hostel development
- Research contingency
- Alumni lectures
- Campus upkeep

6.6.6.10. Certificate

I, Rishi Pal Singh, the Registrar of the Punjab Agricultural University, Ludhiana hereby certify that the information contained in the sections 6.4, 6.5 and 6.6.1 to 6.6.9.7 are furnished as per the records available in the University.



Signature of the Registrar



DETAILS OF STATUTES AND REGULATIONS : CHAPTERS AND SECTIONS

Chapter – I	The Haryana and Punjab Agricultural Universities Act, 1970	
	Short title commencement and Definitions	
Chapter – II	Powers and Duties of the Authorities of the University	
	Board of Management	Powers and Duties
	Academic Council	Selection of a member under clause (f) of sub-section (3) of Section 23 of the Act and Powers and Duties
	Research Council	Constitution and functions
	Extension Council/ Extension Education Council	Constitution and functions
	Board of Studies	Constitution, Powers and Duties
Chapter-III	The Designation, the Manner of Appointment, powers and duties of the Officers of the University	
	Vice-Chancellor	
	Deans of the Colleges	Powers and Duties
	Director of Research	Powers and Duties
	Director, Extension Education	Powers and Duties
	Director, Students Welfare	Powers and Duties
	Registrar	Powers and Duties
	Comptroller	Powers and Duties
	Chief Engineer	Powers and Duties
	Estate Officer	Powers and Duties
	Librarian	Powers and Duties
	Dean Postgraduate Studies	Powers and Duties
Chapter-IV	Classification, the Manner of Appointments, Powers and Duties of Teachers	
	Classification	Classification of teachers
	Appointments	Manner of Appointment
	Appointment of Additional Director of Research/Additional Director of Extension Education	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Heads of Departments	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Director (Seeds)	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Director School of Energy Studies for Agriculture	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Professors, Associate professors and other teachers of equivalent rank	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Joint Director (Sports & Cultural Activities)	Manner of Appointment, Responsibilities, Powers and Duties
	Appointment of Assistant Professor and other teachers of equivalent ranks	Manner of Appointment, Responsibilities, Powers and Duties

Chapter-IV-A	Appointment of Teachers by promotion Based on Merit	Abolished w.e.f. 03-03-99 as per notification No. Acad.I.AU.2001/300 Dt. 1-3-2001.
Chapter-IV-B	Career Advancement of Teachers	
Chapter-IV-C	Career Advancement of Teachers w.e.f. 27-7-1998	
Chapter-V	Appointments of Employees of The University other than Officers and Teachers	
Chapter-VI	Number, Qualifications, Emoluments and Other Conditions of Service of Officers and Other Employees of The University Not Being Teachers and The Preparation and Maintenance of Record of their Service and Activities. (Part-A)	
Chapter-VII	Number, Qualifications, Emoluments and other Conditions of Service of Teachers of the University and the Preparation and Maintenance of Record of their Service and Activities (Part-B)	
Chapter-VIII	Pension and Provident Funds	
Chapter- IX	Institution of Degrees and Diplomas and On ferment of Honorary Degrees	
Chapter-X	The Courses of Study to be Laid Down for Degrees and Diplomas of University	
Chapter-XI	The Institution of Fellowships, Scholarships, Medals and Prizes	
Chapter-XII	The Conditions for The Award of Fellowships, Scholarships, Medals and Prizes, Stipends and Fee Concessions	
Chapter-XIII	The Admission of Students to The University and Their Enrolment and Continuance as such	
Chapter-XIV	The Conditions Under Which Students Shall be Admitted to The Degree, Diploma or Other Courses and The Manner in Which the Examinations Are to be Held and The Eligibility for The Award of The Degrees and Diplomas	
Chapter-XV	The Conditions of Residence of The Students of The University and The Levying of Fees for Residence in Hostels Maintained by The University	
Chapter-XVI	The Establishment and The Abolition of Hostels Maintained by The University	
Chapter-XVII	The Recognition and Supervision of Hostels Not Maintained by The University	
Chapter-XVIII	The Establishment, Amalgamation, Sub-Division and Abolition of Departments	
Chapter-XIX	Levying of Fees by The University for Any Purpose Excluding Hostel Fees Governed by The Statutes (Chapter XV)	
Chapter-XX	Remuneration and Allowances, Including Travelling and Daily Allowances to be Paid to Persons Employed on The Business of The University	
Chapter-XXI	Persons who Are Declared as Officers of The University	
Chapter-XXII	The Exercise of Financial and Administrative Powers by The Officers, Teachers and Other Employees of The University	
Chapter-XXIII	Administrative and Financial Powers by The Board of Management to The Officers/Employees of The University	
Chapter-XXIV	Statement showing delegation of administrative and financial powers by the Vice-Chancellor in exercise of powers conferred on him vide clause 4 of the Statues issued under section 31(u) of the Haryana and Punjab Agricultural Universities Act, 1970 and relating to the delegation of administrative and financial powers by the Board of Management to the officers/employees of the University (Issued vide Notification No. Acad-II (AU)-66-9333 dated 29 March, 1966 and amended from time to time).	
Chapter-XXV	The Conferment of Emeritus Professorship, Payment of Honorarium to Emeritus Professors and Other Conditions of Appointment	
Chapter-XXVI	The Grant of Travelling and Daily Allowances to Members of The Board of Management	

DETAILS OF COLLABORATIVE SCHEMES WITH INDUSTRIES/ ORGANIZATIONS (2018-19 TO 2022-23)

Sr. No	Name of the project	Funding agency	Budget Allotment (Rs)
1	Popularization of Lucky Seed Drill for sowing & simultaneous spraying of pre-emergence herbicides for better & cost effective weed management in rice (DSR) wheat system in Punjab	Punjab Pollution Control Board, Patiala	5,30,000
2	Efficacy study of various crop protection products when applied through Drone spraying Systems to manage pests in various crops	M/s. Bayer Crop Science Ltd., Thane	19,38,000
3	Evaluation of Sardar amin granules & bentovite sulphur on the productivity of rice & maize based cropping systems and on soil health	M/s. Gujarat State Fertilizer & Chemicals (GSFC), Vadodara	25,13,521
4	Technical support in installation of 20 biogas digesters in tribal sub plan district of Jharkhand	Jharkhand Tribal Development Society (JTDS), Ranohi	4,30,000
5	Evaluation of action plan for conservation & restoration of ecology of River Beas including Rejuvenation of aquatic life in the wake of spillage of Molasses in River Beas	Punjab Pollution Control Board, Batala (Amritsar)	31,41,000
6	Evaluation of Sagarika (Seaweed liquid & granules) in rice, potato and moongbean crops	IFFCO India, Ludhiana	4,89,714
7	Impact of discriminate use of chemical-fertilizers and pesticides-resistance studies on tomato fruit borer, Helicoverpa armigera infesting tomato at PAU	NIPHM, Hyderabad	6,67,000
8	Identification of chickpea breeding material for yield and ascochyta blight	ICRISAT, Hyderabad	1,00,000
9	Susceptibility of maize stalks borer (Chilo partellus) populations to Cry1Ab protein and frequency of Cry1Ab-resistance alleles in India	M/s Syngenta Biosciences Pvt Ltd, Telengana	36,44,120
10	Assessment of Potash in improving yield and quality of sugarcane unstressed conditions	ICL, Gurgaon	9,21,247
11	Study on agricultural lending credit absorption, end use, recovery & return from farming in the state of Punjab	Punjab & Sind Bank, New Delhi	32,70,000
12	Validation and dissemination of bio control based integrated post management technology in sugarcane in Hoshiarpur	NABARD Chandigarh	11,70,350
13	Development and dissemination of ecological engineering based IPM model for basmati rice in farmer participatory mode in Amritsar and Ludhiana	NABARD Chandigarh	12,94,950
14	Bio efficacy evaluation of herbal formulations against leaf curl disease, its vector and other major insect pests of chill	National Innovation Foundation- India, Gandhinagar	4,18,000

15	Pheromone based mating disruption technologies for the management of pink ballworm in cotton	M/s ATGC Biotech Pvt Ltd, Secundrabad	8,00,000
16	Use of Industrial product as synthetic conditioner in sodic and sulphur deficient soils of Punjab	M/s Tata Steel Limited, Jamshedpur	49,01,100
17	Inventorization of medicinal plants & prioritized tradable species in selective blocks of kandi region of lower shivalik hills	RCFC-North National Medicinal Plant Board Ministry, AYUSH, GOI, Mandi (HP)	2,50,000
18	Identification of Ground Water Flow Regime for 5 Kms Distance around Guru Gobind Singh Refinery, District Bathinda, Punjab	HPCL- Mittal Energy Ltd, Bathinda	8,08,300
19	Skill development programme on fruit plant nursery raising and management	NABARD , Chandigarh	1,00,000
20	Evaluation of IFFCO nano formulation of Nitrogen, Zinc & copper on Rice –wheat cropping system	IFFCO India	18,12,474
21	Sulphur nutrition of potato	M/s Smartchem Technologies Limited, Pune	18,30,218
22	Water quality status of Sutlej and Beas : past and present trend analysis for future prediction	Punjab Pollution Control Board, Patiala	29,96,544
23	Biology of <i>Phalaris minor</i> and the effect of agronomic Practice in rice wheat production system in Punjab for the development of an integrated management strategy	M/s Syngenta India Ltd, Pune	29,79,000
24	Setting up of Rural Biotech innovation & application centre (R B IAC) in kandi area of Punjab- Technological solutions for value addition of Sugarcane Juice through Scientific Jaggery Production & developing iron fortified Jaggery	Punjab State Council for Science & Technology, Chandigarh	40,66,880
25	Innovation refraction based drying technology for production of fruits and vegetable flakes/ powder under Secondary Agriculture Entrepreneurial Network (SAEN) in Punjab	Punjab State Biotech Corporation, SAS Nagar	7,70,000
26	Rapid appraisal of direct seeding of rice in Punjab	Punjab State Farmers' & Farm Workers' Commission, Mohali	10,00,000
27	Monitoring the evaluation of herbicide resistance in <i>Phalaris minor</i> to new herbicides	M/s FMC India Pvt Ltd, Ludhiana.	20,75,620
28	Shelf life extension of Paneer and soya paneer through hurdle approach	Punjab State of Biotech, Corporation , SAS Nagar, Mohali	6,04,296
29	Value addition of waste from potato processing industry and mandis of Ludhiana, District under SAEN in Punjab	Punjab State of Biotech, Corporation , SAS Nagar, Mohali	6,00,336
30	Popularization of good agriculture practices (GAP) for producing export compliant Basmati Rice under private partnership mode	M/s Bayer Crop Science Limited	21,73,750



31	Collaborative Project with Thapar Institute of Engineering & Technology (TIET) Patiala under the Center of Excellence for food security	Thapar Institute of Engg. & Tech (TIET) Patiala	9,50,000
32	Cereal early Stage establishment program through in situ crop residue management in rice-wheat production system in Punjab for the development & advocacy of integrated approach	M/s Syngenta India Pvt. Ltd. Pune	9,68,500
33	Evaluating the impact of Biochar addition crop yield & Soil quality through farmer field trials	M/s Coromandel. International Ltd. Secunderbad)	20,28,422
34	Managing herbicide resistance in phalaris minor in wheat through popularization of pre-emergence weed control using lucky seed Drill	M/s Bayer Crop Sci)	18,12,000
35	Amelioration of barren undulated land to cotton wheat crop system through micro-irrigation using salime water in semi-arid region of Punjab	NABARD, Chandigarh	4,97,000
36	Enhancing cotton productivity through dissemination of integrated pest management strategies under public- Private Partnership mode	M/s GSP Crop Sci. PVT. Ltd. Ahmadabad)	16,30,000
37	Assessment of crop residue availability & IBS potential in Punjab for Bio-refining	M/s FORTUM India Pvt. Ltd. Gurgaon	5,00,000
38	Management of herbicide resistance in phalaris minor in wheat through popularization of pre-emergence used control	M/s GSP, Crop Sci, Pvt. Ltd. Ahmadabad	4,46,428
39	Promotion of Direct Seeded Rize-Tar water technology in 12 Districts of Punjab	NABARD Chandigarh	24,73,000
40	Setting up of NRDC Innovation facilitation Centre at PAU, Ludhiana	National Research Development Corporation, New Delhi	6,00,000
41	Evaluation of climate resilient high yielding farmers developed crop varieties incubated by NIF in Kandi region of Punjab under different hydrothermal regions	(NIF- India DST, New Delhi)	14,54,970
42	Development of the hermetic system for safe storage of Agricultural produce without using hazardous chemicals	Society for Mission Tandrust Punjab, SAS Nagar	15,00,000
43	Development of sensor platform for rapid detection of adulteration in turmeric powder	Society for Mission Tandrust Punjab, SAS Nagar	24,49,000
44	Assessment of potassium srat of active phosphors (PSAP) in improving yield & quality of sugarcane under Punjab conditions	M/s Isha Agro Sci. Pvt. Ltd., Maharashtra	1,50,000
45	Use of supplemental carbon dioxide for improved crop yields, quality production & control of insect-pests under controlled conditions	Society for Mission Tandrust Punjab, SAS Nagar	14,17,000
46	Sensitizing farming families for sustainable water use behaviour	M/s BCS India Pvt. Ltd. Ludhiana	26,62,550
47	Development of solar apricot dryer in Ladakh	M/s Himmosthan Society Ladakh	1,57,500

48	Nitrogen management in rice-wheat & maize wheat cropping system	The Energy & Resources Institute, New Delhi	14,47,500
49	Digital Village: A data-driven approach to precision Agriculture in small farms project, Project ID TTFS-2021-0001	Thapar Institute of Engg. & Technology, Patiala	19,66,446
50	PB-knot- An innovative approach to manage pink bollworm in cotton	M/s P.I industries Ltd. Gurgaon	16,49,000
51	Enhanced treatment of waste maker using a synergy of microalgae & micro organisms without energy investment & bio-fuel production at PAU, Ludhiana	Thapar Institute of Engineering, Patiala	14,93,520
52	Integrated smart crop monitoring & Irrigation scheduling as decision support system for small farms	Thapar Institute of Engg. & Technology, Patiala)	6,81,520
53	Evaluation of some NPK grade fertilizer on the productivity of different cropping system and on soil health	M/s Gujarat Narmada Valley Fertilizers Company Limited (Gujarat)	24,17,166
54	Evaluation of some nutrient additives on productivity of different cropping systems and on soil health	M/s Duraflex, New Delhi	17,74,408
55	Setting up of Primary agri-processing centre in rural miler accelerator (RMA) at Talwara	Punjab State Council for Science & Technology, Chandigarh	39,15,000

LIST OF PUBLICATIONS (2019-2023)

Sr.No.	2019	NAAS Score
1	Ahmed S, Rattanpal H S and Singh G (2019). Diversity, characterization and evaluation in Pummelo (<i>Citrus maxima</i> Merr.) cultivars using SSR markers and quality parameters. <i>Indian J Genet Plant Breed</i> 79 : 594-605.	6.41
2	Ali S, Singh B and Sharma S (2019). Impact of feed moisture on microstructure, crystallinity, pasting, physico- functional properties, and in vitro digestibility of Twin-screw extruded corn and potato starches. <i>Plant Food Hum Nutr</i> 74 : 474-80.	10.12
3	Anjali, Jindal V and Prakash S (2019). Species richness and diversity of spiders in the semi arid habitat in northern India. <i>Indian J Ent</i> 81 : 783-87.	5.89
4	Aparna, Kansal S K, Verma H K, Hundal J S and Singh J (2019). Knowledge level of veterinary practitioners of Punjab about animal feed technologies. <i>Haryana Vet</i> 58 : 36-39.	5.58
5	Arede M, Bravo-Araya M, Bouchard E, Gill G S, Plajer V, Shehraj A, Adam Shuaib Y (2019). Combating Vaccine Hesitancy: Teaching the next generation to navigate through the post truth era. <i>Front Public Health</i> 6 : 381.	12.46
6	Arora G, Sharma S, Gaba J (2019). Synthesis, characterization and fungitoxicity of substituted benzimidazoles. <i>J Indian Chem Soc</i> 96 : 623-27.	6.20
7	Arora P and Singh D (2019). Copy move image forgery detection with exact match block based technique. <i>Oriental Journal of Computer Science and Technology</i> 12 : 123-31.	6.786
8	Arora R, Jawandha S K, Gill K S and Thakur A (2019). Physico-chemical attributes and shelf life of aonla as influenced by packing materials and storage conditions. <i>Indian J Hortic</i> 76 : 168-175.	6.10
9	Astha and Sekhon P S (2019). Biochemical basis of systemic acquired resistance induced by different SAR elicitors in response to challenge inoculation of late blight pathogen. <i>Kavaka</i> 52 : 114-21.	5.30
10	Astha, Sekhon P S and Sangha M K (2019). Influence of different SAR elicitors on induction and expression of PR-proteins in Potato and Muskmelon against Oomycete pathogens. <i>Indian Phytopathol</i> 72 : 43-51.	5.90
11	Atri A and Oberoi H (2019). Rhizospheric <i>Trichoderma</i> isolates as potential biocontrol agent for southern leaf blight pathogen (<i>Bipolaris maydis</i>) in fodder maize. <i>Proc Indian National Sci Acad</i> 85 : 885-893.	5.89
12	Atri A and Singh H (2019). Influence of weather variables on the development of pearl millet downy mildew. <i>J Agrometeorol</i> 21 : 76-79.	6.56
13	Atri A and Tiwana U S (2019). Effect of seed treatment and foliar spray on leaf blight of fodder oat in Punjab. <i>Phytoparasitica</i> 47 : 723-31.	7.81
14	Atri A, Singh N and Oberoi H (2019). Influence of seed priming on the development of pearl millet downy mildew (<i>Sclerospora graminicola</i>). <i>Indian Phytopathol</i> 72 : 209-15.	5.95
15	Atri C, Akhtar J, Gupta M, Gupta N, Goyal A, Rana K, Kaur R, Mittal M, Sharma A, Singh M P, Sandhu P S, Barbetti M J and Banga S S (2019). Molecular-genetic analysis of defensive responses of <i>Brassica juncea</i> - <i>B. fruticulosa</i> introgression lines to <i>Sclerotinia infestation</i> . <i>Sci Rep</i> 9 : 1-12.	10.12
16	Bajaj K and Singh S (2019). Preference of fruit flies, <i>Bactrocera</i> spp. to methyl eugenol based different coloured traps in peach, pear, guava and Kinnow mandarin orchards. <i>Indian J Agri Sci</i> 90 : 233-35.	6.23

17	Bala B and Babbar B K (2019). Development and testing of methyl anthranilate based formulations against rodents. <i>J Entomol Zool Stud</i> 7: 1586-95.	5.53
18	Bala R, Kalia A and Dhaliwal S S (2019) Evaluation of efficacy of ZnO nanoparticles as remedial zinc nanofertilizer for rice. <i>Soil Sci Plant Nutr</i> 19:379-389.	9.61
19	Banta G and Jindal V (2019). Molecular characterization of <i>Beauveria</i> isolates of Punjab based on Internal Transcribed Spacer (ITS) region. <i>Indian J Agric Sci</i> 89: 1425-428.	7.20
20	Bashir S, Kaur N and Arora N K (2019). Dynamics of major sugars, total phenols and flavonoids in the juice of seven wine grape (<i>Vitis</i> spp.) cultivars during different stages of berry development. <i>Plant Physiol Rep</i> 24:112-18.	5.50
21	Batra C, Gupta N and Goyal P (2019). Priming improves germination and seedling growth performance of accelerated aged seeds of Tomato. <i>Int J Adv Res</i> 7: 209-14.	6.20
22	Behal R, Sharma S, Bansal T, Gaba J, Kaur S (2019). Synthesis of a series of new Schiff bases having heterocyclic moiety and their microbial activity. <i>J Indian Chem Soc</i> 96:349-54.	6.20
23	Bhanot R and Hundal S S (2019). Acute toxic effects of untreated sewage water in <i>Labeo rohita</i> (Hamilton 1822) <i>J Entomol Zool Stud</i> 7: 1351-55	5.53
24	Bhanot R and Sangha G K (2019). Effect of in utero and lactational exposure of Triazophos on reproductive system functions in male offsprings, <i>Rattus norvegicus</i> . <i>Drug Chem Toxicol</i> 42: 519-25.	7.53
25	Bhanot R and Hundal S S (2019). Effect of untreated sewage water on antioxidant enzymes of fish <i>Labeo rohita</i> . <i>Int J Chem Stud</i> 7: 3111-17.	5.31
26	Bhardwaj M, Soni R and Singh M C (2019). Fabrication of a cyclone gasifier for gasification of sugarcane bagasse. <i>Int J Chem Stud</i> 7:1072-75.	5.31
27	Bhardwaj U, Kumar R, Mandal K, Sarao P S and Singh B (2019). Bioefficacy and persistence of chlorantraniliprole against yellow stem borer and leaf folder and persistence in basmati rice. <i>Pestic Res J</i> 31: 233-241.	5.90
28	Bhasin A, Sharma S, Kapoor S and Chandra M (2019). Formulation, sensory and nutritional evaluation of Vitamin D enriched mathi. <i>Int J Chem Studies</i> 7: 355-60.	5.31
29	Bhatia M and M Sharma (2019). Gender disparities in dairy farming enterprise. <i>Ind J Ext Edu</i> 55: 144-47.	5.95
30	Bhatt R and Arora S (2019). Tillage and mulching options for conserving soil and water and improving livelihoods in foothills of lower Shiwaliks. <i>J Soil Water Conserv</i> 18: 230-234.	5.20
31	Bhowmik A, Kukal S S, Saha D, Sharma H, Kalia A and Sharma S (2019). Potential indicators of soil health degradation in different land use-based ecosystems in the shiwaliks of northwestern India. <i>Sustainability</i> 11: 3908.	9.89
32	Bhullar R S, Mavi M S, and Choudhary O P (2019). Adverse Impact of sodicity on soil functions can be alleviated through addition of rice straw biochar. <i>Commun Soil Sci Plant Anal</i> 50: 2369-383.	7.58
33	Bishnoi C, Dhaliwal N S and Sharma K (2019). Cultivation and marketing of Kinnow in south-western region of Punjab: An approaches of SWOT Analysis. <i>J Community Mobilization Sustain Dev</i> 14: 591-94.	5.67
34	Blummel M, Updahyay S R, Gautam N, Barma N C D, Abdu Hakim M, Hussain M, Mujahid M Y, Chatrath R, Sohu V S Mavi G S, Mishra V K, Kalappanavar I K, Naik R, Biradar S, Prasad S V S, Singh Ravi P, Joshi A K (2019). Comparative assessment of food-fodder traits in a wide range of wheat germplasm for diverse biophysical target domains in South Asia. <i>Field Crops Research</i> 236: 68–74.	11.90



35	Brar AS, Buttar GS, Thind HS, Singh KB (2019). Improvement of water productivity, economics and energetics of potato through straw mulching and irrigation scheduling in Indian Punjab. <i>Potato Research</i> 62 :465-84.	8.56
36	Brar P S, Kaur N, Aggarwal R and Kaur S (2019). Studies on artificial groundwater recharge through abandoned well. <i>J Pharmacogn Phytochem Special Issue-1</i> : 582-87.	5.21
37	Brookes V J, Gill G S, Singh B B, sandhu B S, Dhand N K, Aulakh R S and Ward M P (2019) Challenges to human rabies elimination highlighted following a rabies outbreak in bovines and a human in Punjab, India. <i>Zoonoses Public Health</i> 66 : 325-336	8.70
38	Chalotra J and Sooch S S (2019). Design, development and testing of screw press machine for paddy straw underground digester. <i>Int J Curr Micro and App Sci</i> 8 :138-44.	5.38
39	Chandel RS, Soni S, Vashisth S, Pathania M, Mehta PK, Rana A, Bhatnagar A and Aggarwal V K.(2019). The potential of entomopathogens in biological control of white grubs. <i>Int J Pest Manag</i> 65 : 348-62.	7.77
40	Chandi A K and Suri K S (2019). Larval movements of lepidopteran pest, <i>Helicoverpa armigera</i> (Hubner) on insecticide treated surfaces. <i>J Exp Zool India</i> 22 : 615-20.	5.25
41	Chandi RS (2019). Evaluation of new insecticide sulfoxaflor against wheat foliar aphid complex. <i>J Exp Zool India</i> 22 : 583-87.	5.25
42	Chandi R S (2019). Field efficacy of newer insecticide sulfoxaflor against aphids in mustard. <i>J Exp Zool India</i> 22 : 603-607.	5.25
43	Chandi R S and Chandi A K (2019). Pattern of insecticide use on brinjal by farmers in Punjab. <i>Ind J Ext Edu</i> 55 : 215-19.	5.95
44	Chandra A, Dhakad AK, Verma PK, Saxena J and Raut AK (2019). Assessment of impact of <i>Eupatorium adenophorum</i> Spreng. on the plant diversity in Tanakpur Range, Champawat Forest Division, Uttarakhand. <i>Biological Forum</i> 11 : 95-100.	5.11
45	Chaudhary O P, Bhalla M, Sharma S, Sharda R and Mavi M S (2019). Long-term impact of cyclic use of sodic and canal water for irrigation on soil quality and wheat yield in cotton-wheat cropping system. <i>J Indian Soc Soil Sci</i> 67 : 34-43.	5.31
46	Chauhan SK, Singh S, Sharma S, Sharma R and Saralch H S (2019). Tree biomass and carbon sequestration in four short rotation tree plantations. <i>Range Management and Agroforestry</i> 40 : 77-82.	6.64
47	Chhabra D and Sharma P (2019). Tapping of root non-rhizobial endophytic bacteria from chickpea plant tissues for multifunctional traits. <i>Int J Curr Microbiol Appl Sci</i> 8 : 3350-62.	5.38
48	Chhabra R, Kaur N and Bala A (2019). Physiological and biochemical alterations imposed by <i>Fusarium fujikuroi</i> infection in aromatic and non aromatic rice cultivars. <i>Plant Physiol Rep</i> 24 : 563-75.	5.50
49	Choudhary A K, Singh N, Singh D and Raina S (2019). Bioefficacy of various strains of <i>Trichoderma</i> and <i>Pseudomonas</i> spp. against damping-off of cauliflower. <i>Indian J Agri Sci</i> 89 : 63-69.	6.23
50	Choudhary S, Chopra N K, Chopra N K and Kushwaha M (2019). Effect of nitrogen and weed management on seed productivity of forage pearl millet (<i>Pennisetum glaucum</i>). <i>Ind J Agron</i> 64 : 266-69.	5.55
51	Dar E A, Brar A S, Ahmad M, Bhat M A and Poonia T (2019). Growth, yield and economics of drip-irrigated wheat (<i>Triticum aestivum</i> L.) as influenced by timing and depth of irrigation water application. <i>Ind J Agron</i> 64 :360–67.	5.55

52	Das R, Purakayastha TJ, Das D, Ahmed N, Kumar R, Biswas S, Walia SS, Singh R, Shukla VK, Yadava MS, Ravisankar N, Datta SC (2019). Long-term fertilization and manuring with different organics alter stability of carbon in colloidal organo-mineral fraction in soils of varying clay mineralogy. <i>Sci Total Environ</i> 684 : 682-693.	16.75
53	Deepika and Kaur M (2019). Adaptive Capacity of Maize farmers towards weather variability in North-eastern zone of Punjab. <i>Multilogic Sci</i> 9 : 140-142.	5.32
54	Deepti, Bhalla J S and Mohapatra L (2019). To identify the problems faced by the medicinal and aromatic plants growers in hoshiarpur district of Punjab. <i>Advances in Research</i> 19 : 1-4.	5.30
55	Devgan K, Kaur P, Kumar N and Kaur A (2019). Active modified atmosphere packaging of yellow bell pepper for retention of physico-chemical quality attributes. <i>J Food Sci Technol</i> 56 : 878-88.	7.80
56	Devi C B, Chatli M K, Bains K, Kaur H and Rindhe S N (2019). Enrichment of wheatgrass (<i>Triticum aestivum</i> L.) juice and powder in milk and meat-based food products for enhanced antioxidant potential. <i>Int J Curr Microbiol App Sci</i> 8 : 3259-68.	5.38
57	Devi C B, Bains K and Kaur H (2019). Effect of drying procedures on nutritional composition, bioactive compounds and antioxidant activity of wheatgrass (<i>Triticum aestivum</i> L.) <i>J Food Sci Technol</i> 56 : 491-96.	7.80
58	Devi J, Bhatia S and Alam M S (2019). Abiotic elicitors influences antioxidative enzyme activities and shelf life of carrot during storage under refrigerated conditions. <i>J Plant Growth Regul</i> 38 : 1529–544.	10.64
59	Dhailwal N K, Singh J and Chhuneja P K (2019). Comparative evaluation of mass queen bee rearing techniques for <i>Apis mellifera</i> (Hymenoptera: Apidae) in autumn season. <i>J Entomol Zool Stud</i> 7 : 1062-65.	5.53
60	Dhailwal N K, Singh J and Chhuneja P K (2019). Effect of rearing method, age of brood and queenliness of cell builder colony on weight of <i>Apis mellifera</i> Linnaeus queen bees. <i>J Entomol Zool Stud</i> 7 : 1260-1262.	5.53
61	Dhakad A K, Ikram M, Sharma S, Khan S, Pandey V V and Singh A (2019). Biological, nutritional and therapeutic significance of <i>Moringa oleifera</i> Lam. <i>Phytotherapy Research</i> 33 : 2870-2903.	12.39
62	Dhaliwal L K, Buttar G S, Kingra P K and Kaur Sukhjeet (2019). Effect of mulching, row direction and spacing on microclimate and wheat yield at Ludhiana. <i>J Agrometeorol</i> 21 : 42 -45.	6.56
63	Dhaliwal N K and Aggarwal N (2019). Biointensive management of brinjal shoot and fruit borer <i>Leucinodes orbonalis</i> Guenee. <i>Indian J Entomol</i> 81 : 760-64.	5.08
64	Dhaliwal S S, Naresh R K, Mandal A, Walia M K, Gupta R K, Singh R and Dhaliwal M K. (2019). Effect of manures and fertilizers on soil physical properties, build-up of macro and micronutrients and uptake in soil under different cropping systems: A review. <i>J Plant Nutr</i> 42 : 2873-900.	8.28
65	Dhaliwal S S, Ram H, Shukla A K and Mavi G S (2019). Zinc biofortification of bread wheat, triticale and durum wheat cultivars by foliar zinc fertilization. <i>J Plant Nutr</i> 42 : 813-22.	8.28
66	Dhaliwal S S, Ram H, Walia S S, Walia M K, Kumar B and Dhaliwal M K (2019). Long term influence of nutrient management on carbon and nutrients in typic Ustochrept soils. <i>Commun Soil Sci Plant Anal</i> 50 : 2420-428.	7.58
67	Dhami P, Bains K and Kaur H (2019). Traditional Ready-To-Use mix for the food basket of calamity stranded evacuees – Analysis of sensory, nutritional and storage parameters. <i>Chem Sci Rev Lett</i> 31 : 100-09.	5.21
68	Dhar S, Jindal V, Jariyal M and Gupta V K (2019). Molecular characterization of new isolates of the entomopathogenic fungus, <i>Beauveria bassiana</i> and their efficacy against the tobacco caterpillar, <i>Spodoptera litura</i> (Fabricius) (Lepidoptera: Noctuidae). <i>Egyptian J Biol Pest Contr</i> 29 : 8.	6.16



69	Dhatt K K, S Bhandari and T Thakur (2019). Effect of micro nutrients and KNO ₃ on vegetative growth flower yield and pigments of <i>Tagetes erecta</i> cv Pusa Narangi <i>Int J Curr Microbiol App Sci</i> 8 : 54-61.	5.38
70	Dhillon BS, Brar JS and Singh H (2019). Influence of different planting methods on growth, productivity and root characteristics of BT cotton in south-west Punjab. <i>J Pharmacogn Phytochem</i> 8 : 1680-1683.	5.21
71	Dhillon K S, Dhillon S K and Singh B (2019). Genesis of seleniferous soils and associated animal and human health problems. <i>Adv Agron</i> 154 : 1-80.	15.27
72	Dhillon PS, Dhillon GPS and Singh B (2019). Growth performance of <i>Eucalyptus</i> clones in saline soils. <i>Indian For</i> 145 : 315-20.	5.10
73	Dhiman M, Sethi V P, Singh B, Sharma A (2019). CFD analysis of greenhouse heating using flue gas and hot water heat sink pipe networks. <i>Computers and Electronics in Agriculture</i> 163 : 1048-53.	8.20
74	Dhir B and Singla N (2019). Consumption pattern and health implications of convenience foods: A practical review. <i>Current J App Sci Technol</i> 38 : 1-9.	5.32
75	Dhir B, Singla N and Jain R (2019). Relationship between consumption of convenience foods and health status of working women. <i>Current J App Sci Technol</i> 39 : 87-94.	5.32
76	Gaba Y and Vashishat N (2019). Nesting Ecology of Spotted Owlet (<i>Athene brama</i>) and Barn Owl (<i>Tyto alba</i>) in Agroecosystem of Punjab. <i>Int J Ecol Environ Sci</i> 45 : 39-43.	5.15
77	Garcha S and Kansal R (2019). Molasses growth medium for production of Rhizobium based biofertilizer. <i>Ind J Biochem Biophysics</i> 56 : 378-83.	7.92
78	Gaurav, Singh J P, Sahota P P and Singh K (2019). Development of composite radial filter for recharging aquifers with canal water. <i>Current Science</i> 117 : 87-93.	7.17
79	Gill G S, Singh B B, Dhand N K, Aulakh R S, Sandhu B S, Ward M P, Brookes V J (2019). Estimation of the incidence of animal rabies in Punjab, India. <i>PLOS ONE</i> 14 : e0222198 https://doi.org/10.1371/journal.pone.0222198 .	9.24
80	Gill J S and Singh M (2019). Comparison of wheat production under different paddy residue management methods. <i>Current J App Sci Technol</i> 38 : 1-9.	5.32
81	Godara A S and Singh A (2019). Effect of feed restriction and turmeric powder supplementation on broiler performance. <i>Haryana Vet</i> 58 : 254-256.	5.36
82	Goyal G and Sharma S (2019). The promise and peril of health apps in diet, physical activity and behaviour modifications: A systematic review. <i>Int J Curr Microbiol App Sci</i> 8 : 2284-92.	5.38
83	Goyal M and Kaur R (2019). Interactive effects of nitrogen nutrition, nitrate reduction and seasonal variation on oxalate synthesis in leaves of Napier bajra hybrid (<i>Pennisetum purpureum</i> x <i>P. glaucum</i>). <i>Crop & Pasture Science</i> 70 : 669-75.	8.25
84	Grover G, Sharma A, Srivastava P, Kaur J and Bains N S (2019). Genetic analysis of stripe rust resistance in a set of European winter wheat genotypes. <i>Euphytica</i> 215 :57.	8.19
85	Grover S, Jindal V and Banta G (2019). RNA interference mediated knockdown of juvenile hormone esterase gene in <i>Bemisia tabaci</i> (Gennadius): effects on adults and their progeny. <i>J Asia Pacific Ent</i> 22 : 56-62.	7.05
86	Gupta A, Aggarwal R and Kaur S (2019). Performance of abandoned well for groundwater recharge using canal water. <i>J Soil Water Conserv</i> 18 : 64-69.	5.20
87	Gupta R K, Hussain A, Singh Y, Sookh S S, Kang JS, Sharma S and Dheri G S (2019). Rice straw biochar improves soil fertility, growth and yield of rice-wheat system on a sandy loam soil. <i>Experimental Agriculture</i> 56 : 118-31.	8.23

88	Gupta R, Lathwal S S, Bhadauria P, Kerketta S, Fahim A, Devi I and Jadoun Y S (2019). Discrimination of karan fries cow's individuality by the mean of their vocal acoustic features. <i>Indian J Anim Res</i> 53 : 864-69.	6.43
89	Gupta R, Singh K, Bhadauria P and Jadoun Y S (2019). Extension Contact and Extension Participation of Livestock Farmers in Jalandhar District of Punjab- A Benchmark Analysis. <i>Ind J of Ext Edu</i> 55 : 89-93.	5.95
90	Gupta S, Sharma N, Akhatar J, Atri C, Kaur J, Kaur G, Banga S S (2019). Analysis of epigenetic landscape in a recombinant inbred line population developed by hybridizing natural and re-synthesized <i>Brassica juncea</i> (L.) with stable C-genome introgressions. <i>Euphytica</i> 215 :1-11.	8.19
91	Hindoriya P S, Meena R K, Singh M, Kumar R, Ram H, Meena V and Kushwaha M (2019). Evaluation of kharif forage crops for biomass production and nutritional parameters in Indo-Gangetic plains of India. <i>Indian Journal of Animal Nutrition</i> 36 : 25-29.	5.66
92	Hundal H S, Singh K and Singh D (2019). Geochemistry of Manganese in Neutral to Alkaline Soils of Punjab, Northwest India and its availability to Wheat and Rice Plants. <i>Commun Soil Sci Plant Anal</i> 50 : 627-38.	7.58
93	Jain N, Utreja D and Dhillon N K (2019). A convenient one pot synthesis and antinemic studies of nicotinic acid derivatives. <i>Russ J Org Chem</i> 55 : 845-51.	6.75
94	Jain P, Kaur M, Kaur M and Grewal J K (2019). Comparative studies on spinal ferrite MFe_2O_4 (M = Mg/Co) nanoparticles as potential adsorbents for Pb (II) ions. <i>Bull Mater Sci</i> 42 :77-9.	6.93
95	Jain P, Utreja D and Sharma P (2019). An efficacious synthesis of N'1, C'3' substituted indole derivatives and their antimicrobial studies. <i>J Heterocyclic Chem</i> 57 : 428-435.	7.14
96	Jassal R K and Singh H (2019). Effect of seed-priming methods on nodulation, nutrient uptake and quality in soybean (<i>Glycine max</i>) under bed-sown condition. <i>Ind J Agron</i> 64 : 78-84.	5.55
97	Jethwani P and Grover K (2019). Gut microbiota in health and diseases –A Review. <i>Int J Curr Microbiol App Sci</i> 8 : 1586-99.	5.38
98	Jindal V (2019). DNA barcode reveals occurrence of <i>Mythimna loreyi</i> (Duponchel) in Punjab, India. <i>Indian J Biotech</i> 18 : 81-84.	6.32
99	Jindal V (2019). Genetic diversity of rice leaf folder using mitochondrial cytochrome oxidase 1 gene. <i>Indian J Ent</i> 81 : 75-81.	5.89
100	Joshi H, Kochar A and Boora R S (2019). Organoleptic characteristics and nutritive value of candy developed from new varieties of guava. <i>Int J Chem Stud</i> 7 : 2124-27.	5.31
101	Joshi N and Bains K (2019). Bringing unconventional greens from fodder to fork: A review. <i>Int J Curr Microbiol App Sci</i> 8 : 2125-36.	5.38
102	Joshi N, Bains K and Kaur H (2019). Optimization of drying time and temperature for preparation of antioxidant rich vegetable powders from unconventional leafy greens <i>Chem Sci Rev Lett</i> 8 : 70-78.	5.21
103	Joshi N, Bains K and Kaur H (2019). Evaluation of antioxidant activity of developed instant soup mixes using vegetable leaf powders from unconventional greens. <i>Int J Curr Microbiol App Sci</i> 9 : 711-21.	5.38
104	Joshi N, Shera P S, Sangha K S and Sharma S (2019). Bioformulations for management of pod borer, <i>Helicoverpa armigera</i> (Hübner) in Mungbean (<i>Vigna radiata</i> L.) <i>Journal of Biological Control</i> 33 : 76-79.	5.34
105	Kahlon M S and Dhingra M (2019). Combined effect of tillage and sowing method on rice-wheat productivity. <i>Appl Ecol Environ Res</i> 17 :13685-699.	6.82



106	Kalsi M, Dhatt K K and Kaur N (2019). Effect of growth regulators on plant growth and cormel production of gladiolus. <i>The Bioscan</i> 14 : 303-306.	5.26
107	Kandwal P and Rampal V K (2019). Adoption of forestry practices for livelihood in lower Shivalik Hills. <i>Ind J Econ Dev</i> 55 : 30-32.	5.32
108	Kang J S, Kaur J and Sandhu S S (2019). Performance of mechanically transplanted Basmati rice (<i>Oryza sativa</i>) under different age of seedlings and planting densities. <i>Ind J Agron</i> 64 : 200-203.	5.55
109	Kataria S K, Pal R K, Kumar V and Singh P (2019). Population dynamics of whitefly, <i>Bemisia tabaci</i> (Gennadius) as influenced by weather conditions infesting Bt cotton hybrids. <i>J Agrometeorol</i> 21 : 504-09.	6.05
110	Kaur A and Singh R (2019). Emerging use of social media tools in Indian Agribusiness: An overview. <i>Indian J Econ Dev</i> 15 : 418-24.	5.15
111	Kaur A and Thind S K (2019). Relative growth rate of wheat seedlings as effected by PEG-stimulated drought and various concentrations of plant growth regulators. <i>J Pharmacogn Phytochem. Special issue</i> 1 : 62-65.	5.21
112	Kaur A, Gill P P S, Jawandha S K and Singh M (2019). Pre-storage exogenous application of boric acid extends storability and maintains quality of pear fruits. <i>Sci Horti</i> 256 : 108616 https://doi.org/10.1016/j.scienta.2019.108616 .	10.34
113	Kaur A, Gill P P S and Jawandha S K (2019). Effect of sodium benzoate application on quality and enzymatic changes of pear fruits during low temperature. <i>J Food Sci Technol</i> 56 : 3391-398.	7.80
114	Kaur A, Kapoor R, Vikal Y and Kalia A (2019). Production of interspecific hybrids between pearl millet [<i>Pennisetum glaucum</i> (L.) R. Br.] × napier grass [<i>Pennisetum purpureum</i> (K.) schum] and their characterization. <i>Int J Curr Microbiol App Sci</i> 8 : 1308-13.	5.38
115	Kaur A, Kaur J, Singh J and Chhuneja P K (2019). Golden honey utilization in food industry. <i>Agro Food Industry Hi-Tech</i> 16 : 34-36.	6.00
116	Kaur A, Kochhar A, Boora R S and M Javed M (2019). Incorporation of bael (<i>Aegle marmelos</i> L.) pulp and stevia (<i>Stevia rebaudiana</i>) powder in value added sweet products. <i>Current J App Sci Technol</i> 38 : 1-10.	5.32
117	Kaur A, Kochhar A, Sharma S and Boora R S (2019). Sensory evaluation of value added dairy products using bael pulp (<i>Aegle marmelos</i>) and stevia powder. <i>Int J Curr Microbiol App Sci</i> 8 : 2122-31.	5.38
118	Kaur A, Kochhar A, Sharma S and Javed M (2019). Development and evaluation of cereal based sweet products using bael (<i>Aegle marmalos</i>) and stevia. <i>Chem Sci Rev Lett</i> 8 : 257-65.	5.21
119	Kaur A, Zhawar V K, Pannu PPS and Sharma S (2019). Effect of abscisic acid and salicylic acid on growth and phenolic parameters under <i>Fusarium fujikuroi</i> infection in rice seedlings. <i>Indian Phytopathol</i> 72 : 253-60.	5.90
120	Kaur B and Kaur P (2019). Intercropping summer moong (<i>Vigna radiata</i>) in turmeric (<i>Curcuma longa</i> L.) - A feasibility study at Punjab. <i>Journal of Spices and Aromatic Crops</i> . 27 :145–150.	5.11
121	Kaur D, Taggar M S, Kalia A and Singh I (2019). Isolation and characterization of microalgae from water-logged area of Punjab. <i>Indian J Exp Bio</i> 57 : 700-07.	7.48
122	Kaur G, Kaur L and Tiwari. D (2019). Scenario of dowry in rural Punjab -Perceptions and suggestions. <i>Current J App Sci Technol</i> 32 : 1-6.	5.32
123	Kaur H and Goyal M (2019). Salicylic acid priming enhances low temperature stress tolerance in Egyptian clover (<i>Trifolium alexandrinum</i> L.) by influencing antioxidant system. <i>Indian J Exp Bio</i> 57 : 507-15.	7.48

124	Kaur H and Kaur N (2019). Effect of germination on the nutritional and antinutritional composition of soybean (<i>Glycine max</i>) <i>Int J Curr Microbiol App Sci</i> 8:582-91.	5.38
125	Kaur H, Bedi S and Dhatt A S (2019). Comparison of substrate hydroponic systems for soilless tomato production. <i>Indian J Hortic</i> 76: 192-94.	6.10
126	Kaur H, Gosal S K and Kaur J (2019). Effect of sulphur oxidising bacterial inoculants on microbial population and enzymatic activities in rhizosphere of <i>Brassica napus</i> (var. GSC-7). <i>Chem Sci Rev Lett</i> 6: 88-93.	5.21
127	Kaur H, Kapoor S and Sharma S (2019). Correlating lignocellulosics converting enzymes, substrate utilization and biological efficiency of <i>Pleurotus eryngii</i> strains grown on different agricultural residues. <i>Indian J Hortic</i> 76: 305-11.	6.00
128	Kaur H, Kaur K, and Gill G K (2019). Modulation of sucrose and starch metabolism by salicylic acid induces thermotolerance in spring maize. <i>Russ J Plant Physio</i> 166: 771-77.	6.82
129	Kaur H, Kingra P K and Singh S P (2019). Effect of sowing date, irrigation and mulch on thermal time requirement and heat use efficiency of maize. <i>J Agrometeorol</i> 21: 46 – 50.	6.56
130	Kaur H, Kingra P K and Singh S P (2019). Role of micro climatic modification in Managing Climate Change impact on maize in Central Punjab. <i>J Agrometeorol</i> 21: 90-97.	6.56
131	Kaur H, Parmar M and Phutela U G (2019). Bacterial pretreatment of paddy straw for enhancing biogas production. <i>J Env Bio</i> 40: 1073-78.	6.96
132	Kaur H, Sardana V, Sharma P and Kaur G (2019). Effect of crop geometry and nitrogen on nitrogen uptake, protein yield, oil yield and oil quality of determinate and short statured genotypes of Ethiopian mustard (<i>Brassica carinata</i> A. Braun). <i>Ind J Agron</i> 64: 115-22.	5.55
133	Kaur I, Chawla N and Dhatt A S (2019). Evaluating changes in total sugars, fructans and alcohol insoluble solids in onion (<i>Allium cepa</i> L.) genotypes during ambient storage conditions. <i>Int J Chem Stud</i> 7: 1435-40.	5.31
134	Kaur J and Kaur M (2019). Facile fabrication of ternary nanocomposite of MgFe ₂ O ₄ TiO ₂ @GO for synergistic adsorption and photo catalytic degradation studies. <i>Ceram Int</i> 45: 8646-659.	9.06
135	Kaur J, Gosal S K, Walia S S and Kaur J (2019). Impact of green manure and consortium biofertilizer on amyolytic bacterial population and their activities in maize rhizospheric soil. <i>Chem Sci Int J</i> 26: 1-7.	6.00
136	Kaur J, Gosal S K, Walia S S, Kaur J and Khipla N (2019). Effect of green Manure and bio-Inoculants on inter-relationship of soil biological properties of Kharif. <i>Chem Sci Rev Lett</i> 8: 297-301.	5.21
137	Kaur J, Ram H and Singh S P (2019). Productivity, phenology and heat unit accumulation of wheat (<i>Triticum aestivum</i> L.) as influenced by nitrogen management using green seeker. <i>J Crop Weed</i> 15: 24-28.	5.46
138	Kaur J, Sharma R, Sharma S and Jiwan (2019). Monthly nutrient uptake by weeds in different land use systems at two locations of Punjab, India. <i>Ind J Weed Science</i> 51: 275-279.	5.84
139	Kaur J, Taggar M S and Kocher G S (2019). Fermentation of enzymatically saccharified rice straw hydrolysate for bioethanol production. <i>Res J Biotech</i> 14: 98-103.	6.00
140	Kaur J, Utreja D, Dhillon N.K. and Sharma S (2019). Synthesis of Indole Derivatives and their evaluation against Root Knot Nematode <i>Meloidogyne incognita</i> . <i>Lett Org Chem</i> . 16: 759-67.	6.73
141	Kaur J, Utreja D, Ekta, Jain N and Sharma (2019). Recent Developments in the Synthesis and Antimicrobial Activity of Indole and its Derivatives. <i>Curr Org Syn</i> 16: 17-37.	7.84



142	Kaur K and Kaushal S (2019). Phytochemistry and pharmacological aspects of <i>Syzygium aromaticum</i> : A review. <i>J Pharmacogn Phytochem</i> 8 : 1-9.	5.21
143	Kaur K and Singh R (2019). Burrow structure of lesser bandicoot rat, <i>Bandicota bengalensis</i> during different stages of rice crop in Punjab. <i>J Exp Zool</i> 22 : 331-38.	5.51
144	Kaur K, Grewal S K, Gill P P S and Sarvjeet Singh (2019). Comparison of cultivated and wild chickpea genotypes for nutritional quality and antioxidant potential. <i>J Food Sci Technol</i> 56 :1864-876.	7.80
145	Kaur K, Kaushal S and Rani R (2019). Chemical composition, antioxidant and antifungal potential of Clove (<i>Syzygium aromaticum</i>) essential oil, its major compound and its derivatives. <i>J Essent Oil Bear Pl</i> 22 : 1195-17.	6.68
146	Kaur K, Kumar H, Pathak D, Rathore P and Singh S (2019). Assessment of molecular diversity in intra-hirsutum genotypes of cotton. <i>J Pharmacogn Phytochem</i> Special issue 1 : 520 - 25	5.21
147	Kaur K, Singh R and Singla N (2019). Prevalance of endoparasites in <i>Bandicota bengalensis</i> during different growth stages of rice and wheat crops in Punjab. <i>J Exp Zool</i> 22 : 969-73.	5.51
148	Kaur K, Sohu V S, Sharma A, Srivastava P, Mavi G S, Kaur H, Chhuneja P and Bains N S (2019). Biofortification strategies to increase wheat nutrition and sustaining yield simultaneously. <i>Indian J Genet Plant Breed</i> 379 : 15-24.	6.55
149	Kaur K, Utreja D, Sharma P, Bedi S and Grewal I S (2019). Isolation and derivatization of terpenoids from essential oil of <i>Cyperus scariosus</i> and their biological study. <i>Indian J Weed Sci</i> 51(1) :40-44.	5.84
150	Kaur L, Sharma P and Garg L (2019). Perceived Causes of Farmers' Suicides in Rural Punjab. <i>Ind J of Ext Edu</i> 55 :168-72.	5.95
151	Kaur M and Sharma S (2019). Anthropometric measurements and its relation with Attention Span and Memory Retention. <i>Chem Sci Rev Lett</i> 7 : 912-19.	5.21
152	Kaur M and Kaur P (2019). Economic feasibility of small scale garlic peeler. <i>J Pharmacogn Phytochem</i> 8 : 3264-68.	5.21
153	Kaur M, Garg S, Sharda R and Singh K G (2019). Effect of seasonal variation on the performance of solar photovoltaic pumping system under field conditions. <i>Indian J Agri Sci</i> 89 : 867-72.	6.23
154	Kaur M, Kaur K and Sidhu K (2019). Impact of vocational training courses conducted by krishi vigyan kendras of punjab on establishing an enterprise. <i>Current J App Sci Technol</i> 32 : 1-8.	5.32
155	Kaur M, Kaur P and Kumar M (2019). Development and fabrication of small capacity garlic peeler. <i>Int J Curr Microbiol App Sci</i> 8 : 619-34.	5.38
156	Kaur M, Punia S S, Singh J and Singh S (2019). Pre- and post-emergence sequences for management of multiple herbicide resistant littleseed canary grass in wheat. <i>Indian J weed Sci</i> 51 : 133-138	5.84
157	Kaur M, Sharma S and Vig D (2019). Fast food consumption and its relation with attention span and memory retention in school children. <i>Studies on Ethno Medicines</i> 13 : 17-26.	6.29
158	Kaur Maninder, Punia S S, Singh J and Singh S (2019). Efficacy of pendimethalin against resistant little seed canary grass as affected by soil moisture and formulation. <i>J Crop and Weed</i> 15 : 167-73.	5.46
159	Kaur N and Bons H K (2019). Influence of different plant growth regulators on yield and quality of sapota (<i>Manilkara achras</i>) cv. Kalipatti. <i>Indian Journal of Agricultural Sciences</i> 89 : 842-845.	6.23
160	Kaur N and Kaur P (2019). Maize yield projections under different climate change scenarios in different districts of Punjab. <i>J Agrometeorol</i> 21(2) : 154-158.	6.56

161	Kaur N and Vashishat N (2019). Abundance and diversity of birds around the mobile phone towers in Punjab, India. <i>J Exp Zool</i> 22 : 1091-95.	5.51
162	Kaur N, Kaur H and Mavi G S (2019). Assessment of nutritional and quality traits in biofortified bread wheat genotypes. <i>Food Chemistry</i> 302 : 125342. https://doi.org/10.1016/j.foodchem.2019.125342 .	12.31
163	Kaur N, Kaur M and Singh D (2019). Fabrication of mesoporous nanocomposite of graphene oxide with magnesium ferrite for efficient sequestration of Ni (II) and Pb (II) ions: Adsorption, thermodynamic and kinetic studies. <i>Environ Poll</i> 253 : 111-19.	15.99
164	Kaur N, Kocher D K and Sidhu A (2019). Synthesis and testing of <i>Eucalyptus globulosa</i> oil based nanoemulsion for its larvicidal potential against <i>Aedes aegypti</i> . <i>Afr Entomol</i> 27 : 433-38.	6.51
165	Kaur N, Singh B and Sharma S (2019). Comparison of quality protein maize (QPM) and normal maize with respect to properties of instant porridge. <i>LWT- Food Sci Technol</i> 99 : 291-98.	12.06
166	Kaur N, Singh M J (2019). Verification of medium range weather forecast for the Kandi region of Punjab. <i>Mausam</i> 70 : 825-832.	6.91
167	Kaur P and Bhullar M B (2019). Acaricide resistance in <i>Tetranychus urticae</i> on cucumber (<i>Cucumis sativus</i>) under protected cultivation. <i>Indian J Agric Sci S</i> . 89 : 1462-465.	6.80
168	Kaur P, Kaur H, Singh H and Sandhu S S (2019). Effect of elevated temperature regimes on growth and yield of rice cultivars under temperature gradient tunnel (TGT) environments. <i>J Agrometeorol</i> 21 : 241-248.	6.56
169	Kaur P, Kocher G S and Taggar M S (2019). Enhanced bio-composting of rice straw using agricultural residues: an alternate to burning. <i>Int J Recyc Orgc Waste in Agri</i> 8 : 479-83.	6.60
170	Kaur P, Kocher G S, Taggar M S (2019). Development of fungal consortium for the pre-treatment of rice straw under optimized solid state and shake flask conditions. <i>Env Prog Sust Energ</i> 38 : 635-46.	7.33
171	Kaur P, Sharma S, Gaba J, Rashmi (2019). Conventional vs microwave assisted synthesis of different substituted heterocyclic amides. <i>J Indian Chem Soc</i> 96 : 401-5.	6.20
172	Kaur R and Dhillon B S (2019). Control of <i>Phalaris minor</i> with sequential application of pre- and post-emergence herbicides and herbicide combinations in wheat. <i>Indian J weed Sci</i> 50 : 351-54.	5.84
173	Kaur R, Kaur K and Ahluwalia P (2019). Effect of drying temperatures and storage on chemical and bioactive attributes of dried tomato and sweet pepper, <i>LWT - Food Sci Technol</i> 117 : 108604.	12.06
174	Kaur R, Kocher D K, Vashishat N and Sidhu A (2019). Larvicidal efficiency of aquananoemulsion of <i>Aloe vera</i> oil against <i>Aedes aegypti</i> mosquito. <i>Indian J Ent</i> 81 : 753-56.	5.89
175	Kaur R, Nirmaljit Kaur and Singh H (2019). Pericarp and pedicel anatomy in relation to fruit cracking in lemon (<i>Citrus limon</i> L. Burm.). <i>Sci Hortic</i> 246 : 462-68.	10.34
176	Kaur R, Sharma S, Shera P S and Sangha K S (2019). Evaluation of anthocorid predator, <i>Blaptostethus pallescens</i> Poppius against spider mite, <i>Tetranychus urticae</i> Koch on Okra under insect net cage condition. <i>Journal of Biological Control</i> 33 : 236-241.	5.34
177	Kaur S and Bains K. (2019). Chia (<i>Salvia hispanica</i> L.) –a rediscovered ancient grain, from Aztecs to food laboratories. <i>Nutr Fd Sci</i> 50 : 463-79.	5.26
178	Kaur S and Dhatt K K (2019). Response of pollen viability in gladiolus (<i>Gladiolus grandiflorus</i> L.) to storage method and period <i>Int J Curr Microbiol App Sci</i> 8(2) : 1625-31	5.38
179	Kaur S and Kaur P (2019). Enhancing income and employment on marginal and small farms through dairying in Punjab. <i>Ind J Dairy Sci</i> 72(4) : 413-421	5.95



180	Kaur S and Kler T K (2019). Food and foraging niches of carnivorous bird species in orchards: Implications for their conservation. <i>J Anim Res</i> 9(2) : 325-34	5.68
181	Kaur S S and Dhaliwal L K (2019). Epidemiology of mungbean yellow mosaic virus under Ludhiana conditions. <i>J Agrometeorol</i> 21(Special Issue-1) : 27-32.	6.56
182	Kaur S, Bains K and Kaur H (2019). Regional disparity analysis for iron status of school-going children from Punjab, India. <i>Int J Curr Microbiol App Sci</i> 8 : 2008-13	5.38
183	Kaur S, Bains K and Kaur H (2019). Study of morbidity status of school-children from different cultural regions of Punjab, India. <i>Int J Chem Stud</i> 7 : 2509-14	5.21
184	Kaur S, Bains K and Kaur H (2019). Screen time and physical activity pattern of school children (11-17 years) from different cultural regions of Punjab, India. <i>Current J App Sci Technol</i> 32(6) : 1-13.	5.32
185	Kaur S, Bains K and Kaur H (2019). Thinness and stunting among school children in the perspective of socio-economic disparity in Punjab, India. <i>Chem Sci Rev Lett</i> 8 : 141-48	5.21
186	Kaur S, Bhardwaj R D, Kapoor R, Grewal S K (2019). Biochemical characterization of oat (<i>Avena sativa</i> L.) genotypes with high nutritional potential. <i>LWT - Food Sci Tech</i> 110 : 32-39	9.13
187	Kaur S, Dhaliwal L K and Buttar G S (2019). Monsoon rainfall variability and groundwater table fluctuations in Punjab. <i>J Agrometeorol</i> 21 (Special Issue-1) : 182-94.	6.56
188	Kaur S, Dheri G S and Benbi D K (2019). Effect of long-term fertilization in maize-wheat cropping system on carbon mineralization in soil. <i>Carbon Management</i> 10 : 523-32	9.52
189	Kaur S, Kaur P and Kumar P (2019). Awareness of farmers regarding soil health card scheme. <i>Int J Curr Microbiol Appl Sci</i> 8(11) : 2206–10.	5.32
190	Kaur S, Kumar D, Singla M and Dogra R (2019). Biogas to Bio-CNG from paddy straw: A review. <i>Int J Chem Stu</i> 8(3) : 1833-38	5.31
191	Kaur S, Raheja A and Aggarwal R (2019). Performance evaluation and optimization studies of border irrigation system for wheat in the Indian Punjab. <i>Water SA</i> 45(1) :41-47	7.59
192	Kaur S, Saini MK and Bakhshi D K(2019). Influence of date of planting, nitrogen application and planting geometries on growth, biomass yield and essential yield of palmarosa (<i>Cymbopogon martini</i> Roxb. Wats) under sub-mountainous region of Punjab. <i>Int J Curr Microbiol App Sci</i> 8(11) : 1310-18.	5.38
193	Kaur T, Bhullar M S and Kaur S (2019). Weed control in Bt (<i>Bacillus thuringiensis</i>) cotton with pre mix of pyriithiobac sodium plus quizalofop ethyl in north-west India. <i>Crop Protection</i> 119 :69-75	9.04
194	Kaur T, Kaur S and Bhullar M S (2019). Management of grass weeds with quizalofop in soybean (<i>Glycine max</i> (L.) Merill). <i>Phytoparasitica</i> 47(1) : 155-162	7.81
195	Kaur Y, Dhall R K, Sharma P (2019). Characterization of bolting behaviour in garlic (<i>Allium sativum</i> L.) using SNP identification. <i>Indian J Agric Sci</i> 90(1) :112-117	6.18
196	Kawatra M, Kaur K and Kaur G (2019). Effect of osmo priming on sucrose metabolism in spring maize, during the period of grain filling, under limited irrigation conditions. <i>Physiol Mol Biol Plants</i> 25 (6) :1367–376	9.02
197	Kerketta S, Mohanty T K, Bhakat M, Kumaresan A, Baithalu R, Gupta R, Mohanty A K, Abdullah M, Kar S, Rao V and Fahim A (2019). Moosense pedometer activity and peri-estrous hormone profile in relation to oestrus in crossbred cattle. <i>Indian J Anim Sci</i> 89(12) : 1338–1344	6.29
198	Kingra P K, Kukal S S and Singh S P (2019). Trends in evapotranspiration and water productivity of rice-wheat in different agroclimatic regions of Punjab, India. <i>J Agrometeorol</i> 21 (1) : 63 – 69	6.56
199	Kour A and Gupta N (2019). RNA inference: A new technology for genetic improvement of major fruit species. <i>Int J Curr Microbiol App Sci</i> 8 (3) :1209-18	5.38

200	Kour A, Gupta N and Brar S K (2019). Integrated weed management practices in guava nursery. <i>J Pharmacogn Phytochem</i> 8(2) : 982-85	5.21
201	Kumar A and Dhillon T S (2019). Responses of ethyl methane sulphonate treatments on growth and yield of French bean (<i>Phaseolus vulgaris</i> L.). <i>Indian J Agri Sci</i> 90 : 436-38.	6.23
202	Kumar A and Dhillon T S (2019). Stability of French bean (<i>Phaseolus vulgaris</i> L.) genotypes under diverse environments. <i>Indian J Agri Sci</i> 90 : 157-62.	6.23
203	Kumar A, Jindal S K, Dhaliwal M S, Sharma A, Jain S and Kaur S (2019). Horticultural evaluation of advance breeding lines possessing different combinations by ty and ph genes on tomato (<i>Solanum lycopersicum</i> L.) <i>Genetika</i> 51(3) : 771-88	6.46
204	Kumar A, Jindal S K, Dhaliwal M S, Sharma A, Kaur S and Jain S (2019). Gene pyramiding for elite tomato genotypes against ToLCV (Begomovirus spp.), late blight (<i>Phytophthora infestans</i>) and RKN (<i>Meloidogyne</i> spp.) for northern India farmers. <i>Physiol Mol Biol Plants</i> 25(5) :1197-209	9.02
205	Kumar D, Dogra B, Dogra R, Bains T S, Manes G S (2019). Optimization of operational parameters for mechanized harvesting of mungbean [<i>Vigna radiata</i> (L.) Wilczek] with combine harvester. <i>Legum Res</i> 42(2) : 216-221.	6.67
206	Kumar D, Dogra B, Dogra R, Singh I, Manes G S (2019). Optimization of operational parameters for mechanized harvesting of pigeon-pea (<i>Cajanus-cajan</i>) with combine harvester. <i>Legum Res</i> 42(2) : 198-204.	6.67
207	Kumar K, Arora P K, Brar J S, Bhatia D and Kumar A (2019). Influence of explant collection period, anti-browning strategy and growth regulators composition on in vitro propagation of Bhagwa pomegranate. <i>Indian J Hortic</i> 76(2) : 273-78.	6.10
208	Kumar M, Dogra B, Sanghera G S, Manes G S (2019). Modification and evaluation of commercially available sugarcane trench planter for its application under punjab conditions. <i>Sugar Tech</i> 21(4) : 586-95	7.87
209	Kumar P and Kaur P (2019). Role perception of subject matter specialists of selected Krishi Vigyan Kendras of Northern India. <i>J Community Mobilization Sustain Dev</i> 14 (2) : 283-292	5.67
210	Kumar S and Singh T P (2019). Development and performance evaluation of a PTO powered vertical disc plough with seeding attachment for sowing of wheat after rice. <i>J Agric Eng</i> 56(3) :1-11.	5.59
211	Kumar S S, Singh S P and Kingra P K (2019). Estimation of moisture depletion rate of barley in accordance with pan evaporation under diverse hydrothermal regimes. <i>J Pharmacogn Phytochem</i> 8(3) : 3381-3385	5.21
212	Kumar V and Jindal V (2019). Anthranilic diamide-cyantraniliprole 100D in the management of sucking insects of Bt cotton. <i>Pestic Res J</i> 31(1) : 42-47	5.49
213	Kumar V, Jindal V, Kataria S K and Pathania M (2019). Activity of novel insecticides against different life stages of whitefly, <i>Bemisia tabaci</i> (Gennadius) in Bt cotton. <i>Indian J Agric Sci</i> 89(10) : 1599-603	6.80
214	Kumari A, Kaur S and Bal S K (2019). Assessment of microbiological quality of food items served in college canteens. <i>Int J Curr Microbiol App Sci</i> 8(11) : 974-81	5.38
215	Kumari S and Khanna V (2019). Biocidal mechanisms in biological control of fusarium wilt in chickpea(<i>Cicer arietinum</i> L.) by antagonistic rhizobacteria: A current perspective in soil borne fungal pest management. <i>Int J Curr Microbiol App Sci</i> 8(10) : 1494-1510	5.38
216	Kumawat K C, Sharma P, Singh I, Sirari A and Gill B S (2019). Coexistence of <i>Leclercia adecarboxylata</i> LSE-1 and <i>Bradyrhizobium</i> sp. LSBR-3 in nodule niche for multifaceted effects and profitability in soybean production. <i>World J Microbiol Biotechnol</i> 35 : 172. https://doi.org/10.1007/s11274-019-2752-4	8.60



217	Ludhar N K, Sirari A, Bains T S, Sharma A, Patel S A H, Sharma P, Rani U and Cheema H K (2019). Deployment of yellow mosaic disease resistance in mungbean (<i>Vigna radiata</i> (L.) Wilczek) through interspecific hybridization. <i>Legum Res</i> 44(2) : 152-157	6.67
218	Madhwal S and Sharma S (2019). Food safety knowledge and procurement practices in relation to food borne disease incidence in Ludhiana district, India. <i>Int J Curr Microbiol App Sci</i> 8 :2025-40.	5.38
219	Madhwal S and Sharma S (2019). Refrigerated food safety awareness and attitude in relation to food borne disease incidences. <i>Int J Chem Stud</i> 7 : 262-70.	5.31
220	Mahal J S, Manes G S, Singh A, Kaur S and Singh M (2019). Complementing solutions and strategies for managing rice straw and their impact in the state of Punjab. <i>Agric Res J</i> 56 (3) : 588-593	6.00
221	Mahala P, Chaudhary M R and Garhwal O P (2019). Effect of integrated nutrient management on growth and yield of rabi onion and its residual effect on succeeding okra crop. <i>Indian J Hortic</i> 76 (2) : 312-18.	6.10
222	Maini C, Tandon R, Kalia A and Kaur H (2019). Chemical characterization and antimycotic potential of <i>Azadirachta indica</i> L. leaf extracts against <i>Penicillium digitatum</i> of kinnow fruit. <i>Allelopathy</i> 47(2) :243-46	6.71
223	Manan J, Sharma M and Jaidka M (2019). Factors affecting the adoption of paddy varieties in Kapurthala district of Punjab, India. <i>Int J Curr Microbiol App Sci</i> 7(9) : 3014-20.	5.38
224	Maninder Kaur and AK Singh (2019). Effect of process parameters on quality of honey osmosed dehydrated Aonla. <i>Int J Chem Stud</i> 7(4) : 3151-57	5.31
225	Mittal R and Randhawa V (2019). Assessing perceived prevalence of deception in Organizational Communication. <i>Current J App Sci Technol</i> 36(1) : 1-11.	5.32
226	Mukherjee S, Mavi M S, Singh J and Singh B P (2019). Rice-residue biochar influences phosphorus availability in soil with contrasting P status. <i>Arch Agron Soil Sci</i> 66(6) : 778-791. 10.1080/03650340.2019.1639153.	8.24
227	Murria S, Nirmaljit Kaur, Arora A and Arora N K (2019). Microscopic and ultrastructural studies of grape cultivars (<i>Vitis vinifera</i> L.) with variable susceptibilities to anthracnose. <i>Indian Phytopathol</i> 72(2) :261-69.	5.90
228	Nagpal S, Sharma P and Kumawat K C (2019). Assessment of native single and dual inoculants of <i>Mesorhizobium</i> sp. and endophytic rhizobacteria for plant growth promotion in chickpea. <i>Agric Res J</i> 56 (4) : 746-51	5.77
229	Navneet K, Kaur M and Singh D (2019). Fabrication of mesoporous nanocomposite of graphene oxide with magnesium ferrite for efficient sequestration of Ni (II) and Pb (II) ions: Adsorption, thermodynamic and kinetic studies. <i>Environ Poll</i> 49 : 1650-659	15.99
230	Nazir G, Kumar P, Shukla A K and Sharma U. (2019). Influence of boron fertilization on cauliflower productivity, nutrient uptake and soil nutrient status in an acid Alfisol in Northwestern Himalaya. <i>Commun Soil Sci Plant Anal</i> 50(12) : 1403-16	7.58
231	Oberoi H K (2019). Non-enzymatic antioxidant defence mechanism in plants. <i>Chem Sci Rev Lett</i> 8 : 110-14	5.21
232	Pal R, Mahajan G, Sardana V, Asthir B and Chauhan B S (2019). Performance of dry-seeded rice genotypes under varied soil moisture regimes and foliar applied hormones. <i>Int J Plant Prod</i> 9(4) : 539	8.61
233	Pal V, Singh Guriqbal and Dhaliwal S S (2019). Agronomic biofortification of chickpea with zinc and iron through application of zinc and urea. <i>Commun Soil Sci Plant Anal</i> 50(15) : 1864-877.	7.58

234	Pal V, Singh Guriqbal and Dhaliwal S S (2019). Yield enhancement and biofortification of chickpea (<i>Cicer arietinum</i> L.) grain with iron and zinc through foliar application of ferrous sulfate and urea. <i>J Plant Nutr</i> 42(15) : 1789-802	8.28
235	Pandey S, Thakur A, Singh H, Vikal Y (2019). Intraspecific hybridization of low chill peach cultivars for superior fruit quality and their hybridity confirmation by SSR markers. <i>Indian J Hortic</i> 76 (2) :199-205.	6.10
236	Pandey A K, Singh M, Kumar S, Meena V K, Onte S and Kushwaha M (2019). Influence of stage of harvesting and zinc application on yield and zinc uptake in cluster bean [<i>Cyamopsis tetragonoloba</i> (L.) TAUB]. <i>Legum Res</i> 42(5) : 661-65	6.67
237	Pandher L K, Gupta R K and Kukal S S (2019). Seasonal variations in C and N fractions under tree based cropping systems in typic ustochrepts. <i>Tropical Ecology</i> 60 :455–461	7.33
238	Pathania M, Arora PK, Pathania S and Kumar A (2019). Studies on population dynamics and management of pomegranate aphid, <i>Aphis punicae</i> Passerini (Hemiptera: Aphididae) on pomegranate under semi-arid conditions of South-Western Punjab. <i>Sci Hortic</i> 243 : 300-306	10.34
239	Pawar P, Singla LD, Kaur P, Bal M S and Javed M (2019). Evaluation and correlation of multiple anthelmintic resistances to gastrointestinal nematodes using different fecal egg count reduction methods in small ruminants of Punjab, India. <i>Acta Parasitologica</i> 64 : 456-63.	7.53
240	Priscilla L and Chauhan AK (2019). Economic impact of cooperative membership on dairy farmers in Manipur: a propensity score matching approach. <i>Agric Econ Res Rev</i> 32 :117-123	5.90
241	Raigond P, Sood A, Kalia A, Joshi A, Kaundal B, Raigond B, Dutt S, Singh B and Chakrabarti S K (2019). Antimicrobial activity of potato starch based active biodegradable nanocomposite films. <i>Potato Res</i> 62 : 69-83	8.56
242	Rajesh and Kumar M (2019). Breeding ecology of Black Ibis <i>Pseudibis papillosa</i> in agro-ecosystem of Punjab, India. <i>J Exp Zool</i> 22(2) : 1151-55.	5.51
243	Ramesh SV, Maranna S, Ramteke R, Bhatia V S, Chouhan B S, Goyal S, Singh A, Praveen S, Gill B S and Chand S (2019). Quantification of a legume begomovirus to evaluate soybean genotypes for resistance to yellow mosaic disease. <i>J Virol Methods</i> 268 : 24–31.	8.62
244	Ramya S, Pandove G, Kalia A, Kaur S, Oberoi H K and Yadav B (2019). Appraisal of seed priming with liquid microbial inoculants on growth and yield attributes of forage cowpea. <i>Legum Res</i> 44(9) : 1109-17	6.67
245	Rana K, Atri C, Akhatar J, Kaur R, Goyal A, Singh M P, Kumar N, Sharma A, Sandhu P S, Kaur G, Barbetti M J, Banga S S (2019). Detection of First Marker Trait Associations for Resistance Against <i>Sclerotinia sclerotiorum</i> in <i>Brassica juncea-Erucastrum cardaminoides</i> Introgression Lines. <i>Front Plant Sci</i> 10 : 1015. doi: 10.3389/fpls.2019.01015	12.63
246	Rashid A, Ram H, Zou C, Rerkasem B, Duarte AP, Simunji S, Yazici A, Guo S, Rizwan, Rajinder M, Bal S, Wang Z, Malik SS, Phattarakul N, de Freitas RS, Lungu O, Barros NLNP, and Cakmak I (2019). Effect of zinc-biofortified seeds on grain yield of wheat, rice, and common bean grown in six countries. <i>J Plant Nutr Soil Sci</i> 182 : 791–804	8.57
247	Rasool R, Bhullar MS, Singh M and Gill G (2019). Flufenacet controls multiple herbicide resistant <i>Phalaris minor</i> Retz. in wheat. <i>Crop Protection</i> 121 : 127-31	9.04
248	Ratra S, Tiwari R, Niazi K R and Bansal R C (2019). Optimal coordinated control of OLTCs using taguchi method to enhance voltage stability of power systems. <i>Energy Procedia</i> 158 : 3957–963	6.44
249	Rattanpal HS, Singh G and Gupta M (2019). Studies on mutation breeding in mandarin variety Kinnow. <i>Current Science</i> 116 :483-87	7.17



250	Resmi P K, Libby J, Trabelsi K, Kumar R. et al. (The Belle Collaboration) (2019). First measurement of the CKM angle ϕ_3 with $B_{\pm} \rightarrow D(K0S \pi^+ \pi^- \pi^0) K_{\pm}$ decays. <i>J. High Energ. Phys.</i> 10.1007/JHEP10	11.83
251	Ritika, Joshi N and Sangha K S (2019). Effect of adjuvants on <i>Iecanicillium lecanii</i> against nymphs of <i>lipaphis erysimi</i> (kalt). <i>Indian J Ent</i> 81(3) : 597-602	5.89
252	Rotondo F, Vrisman C M, Rani R, Testen A L, Deblais L and Miller S A (2019). First report of <i>Pseudomonas syringae</i> pv. <i>aptata</i> causing bacterial leaf spot on common beet (<i>Beta vulgaris</i>) in Ohio. <i>Plant Disease</i> 104 (2) : 561-61	10.61
253	Roy P and Kaur M (2019). Comparison on farmer profile, knowledge and problem association of straw management in Punjab and West Bengal. <i>Ind J Ext Edu</i> 55 (3) : 90-101	5.30
254	S Sukhvir and Kocher GS (2019). Development of apple wine from Golden Delicious cultivar using a local yeast isolate. <i>J Food Sci Technol</i> 56 (6) : 2959-969	9.12
255	Sachar S and Sharma S (2019). Protecting child health by preventing school packed lunch related food borne illnesses: A qualitative study of parent's lunch box related practices. <i>Int J Curr Microbiol App Sci</i> 8 : 1920-33.	5.38
256	Sahni P, Sharma S and Singh B (2019). Evaluation and quality assessment of defatted microalgae meal of <i>Chlorella</i> as an alternative food ingredient in cookies. <i>Nutr Food Sci</i> 49 : 221-31	5.26
257	Sahoo J, Dinesh, Bhat M A, Anil A S and Anurag (2019). Characterization and classification of soils of selected watershed area of Haryana, North-west India. <i>Indian J Agric Sci</i> 89(11) : 1942-47.	6.37
258	Saikia R, Sharma S, Thind H S, Sidhu H S and Singh Y (2019). Temporal changes in biochemical indicators of soil quality in response to tillage, crop residue and green manure management in a rice-wheat system. <i>Ecological Indicators</i> 103 : 383-94	12.26
259	Saikia Rituparna, Sandeep Sharma, Thind, H S, Sidhu H S and Singh Y (2019). Tillage and residue management practices affect soil biological indicators in a rice-wheat cropping system in north-western India. <i>Soil Use Manag</i> 36(1) : 157-172	9.67
260	Saini M, Kaur J and Bajwa U (2019). Development of oat bran incorporated kulfi. <i>Ind J Dairy Sci</i> 72 (6) : 580-89.	5.26
261	Saini SP, Singh P and Brar BS (2019). Nutrient management productivity and nutrient use efficiency in flood plan soils under maize (<i>Zea-mays</i> L.)-wheat (<i>Triticum aestivum</i>) cropping. <i>Indian J Agri Sci</i> 89(10) : 1589-93.	6.23
262	Sandhu BS and Dhaliwal N S (2019). Happy seeder machine enable direct drilling of wheat (<i>triticum aestivum</i>) in rice-wheat cropping System. <i>Current J App Sci Technol</i> 37(6) : 1-6.	5.32
263	Sandhu BS and Dhaliwal NS (2019). Impact of frontline demonstration on rapeseed productivity in South-western part of Punjab. <i>J Oilseeds Res</i> 36 (2) : 102-104.	5.02
264	Sandhu JS, Nayyar S, Kaur A, Kaur R, Kalia A, Arora A, Kaur Y, Thind SK and Chhabra G (2019). Foot rot tolerant transgenic rough lemon rootstock developed through expression of β -1,3-glucanase from <i>Trichoderma</i> spp. <i>Plant Biotechnology Journal</i> . 17(11) : 2023-25	19.26
265	Sandhu K K and Singla N (2019). Postnatal development and attainment of sexual maturity in male Indian gerbil, <i>Tatera indica</i> Hardwicke: morphometric, biochemical, spermatic and histological evaluation. <i>J Exp Zool</i> 22(1) : 41-49.	5.51
266	Sandhu O S, Gupta R K, Thind H S, Jat M L, Sidhu H S and Singh Y (2019). Evaluation of N fertilization management strategies for increasing crop yields and nitrogen use efficiency in furrow irrigated maize-wheat system under permanent raised bed planting. <i>Arch Agron Soil Sci</i> 66(9) : 1302-1317 DOI: 10.1080/03650340.2019.1666209	8.24

267	Sandhu O S, Gupta R K, Thind H S, Jat M L, Sidhu H S, Singh Y (2019). Drip irrigation and nitrogen management for improving crop yields, nitrogen use efficiency and water productivity of maize-wheat system on permanent beds in north-west India. <i>Agric Water Manag</i> 219 : 19-26	12.61
268	Sangha K S, Shera P S, Sharma S, Kaur R, Thakur A and Kaur H (2019). Studies on the population dynamics and host range of Lac insect in different agro-climatic zones of Punjab (India). <i>J Entomol Zool Stud</i> 7 : 183-189.	5.53
269	Sarao P S and Randhawa H S (2019). Bioefficacy of dinotefuran 20% SG against major planthoppers of rice. <i>Indian J Entomol</i> 81(2) : 312-16	5.80
270	Sekhon A S, Sandhu P S, Sharma P, Sharma K K and Belludi R (2019). Effect of date of sowing on development of root rot complex disease in groundnut (<i>Arachis hypogaea</i> L.). <i>Int J Curr Microbiol App Sci</i> 8(11) : 1192-1205.	5.38
271	Sekhon A S, Sandhu P S, Sharma P, Sharma K K and Belludi R (2019). In vitro evaluation of fungicides against <i>Aspergillus niger</i> causing collar rot disease in groundnut (<i>Arachis hypogaea</i> L.). <i>Int J Curr Microbiol App Sci</i> 8(11) : 908-19.	5.38
272	Sekhon B, Dey P K, Singh K B (2019). A new method for computing reliable sample size for prescribing soil test based nutrient management interventions. <i>Commun Soil Sci Plant Anal</i> 50 (21) : 2701-717	7.58
273	Sekhon M and Sethi V P (2019). Thermal modelling and analysis of novel twin-chamber community solar cooker as a replacement of biomass-based cooking. <i>Int J Green Energy</i> 16(2) : 167-184	9.21
274	Sethi M, Bains S and Kaur R (2019). Occupational health assessment of textile unit workers. <i>J Community Mobilization Sustain Dev</i> 14(2) : 337-40.	5.67
275	Sewak A, Singla N and Jain R (2019). Physical activity level in relation to the nutrient intake in elite athletes. <i>Current J App Sci Technol</i> 34(2) : 1-10.	5.32
276	Shankar A, Gupta R K and Singh B (2019). Establishing indicator leaf and its threshold values for need based nitrogen management using chlorophyll meter and leaf color chart in Bt cotton. <i>J Plant Nutr</i> 42 : 186-201.	6.51
277	Sharma A and Singh R (2019). Correlation of abiotic factors with burrow dimensions of Indian gerbil, <i>Tatera indica</i> in sandy-loam soil at different seasons of Punjab. <i>J Pharmacogn Phytochem</i> 8(2) : 2313-18.	5.21
278	Sharma A, Acharya M, Punetha H, Sharma S, Kumari N, Rai P K (2019). Biochemical characterization and correlations in <i>Brassica juncea</i> genotypes. <i>Int J Curr Microbiol App Sci</i> 8(1) : 2408-17.	5.38
279	Sharma C, Bhardwaj N, Sharma A, Tuli H S, Batra P, Beniwal V Gupta G K and Sharma A K (2019). Bioactive metabolites of <i>Ganoderma lucidum</i> : Factors, mechanism and broad Spectrum therapeutic potential. <i>J Herb Med</i> 17-18 : 100268 https://doi.org/10.1016/j.hermed.2019.100268	8.54
280	Sharma H, Chawla N and Dhatt A S (2019). Nutraceutical content and free radical scavenging capacity of Brinjal (<i>Solanum melongena</i> L.) genotypes. <i>Sci Hortic</i> 244 : 294-303.	10.34
281	Sharma K, Dhaliwal NS and Rampal VK (2019). Farmer's attribute towards aerobic rice cultivation in Mukatsar district of Punjab. <i>J Community Mobilization Sustain Dev</i> 14(2) : 262-266	5.67
282	Sharma L, Shukla S K, Jaiswal V P and Sharma K K (2019). Characterization of cultural beneficial bacterial diversity for plant growth promoting attributes associated with rice rhizosphere. <i>J Environ Biol</i> 40(6) : 1180-87.	5.57
283	Sharma M and Bhatia M (2019). Gender disparities in dairy farming enterprise. <i>Ind J of Ext Edu</i> 55 (2) : 144-47.	5.95



284	Sharma N, Acharya S, Kumar K, Singh N, Chaurasia OP (2019). Hydroponics as an advanced technique for vegetable production: An overview. <i>J Soil Water Conserv.</i> 17(4) : 364-71	5.20
285	Sharma N, Sharma S, Singh B and Kaur G (2019). Stability evaluation of iron and vitamin A during processing and storage of fortified pasta. <i>Journal of Quality Assessment and Safety of Crops and Foods</i> 12 : 50-60	8.85
286	Sharma P, Garg S, Kaur M and Satpute S (2019). Evaluating Performance of a Nano-Filter in Removal of Arsenic Trioxide from Water. <i>J Agric Eng</i> 56(1) : 37-44.	5.59
287	Sharma P, Singh I, Sirari A, Khosla G, Singh G, Kaur N and Singh S (2019). Inheritance and molecular mapping of restorer-of-fertility (Rf) gene in A ₂ hybrid system in pigeonpea (<i>Cajanus cajan</i>). <i>Plant Breeding</i> 138(6) : 741-47.	8.54
288	Sharma P, Kaur L, Mittal R, Kaur S and Kaur S (2019). Social marketing approach to bring change in water use behaviour of rural people of Punjab, India. <i>Journal of water and climate change</i> 10(4) : 968-76.	8.80
289	Sharma RK, Bhullar MB and Singh S(2019). Mitochondria COI-Based Molecular Characterization and Genetic Analysis of the Fenazaquin Selected Resistant Strain of Two-Spotted Spider Mite, <i>Tetranychus urticae</i> Koch. <i>Int J Curr Microbiol App Sci</i> 8(02) : 2508-17.	5.38
290	Sharma R K, Bhullar MB, Sangha M K (2019). Biochemical basis of resistance in laboratory selected fenazaquin resistant strain of spider mite, <i>Tetranychus urticae</i> Koch. <i>Indian J Exp Biol</i> 57(10) : 774-79.	7.22
291	Sharma R, Kaur S, Dhillon N K, Pathak M (2019). Identification of resistance in cultivated and wild bitter melon against root knot nematode, <i>Meloidogyne incognita</i> . <i>Indian Phytopathol</i> 72 : 203-08.	5.90
292	Sharma S and Aggarwal N (2019). Safety assessment of selected biopesticides and botanicals on <i>Trichogramma</i> spp. (Hymenoptera: <i>Trichogramma tidae</i>) in fields. <i>Indian J Exp Biol</i> 57 : 443-49.	6.94
293	Sharma S and Dhaliwal S S (2019) Effect of Sewage Sludge and Rice Straw Compost on Yield, Micronutrient Availability and Soil Quality under Rice–Wheat System. <i>Commun Soil Sci Plant Anal</i> 50 (16): 1943-54.	7.58
294	Sharma S and Sharma A (2019) Occurrence of Pepper mottle virus on tomato in India. <i>Virus Disease</i> 30 : 474–75	5.95
295	Sharma S P, Leskovar D I and Crosby K M (2019) Genotypic differences in leaf gas exchange and growth responses to deficit irrigation in reticulatus and inodorus melons (<i>Cucumis melo</i> L.). <i>Photosynthetica</i> 57(1) : 237-47. DOI: 10.32615/ps.2019.022	8.48
296	Sharma S, Brar KS and Sandhu S K. (2019). Profiling of groundnut (<i>Arachis hypogaea</i> L.) genotypes for seed quality traits. <i>Indian J of Plant Genetic Resources.</i> 32(1) :72-79	5.54
297	Sharma S, Kaur A and Warangtiwar RK (2019). Dissipation and Residual bioefficacy of chlorantraniliprole in tomato and brinjal fruits. <i>Pestic Res J</i> 31 : 249-258	5.49
298	Sharma S, Kaur, A and Kooner R(2019). Relative toxicity of newer insecticides against <i>Spodoptera litura</i> and <i>Pieris brassicae</i> infesting Cole crops in Punjab. <i>Indian J Hortic</i> 76(2) : 324-28	6.00
299	Sharma S, Singh A and Singh B (2019). Effect on germination time and temperature on techno-functional properties and protein solubility of pigeon pea (<i>Cajanus cajan</i>) flour. <i>Qual Assur Saf Crop Foods</i> 11 : 305-11.	7.67
300	Sharma S, Vashisht M, Singh Y and Thind H S (2019). Soil carbon pools and enzyme activities in aggregate size fractions after seven years of conservation agriculture in a rice–wheat system. <i>Crop & Pasture Science</i> 70 : 473–485.	8.25

301	Sharma U and Srivastava A (2019). Field efficacy of some insecticides and biopesticides against rice hispa, <i>Dicladispa armigera</i> (Olivier). <i>Indian J Ent</i> 81 (1): 166-69	5.89
302	Sharma V, Sharma S, Sharma S, and Kumar V(2019). Synergistic effect of bio-inoculants on yield, nodulation and nutrient uptake of chickpea (<i>Cicer arietinum</i> L) under rainfed conditions. <i>J Plant Nutr</i> 42 (4): 374-83	8.28
303	Sharma, K., Dhaliwal, N.S. and Rampal, V.K. (2019). Farmer's attitude towards aerobic rice cultivation in Muktsar District of Punjab. <i>J Community Mobilization Sustain Dev</i> 14 (2): 56-60.	5.67
304	Shende, D and Kaur Gagandeep (2019). Comparison of Quality Characteristics of Conventional and Aqueous Enzymatic Extraction of Maize Germ Oil during Storage. <i>J Agric Eng</i> 56 (1):1-15.	5.59
305	Shilpa, Mahajan BV C, Singh NP, Sharma S and Kaur S (2019). Hydrocooling delay pericarp browning, enzymatic activities and maintain quality of litchi fruits under cold chain conditions. <i>Indian J Hort</i> 76 (1): 162-67.	6.10
306	Sidh P S, Dhillon G S and Brar J S (2019). Performance of wheat under various rice residue management practices on farmer fields under south western conditions of Punjab. <i>J Agric Sci Technol</i> 8 (1): 24-27.	7.28
307	Sidhu G K, Singh Mand Kaur P (2019). Effect of Operational Parameters on Physiochemical Quality and Recovery of Spray-dried Tomato Powder. <i>J Food Process Preserve</i> 43 (10):e14120https://doi.org/10.1111/jfpp.14120	8.61
308	Singh A K, Manes G S, Dixit A, Singh S K and Singh M (2019). Development and evaluation of multi nozzle back pack type power sprayer. <i>Indian J Agri Sci</i> 89 (6): 1005-10.	6.23
309	Singh AS, Sidhu PK, Aparna&Kaur H (2019). Selective Breeding, feeding & management practices followed by dairy farmers in Punjab. <i>Int J Curr Microbiol App Sci</i> 8 (8): 754-59	5.38
310	Singh A, Chhuneja P K, Singh J and Choudhary A (2019). Population dynamics of ectoparasitic bee-mite (<i>Tropilaelaps clareae</i>) in European honey bee (<i>Apis mellifera</i>) colonies in north-western India. <i>J Entomol Zool Stud</i> 7 (1): 976-80.	5.53
311	Singh A, Kumar R and Singh D (2019). Mycorrhizal fungi as biocontrol agent for soil borne pathogens: A review. <i>J Pharmacogn Phytochem</i> SP1: 281-84.	5.21
312	Singh A, Sharma S, Singh B and Kaur G (2019). In vitro nutrient digestibility and antioxidative properties of flour prepared from sorghum germinated at different conditions. <i>J Food Sci Technol</i> 56 : 3077-89	9.11
313	Singh A, Singh D and Romana B.S (2019). Adoption status of vegetable cultivation: A case study of Sangrur district of Punjab. <i>J Community Mobilization Sustain Dev</i> 14 : 403-414.	5.67
314	Singh A, Singh L P, Singh S, Singh H, Chhuneja N K and Singh M (2019). Evaluation and analysis of occupational ride comfort in rotary soil tillage operation. <i>Measurement</i> 131 :19-27.	11.60
315	Singh B B, Kaur R, Gill G S, Gill J PS, Soni RK, Aulakh RS (2019). Knowledge, attitude and practices relating to zoonotic diseases among livestock farmers in Punjab, India. <i>Acta Tropica</i> 189 : 15-21	9.11
316	Singh B, Dhillon GPS, Gill RIS and Kaur J (2019). Biomass production of high density <i>Leucaena leucocephala</i> plantation under different levels of nutrients. <i>Indian For</i> 145 (1): 34-37	5.10
317	Singh C, Srivastava P, Sharma A, Kaur H, Sohu VS and Bains NS (2019). Gpc-B1 mediated grain protein enhancement in wheat is compatible with high grain weight at moderated yield thresholds. <i>Indian J Genet Plant Breed</i> 79 : 494-498	7.34
318	Singh D and Kalra R K (2019). Extent of Utilization of Services Provided by Agricultural Technology and Information Centre (ATIC). <i>Int J Curr Microbiol App Sci</i> 8 (10): 1235-42.	5.38



319	Singh D and Kalra R K (2019). Level of satisfaction of farmers from the services provided by agricultural technology and information centre (ATIC). <i>Int J Bio-Resour Stress Manag</i> 10 (5): 575-79	5.11
320	Singh D and Kaur P (2019). Factors influencing the prospects of zero till technology in Punjab. <i>Ind J Ext Edu</i> 55 (1): 59-65.	5.95
321	Singh D, Kaur P and Singh D (2019). Comparative analysis of psychological characters of farmers adopting various resource conservation technologies. <i>Indian J Ext Educ</i> 20 (1): 61-66.	5.22
322	Singh G and Vatta K (2019). Assessing the economic impacts of farmer producer organizations: a case study in Gujarat, India. <i>Agric Econ Res Rev</i> 32 : 139-48	5.90
323	Singh G, Bhalla JS and Rampal VK (2019). Extent of adoption of recommended citrus production practices by beneficiaries of Citrus Estates in Punjab. <i>Ind J of Ext Edu</i> 55 : 1-8	5.95
324	Singh G, Singh P and Sodhi GPS (2019). Analysis of yield gaps in pulse production in South Western Punjab. <i>J Community Mobilization Sustain Dev</i> 14 (3): 572-578	5.67
325	Singh G, Singh R K, Biwalkar N and Grover J (2019). Evaluation of <i>Capsicum</i> Varieties under Naturally Ventilated Greenhouse in Faridkot District of Punjab, India. <i>Int J Curr Microbiol App Sci</i> 8 (12):1407-1413.	5.38
326	Singh G, Virk HK and Khanna V (2019). Pre- and post-emergence herbicides effect on growth, nodulation and productivity of greengram. <i>Indian J weed Sci</i> 51 (3): 257-61	5.84
327	Singh G, Virk HK, Aggarwal N, Gupta R K and Khanna V (2019). Symbiotic parameters, growth, nutrient accumulation, productivity and profitability as influenced by integrated nutrient management in lentil (<i>Lens culinaris</i>). <i>Arch Agron Soil Sci</i> 65 (3): 411-20	8.24
328	Singh H, Dhaliwal L K and Buttar G S (2019). Modification of microclimatic by debranching and defoliation in gobhisarson (<i>Brassica napus</i>). <i>J Agrometeorol</i> 21 : 1-6	6.56
329	Singh H, Garg R K, Chauhan S K and Sharma S (2019). Growth and biomass production of different <i>Eucalyptus</i> species on riverine soils of Punjab. <i>Indian For</i> 145 (3): 239-245	5.10
330	Singh H, Jawandha S K and Arora A (2019). Ripening behavior of papaya at different temperature regimes. <i>Indian J Hortic</i> 76 (1):195-97.	6.10
331	Singh H, Singh I and Singh S K (2019). Preparation and investigation of bio-diesel using hydrated ethanol as an alternative fuel: A comparative study. <i>Int J Chem Stud</i> 7 (1):2244-48.	5.31
332	Singh J M, Singh J, Kumar H, Singh S, Sachdeva J, Kaur B, Chopra S, and Chand P (2019). Management of paddy straw in Punjab: An economic analysis of different technologies. <i>Indian J Agric Econ</i> 74 (3): 301-310.	5.30
333	Singh J, Singh N P, Sangwan A K, Gill P P S, Gill B S and Kaur S (2019). Standardization of litchi leaf nutrient composition for tissue analysis in sub tropics of India. <i>Commun Soil Sci Plant Anal</i> 50 (22): 2889-98	7.58
334	Singh K, Choudhary O P, Singh H P, Singh A, Mishra SK (2019). Sub-soiling improves productivity and economic returns of cotton-wheat cropping system. <i>Soil Tillage Research</i> 189 :131-36	10.68
335	Singh K, Verma G and Manchanda JS (2019). To assess the response of Zn application in soils of variable available P and Zn and comparison of different extraction methods for bioavailability of zinc: A Case Study. <i>Int J Curr Microbiol App Sci</i> 8 (7): 2081-86.	5.38
336	Singh L, Sharma R and Goyal P (2019). Enhancing germination indices of neem seed during storage using pre-sowing treatments. <i>J. Tree Science</i> 38 : 70-80.	7.56
337	Singh M and Bala M (2019). Induction of radiomutants in <i>Chrysanthemum morifolium</i> Ramat. cv. Gul-e-Sahir for novel traits. <i>Indian J Exp Bio</i> 57 : 50-54	7.48

338	Singh M and Singh K (2019). Agronomic zinc biofortification of wheat. <i>Agrochimica</i> 63 (4):307-317	6.28
339	Singh M C, Singh K G and Singh J P (2019). Nutrient and water use efficiency of cucumbers grown in soilless media under a naturally ventilated greenhouse. <i>J Agric Sci Technol</i> 21 (3):193-207.	7.28
340	Singh M C, Singh K G, Singh J P and Mahal A K (2019). Performance of soilless cucumbers in relation to differential fertigation under naturally ventilated greenhouse conditions. <i>J Plant Nutr</i> 42 (11-12):1316-332	8.28
341	Singh M, Kaul A, Pandey V and Bimbraw A S (2019). Weed management in vegetable crops to reduce the yield losses. <i>Int J Curr Microbiol App Sci</i> 8 (7) : 1241-58	5.38
342	Singh M, Sharma S P, Sarao N K, Kaur S and Chhuneja P (2019). Molecular mapping of nuclear male-sterility gene ms-1 in muskmelon (<i>Cucumis melo</i> L.). <i>J Hortic Sci Biotechnol</i> 95 (2): 162-168	6.72
343	Singh N and Bhardwaj R D (2019). Proline treatment ameliorates water deficit induced oxidative damage in wheat seedlings. <i>Indian J Exp Bio</i> 57 : 399-407	7.48
344	Singh N, Singh Gand Gupta RK (2019). Nutrient uptake and nutrient use efficiency as influenced by application of plant growth promoting rhizobacteria, Rhizobium, and phosphorus in lentil (<i>Lens culinaris</i> Medikus). <i>Agrochimica</i> 63 (3): 275-90.	6.28
345	Singh P and Kaur N (2019). Population dynamics and reproductive biology of <i>Bandicota bengalensis</i> in relation to growth stages of rice crop. <i>J Exp Zool</i> 22 (2): 1235-41.	5.51
346	Singh P, Rampal V K, Sharma K and Dhaliwal N S (2019). Constraints Analysis of Dairy Farmers in Malwa Region of Punjab. <i>J Community Mobilization Sustain Dev</i> 14 (3): 384-88	5.67
347	Singh P, Sharma S P, Kaur N and Gill R I S (2019). Potato cultivars differ in response to date of planting in intercrop with poplar (<i>Populus deltoids</i> Bartr. ex Marsh.) in irrigated agro-ecosystem of north-west India. <i>Agroforestry Systems</i> 93 : 2345–55.	8.42
348	Singh P, Singh G and Sodhi GPS (2019). Applying DEA optimization approach for energy auditing in wheat cultivation under rice-wheat and cotton-wheat cropping systems in north-western India. <i>Energy</i> 181 : 18-28	14.86
349	Singh P, Singh G and Sodhi G P S (2019). Energy auditing and optimization approach for improving energy efficiency of rice cultivation in south-western Punjab. <i>Energy</i> 174 : 169-79	14.86
350	Singh P, Tiwari R, Shah M K, Niazi K R, Meena N K and Ratra S (2019). Voltage stability index and APFC for performance improvement of modern power systems with intense renewables”, The Journal of Engineering, IET https://doi.org/10.1049/joe.2018.9375	6.66
351	Singh R, Mavi M S, and Choudhary O P (2019). Saline soils can be ameliorated by adding biochar generated from rice-residue waste. <i>CLEAN-Soil Air Water</i> 47 (2): 1700656 https://doi.org/10.1002/clen.201700656	7.47
352	Singh S and Sreedevi K (2019) Record of longhorn borer (<i>Aeolesthes holosericea</i>) on mango in the Punjab. <i>Indian J Agri Sci</i> 89 (10): 1714-1718.	6.23
353	Singh S, Bawa S S, Singh S, Sharma S C, Sheoran P, Sardana V, Salaria A (2019). Long term tillage and nitrogen management for improving productivity and profitability of a rainfed maize-wheat system in north western Himalaya. <i>J Environ Biol</i> 40 : 36-44	6.78
354	Singh S, Chauhan SK, Chauhan R and Sharma D (2019). Clonal diversity of Salix for growth parameters. <i>Int J Chem Stud</i> 7 (6): 2975-79.	5.31
355	Singh S, Kukal S S and Dubey R K (2019). Water retention and transmission characteristics of containerized growing media amended with differential proportions of compressed coir bricks. <i>Current Science</i> 9 (116): 1580-87	7.17



356	Singh S, Pathania M, Grover G and Singh P (2019). Genetically modified (GM) cotton: Its past, present and future: A review. <i>J Entomol Zool Stud</i> 7(3) : 683-91.	5.53
357	Singh S, Singh N P, Sharda R and Sangwan A K (2019). Response of irrigation, fertigation and mulching on plant growth and fruit yield of strawberry. <i>Indian J Hortic</i> 76(2) : 233-40.	6.10
358	Singh S, Tiwana U S, Goyal M, Rani U and Bhullar M S (2019). Evaluation of different pre- and post- emergence herbicide on forage yield, quality and disease reaction of multi-cut forage sorghum (<i>Sorghum bicolor</i>). <i>Ind J Agron</i> 64(1) : 93-97	5.55
359	Singh U, Gaur PM, Chaturvedi SK, Hazra KK and Singh G (2019). Changing plant architecture and density can increase chickpea productivity and facilitate for mechanical harvesting. <i>Int J Plant Prod</i> 13 : 193-202	8.61
360	Singh V and Kaur K (2019). Development, formulation and shelf life evaluation of baby corn soup mix from industrial by-products. <i>J Food Sci Technol</i> 57 : 1917–1925	9.12
361	Singh V P, Singh G and Dhaliwal S S (2019). Agronomic biofortification of chickpea with zinc and iron through application of zinc and urea. <i>Commun Soil Sci Plant Anal</i> 50 (15) : 1864-77	7.58
362	Singh V P, Singh G and Dhaliwal S S (2019). Yield enhancement and biofortification of chickpea (<i>Cicer arietinum</i> L.) grain with iron and zinc through foliar application of ferrous sulphate and urea. <i>J Plant Nutr</i> 42 :1789-802	8.28
363	Singh V, Jawandha SK, Gill PP S and Dhillon W S (2019). Pre harvest application of putrescine influences the storage life and quality of pear fruit. <i>Indian J Hortic</i> 76 (3) : 486-92.	6.10
364	Singh V, Jawandha S K, Gill PPS and Gill MS (2019). Suppression of fruit softening and extension of shelf life of pear by putrescine application. <i>Sci Hortic</i> 256 :108623 doi:10.1016/j.scienta.2019.108623	10.34
365	Singh V, Sharma S, Kunal, Gosal S K, Choudhary R, Singh R, Adholeya A and Singh B (2019). Synergistic use of plant growth-promoting rhizobacteria, arbuscular mycorrhizal fungi, and spectral properties for improving nutrient use efficiencies in wheat (<i>Triticum aestivum</i> L.). <i>Commun Soil Sci Plant Anal</i> 51(1) : 14-27	7.58
366	Singh V, Thakur A, Jawandha SK and Singh S P (2019). Harvest maturity and storage temperature affect fruit colour, chilling injury and quality of Indian gooseberry fruit (<i>Emblica officinalis</i> Gaertner). <i>Fruits</i> 74(6) , 259-271	6.64
367	Singla N, Jain R and Singla P (2019). Relationship between bioactive components and antioxidant capacity of some commonly consumed vegetables in Punjab. <i>Int J Curr Microbiol App Sci</i> 8 : 1720-29.	5.38
368	Singla P, Bhardwaj R D, Kaur S and Kaur J (2019). Antioxidant potential of barley genotypes inoculated with five different pathotypes of <i>Puccinia striiformis</i> f. sp. <i>hordei</i> . <i>Physiol Mol Biol Plants</i> 25 : 145-157.	7.15
369	Sinha A, Jawandha SK, Gill PPS and Singh H (2019). Influence of pre-harvest sprays of calcium nitrate on storability and quality attributes of plum fruits. <i>J Food Sci Technol</i> 56 : 1427-437	7.80
370	Sinha A, Jawandha SK, Gill PPS and Singh Harminder (2019). Enhancement of storage life and quality maintenance of plum fruits. <i>Indian J Hortic</i> 76(3) : 493-501	6.10
371	Sohi G K, Kler T K and Kaur S (2019). Heavy metal contamination in excreta of blue rock pigeon (<i>Columba livia</i>) and Indian peafowl (<i>Pavo cristatus</i>) in Rural Areas of Punjab. <i>J Anim Res</i> 9(3) : 425-30	5.68
372	Sohi H S, Gill M I S, Singh D and Arora N K (2019). Characterization of F ₁ hybrids of guava (<i>Psidium guajava</i> L.) on the basis of phenotypic and biochemical parameters. <i>Chem Sci Rev Lett</i> 8(32) : 335-39.	5.21

373	Soni S, Kler T K and Javed M (2019). Emerging threat of urbanization to ponds and avian fauna in Punjab, India. <i>J Entomol Zool Stud</i> 7(4) : 1310-15	5.53
374	Sra S K, Sharma M, Kaur G, Sharma S, Akhatar J, Sharma A, Banga S S (2019). Evolutionary aspects of direct or indirect selection for seed size and seed metabolites in <i>Brassica juncea</i> and diploid progenitor species. <i>Mol Biol Rep</i> 46(1) :1227-238. doi: 10.1007/s11033-019-04591-3	8.74
375	Sran T S and Jindal S K (2019). Multi-environmental evaluation of chilli genotypes for yield and yield components. <i>Genetika</i> 51 : 551-570.	6.39
376	Stéphanie M S, Wang M, Wang Y, Kindred D, Roger S, Shi W, Singh V, Bentley A R, and Griffiths H (2019). A roadmap for lowering crop nitrogen requirement. <i>Trends in Plant Sciences</i> 24(10) : 892-904doi.org/10.1016/j.tplants.2019.06.006	18.15
377	Sunayana, Sangwan R S, Khichar M L and Singh M (2019). Weather parameters influencing biochemical constituents in Asiatic cotton (<i>Gossypium arboreum</i> L.) under different environmental conditions. <i>J Agrometeorol</i> 21 : 160-66.	6.56
378	Suneja Y, Gupta A K and Bains A K (2019). Stress adaptive plasticity: <i>Aegilops tauschii</i> and <i>Triticum dicoccoides</i> as a potential donor for drought associated morpho-physiological traits in wheat. <i>Front Plant Sci</i> 10 : https://doi.org/10.3389/fpls.2019.00211	10.40
379	Suneja Y, Gupta A K, Chhuneja P and Bains N S (2019). Molecular evolution and structural variations in nuclear encoded chloroplast localized heat shock protein 26 (sHSP26) from genetically diverse wheat species. <i>Comput Biol Chem</i> 83 : https://doi.org/10.1016/j.compbiolchem.2019.107144	9.74
380	Surasani V K R, Singh A, Gupta A and Sharma S (2019). Functionality and cooking characteristics of pasta supplemented with protein isolate from pangas processing waste. <i>LWT-Food Sci Technol</i> 111 : 443-48.	12.06
381	Taggar G K and Singh R (2019). Evaluation of some non-conventional insecticides for the management of whitefly, <i>Bemisia tabaci</i> (Gennadius) in black gram. <i>Indian J Entomol</i> 82(2) : 294-97	5.08
382	Taggar G K, R Singh, H S Randhawa and H K Cheema (2019). Novel insecticides for the management of pod borer complex in pigeonpea crop. <i>Legum Res</i> 44(10) : 1179-1185	6.67
383	Taggar G K, Singh R, Cheema H K and Singh P (2019). Relative abundance, population dynamics and damage potential of spotted pod borer, <i>Maruca vitrata</i> (Fabricius) on early pigeonpea in Punjab. <i>Int J Trop Insect Sci</i> 39 : 229-34	7.02
384	Taggar G K, Singh R, Randhawa H S and Cheema H K (2019). Novel insecticides for the management of pod borer complex in pigeonpea crop. <i>Legume Res</i> 44(10) : 1179-85	6.67
385	Tanotra S, Zhawar VK, Sharma S (2019). Regulation of antioxidant enzymes and invertases by hydrogen peroxide and nitric oxide under ABA and water deficit stress in wheat. <i>Agricultural Research</i> 8(4) : 441-51	5.95
386	Tegeye M, Kaur A, Kaur J and Singh H (2019). Value added convenience food from composite sorghum-maize-sweet potato flour blends. <i>Indian J Agri Sci</i> 89 : 1906-10.	6.23
387	Thakur H, Jindal S K, Sharma A, and Dhaliwal M S (2019). A monogenic dominant resistance for leaf curl virus disease in chilli pepper (<i>Capsicum annum</i> L.). <i>Crop Protection</i> 116 :115-20.	9.04
388	Thakur M, Kumar, R and Kansal, S (2019). Heterosis, combining ability and gene action studies in cucumber for different biotic stresses to develop resistant hybrids. <i>Genetika</i> 51(1) : 199-212	6.76



389	Thakur S S, Singh M and Chandel R (2019). Yield and economics attributed study of direct seeding and transplanting method on beds for onion (<i>Allium cepa</i> L.) crop with pneumatic precision multicrop planter and manual transplanting methods alongwith rotary tiller cum bed former in Indian conditions. <i>Agricultural Mechanization in Asia, Africa and Latin America</i> (4) : 76-86.	6.15
390	Thakur T and Grewal H S (2019). Growth regulation and off-season flowering through night breaks in <i>Chrysanthemum morifolium</i> Ramat cv. Anmol. <i>Bangladesh J Bot</i> (2) :373-78	6.34
391	Thakur T and Grewal H S (2019). Influence of potting media compositions on flower production of chrysanthemum (<i>Chrysanthemum morifolium</i> Ramat) cultivar Kikiobiory. <i>J Plant Nutr</i> 42 (15) : 1861-67	6.57
392	Thind H S, Sharma S, Singh Y and Sidhu H S (2019). Rice–wheat productivity and profitability with residue, tillage and green manure management. <i>Nutrient Cycling in Agrosystems</i> 113 :113–25.	8.85
393	Utreja D, Sharma S, Goyal A, Kaur K and Kaushal S(2019). Synthesis and Biological Activity of Quaternary Quinolinium salts: A review. <i>Curr Org Chem</i> 23 : 2271-294.	8.15
394	Vaid V and Hundal S S (2019). Light microscopic studies to evaluate fish scales as non-invasive indicators of heavy metal contaminated waters. <i>Environ Monit Assess</i> 191 (10):638. doi: 10.1007/s10661-019-7801-9.	7.84
395	Vashisht B B, Maharjan B and Jalota S K (2019). Management practice to optimize wheat yield and water use in changing climate. <i>Arch Agron Soil Sci</i> 65 (13):1802-1819. doi.org/10.1080/03650340.2019.1578957	8.24
396	Vasmatkar P, Kaur K, Pannu PPS, Kaur G and Kaur H (2019). Unraveling the metabolite signatures of maize genotypes showing differential response towards southern corn leaf blight by ¹ H-NMR and FTIR spectroscopy. <i>Physiol Mol Plant Pathol</i> 108 :101441. https://doi.org/10.1016/j.pmpp.2019.101441	8.74
397	Verma V, Kaur M and Greneche J M (2019). Tailored structural, optical and magnetic properties of ternary nanohybrid Mn _{0.4} Co _{0.6-x} Cu _x Fe ₂ O ₄ (x= 0, 0.2, 0.4, 0.6) spinel ferrites. <i>Ceram Int</i> 45 : 10865–75	9.06
398	Verma V, Kaur M and Sharma S (2019). Superoxide dismutase mimic activity of spinel ferrite MFe ₂ O ₄ (M=Mn, Co and Cu) nanoparticles. <i>Bull Mater Sci</i> 42 : 1-6	6.93
399	Verma V, Utreja D, Kaur J (2019). Quinolinium chlorochromate: An excellent reagent for N ₃ -C ₄ dehydrogenation of dihydropyrimidinones and their antifungal evaluation. <i>Indian J Heterocycl Chem</i> 29 (1): 11-20.	6.04
400	Vijeth S, Dhaliwal M S, Jindal S K, Garg N, Kaushik P and Sharma A (2019). Diallel analysis of elite tomato lines comprising leaf curl virus resistant genes. <i>Appl Ecol Environ Res</i> 17 : 6457-71	6.72
401	Virk H K and Singh G (2019). Effect of foliar fertilization at early reproductive stage on growth, productivity and profitability of soybean [<i>Glycine max</i> (L.) Merrill]. <i>Appl Biol Res</i> 21 (3): 250-54.	5.07
402	Virk H K, Singh G and Manes G S (2019). Nutrient uptake, nitrogen use efficiencies, and energy indices in soybean under various tillage systems with crop residue and nitrogen levels after combine harvested wheat. <i>J Plant Nutr</i> 43 (3): 407-17	6.57
403	Virk H K, Singh G, Aggarwal N And Sharma P (2019). Growth, nodulation and productivity of rainfed soybean (<i>Glycine max</i>) as influenced by mulching and anti-transpirants. <i>Ind J Agron</i> 64 (4): 506-510	5.55
404	Vyas P and Kaur R (2019). Culturable stress tolerant plant growth-promoting bacterial endophytes associated with <i>Adhatoda vasica</i> . <i>J Soil Sci Plant Nutr</i> 19 : 290-98	9.87

405	Yadav R, Nanjundan J, Tewari A K, Sandhu P S, Rao M, Prasad L, Kumar S, Kaur V, Kumar A, Rana J C and Radhamani J (2019). IC265495 (IC0265495; INGR18032), an Indian Mustard (<i>Brassica juncea</i>) germplasm with white rust resistance (PDI=0). <i>Indian J of Plant Genetic Resources</i> 32(3) : 440-41	5.54
406	Zada W A M, Mohapatra L and Anand A (2019). Analysis of Awareness Level of Agricultural Insurance among the Stakeholders in Punjab. <i>Economic Affairs</i> 64 : 503-512	5.08
407	Zhawar VK, Kandpal RP, Athwal RS (2019). Isoforms of ionotropic glutamate receptor GRIK2 induce senescence of carcinoma cells. <i>Cancer Genomics & Proteomics</i> 16 : 59-64. doi:10.21873/cgp.20111	9.28
408	Zou C, Du Y, Rashid A, Ram H, Savasli E, Pieterse PJ, Ivan O, Yazici A, Kaur C, Mahmood K, Singh S, Le Roux M, Kuang W, Onder O, Kalayci M and Cakmak I (2019). Simultaneous biofortification of wheat with zinc, iodine, selenium and iron through foliar treatment of a micronutrient cocktail in six countries. <i>J Agric Food Chem</i> 67(29) : 8096–106	11.90

Sr.No.	2020	NAAS Score
409	Abhishek D, Pal R K, Kingra P K and Mishra S K (2020). Microclimatic conditions and seed cotton yield as affected by sowing time, row orientation and plant spacing under Bt cotton hybrid. <i>Mausam</i> 71(4) : 729-38.	6.24
410	Adhikary T, Gill P P S, Jawandha S K, Bhardwaj R D and Anurag R K (2021). Efficacy of post-harvest sodium nitroprusside application to extend storability by regulating physico-chemical quality of pear fruit. <i>Food Chem</i> 346 :128934.	15.23
411	Adhikary T, Gill PPS, Jawandha SK, Bharadwaj RD and Anurag RK (2020). Browning and quality management of pear fruit by salicylic acid treatment during low temperature storage. <i>J Sci Food Agric</i> 101(3) : 853-62.	10.1
412	Aggarwal P, Kumar V, Yaqoob M, Kaur S and Babbar N (2020). Effect of different levels of hydrocolloids on viscosity and cloud stability of Kinnow juice and beverages. <i>J Food Process Preserv</i> 44(10) :14802.	8.61
413	Aggarwal R and Bains K (2022). Protein, lysine and vitamin D: critical role in muscle and bone health. <i>Crit Rev Food Sci Nutr</i> 62(9) :2548-59.	17.21
414	Ahmadzai A B, Sidana B K and Guleria A (2020). Integration of domestic and international markets of Indian coffee. <i>Econ Aff</i> 65 : 401-8.	5.41
415	Ahuja S, Sandhu O S and Makkar G S (2020). Frontline demonstrations of capsicum, turmeric, garlic and chilli in district Rupnagar in sub-mountainous zone of Punjab. <i>Int J Curr Microbiol Appl Sci</i> 9 : 3690-96.	5.38
416	Akanksha and Singh R (2020). Comparative efficacy of biopesticides and newer insecticides against <i>Helicoverpa armigera</i> (Hübner) in chickpea under Punjab conditions. <i>Pestic Res J</i> 32 : 29-38.	5.90
417	Akhatar J, Singh M P, Sharma A, Kaur H, Kaur N, Sharma S and Banga S S (2020). Association mapping of seed quality traits under varying conditions of nitrogen application in <i>Brassica juncea</i> L. Czern & Coss. <i>Front Genet</i> 11 :744.	10.77
418	Alam MS, Singh A and Chavan P (2020). Influence of shape, pre-treatment and drying air temperature on quality of dried aonla. <i>Agric Eng Int: CIGR J</i> 22 : 145-51.	6.41
419	Ali A M (2020). Using hand-held chlorophyll meters and canopy reflectance sensors for fertilizer nitrogen management in cereals in small farms in developing countries. <i>Sensors</i> 20(4) :1127.	9.85



420	Ali S, Singh B and Sharma S (2020). Effect of processing temperature on morphology, crystallinity, functional properties, and in vitro digestibility of extruded corn and potato starches. <i>J Food Process Preserv</i> 44(7) :14531.	8.61
421	Ankush, Prakash Ram, Kumar R, SinghV, Harender and Singh VK (2020). Soil microbial and nutrient dynamics influenced by irrigation-induced salinity and sewage sludge incorporation in sandy-loam textured soil. <i>Int Agrophys</i> 34 :451-462.	7.63
422	Anusha and Gupta R M (2020). Perception of University students towards e learning in Punjab. <i>J Community Mobilization Sustain Dev</i> 14 : 602-08.	5.30
423	Arora NK, Arora R and Kaur G (2020). Impact of sulphur dioxide generating pads and liners on enhancing market acceptability and post-harvest life of grapes. <i>J Env Biol</i> 41(6) : 1741-47	6.56
424	Arora R, Sangwan A K, Singh N P and Sharma S (2020). Impact of IBA and bio-inoculants on growth and rhizogenesis in pomegranate (<i>Punica granatum</i>). <i>Indian J Agric Sci</i> 90 : 560-64.	6.25
425	Arora S, Kaur S, Dhillon G S, Singh R, Kaur J, Sharma A and Chhuneja P (2020). Introgression and genetic mapping of leaf rust and stripe rust resistance from <i>Aegilops Triuncialis</i> . <i>J Genet</i> 100 :6.	7.51
426	Astha and SekhonP S (2020). Testing efficacy of different SAR compounds against late blight pathogen on various germplasm lines of potato KAVAKA 54 : 74-79.	5.30
427	Aulakh D S, Chalotra J and Sooch S S(2020). Survey Report: Performance evaluation of deen-bandhu biogas plants installed in various regions of Punjab, India. <i>Int J Curr Microbiol Appl Sci</i> 9 : 185-93.	5.38
428	Azizinia S, Bariana H, Kolmer J, Pasam R, Bhavani S, Chhetri M and Daetwyler H D (2020). Genomic prediction of rust resistance in tetraploid wheat under field and controlled environment conditions. <i>Agronomy</i> 10(11) :1843.	9.95
429	Babu G R, Kumar S and Kalia A (2020). Optimization of Process variables and validation of models for nano-particle embedded biodegradable polymers for packaging. <i>Int J Bio Resource Stress Mgmt</i> 11 : 202-10	5.11
430	Bajpai A and Kaushal A (2020). Soil moisture distribution system under trickle irrigation: a review. <i>Water Supply</i> 20 :761-72.	7.77
431	Bala A, Bala M and Khare V (2020). A review on cytological study in Chrysanthemum species. <i>J Pharmacogn Phytochem</i> 9 :549-53.	5.21
432	Bansal M, Adamski N M, Toor P I, Kaur S, Molnár I, Holušová K and Chhuneja P (2020). Aegilops umbellulata introgression carrying leaf rust and stripe rust resistance genes Lr76 and Yr70 located to 9.47-Mb region on 5DS telomeric end through a combination of chromosome sorting and sequencing. <i>Theor Appl Genet</i> 133 :903-15.	11.57
433	Bassi D, Kaur K, Singh T P and Kaur J (2020). Quality attributes and chapatti making property of biofortified wheat as influenced by particle size. <i>J Food Sci Technol</i> 58(3) :1156-64.	9.12
434	Bassi P, Garg R K, Chaudhary O P and KaurN (2020). Effect of salinity stress on growth related physiological and biochemical traits of Casuarina clones in nursery. <i>Indian J Agroforestry</i> 22 :90-96	5.19
435	Bawa N, Kaur S and Dhillon N K (2020). Efficacy of <i>Purpureocillium lilacinum</i> , <i>Trichoderma harzianum</i> and <i>T. viride</i> bio-formulations against <i>Meloidogyne incognita</i> . <i>Indian Phytopathol</i> 73 : 799-804.	5.90
436	Bawa N, Kaur S and Dhillon N K (2020). Integrated management of root knot nematode, <i>M. incognita</i> in Bell pepper, using Paecilomyceslilacinus and organic amendments. <i>J Entomol Zool Stud</i> 8 : 1693-701.	5.53

437	Bhadauria P, Lathwal SS, Jadoun Y and Gupta R (2020). Metabolic Profiling of Normal and Lame Karan Fries Cows and its Association with Lameness during Transition Period. <i>J Anim Res</i> 10 : 375-82.	5.36
438	Bhagat I, Bains NS, Sohu VS, Mavi GS and Sharma A (2020). Bread wheat variety PBW 660. <i>Indian J Genet Plant Breed</i> 80(3) : 359-363	7.34
439	Bhandari A, Sandhu N, Bartholome J, Cao-Hamadoun T V, Ahmadi N, Kumari N and Kumar A (2020). Genome-wide association study for yield and yield related traits under reproductive stage drought in a diverse indica-aus rice panel. <i>Rice</i> 13 :1-22.	11.64
440	Bhanot R and Hundal S S (2021). Assessment of cytotoxicity in gills of fish <i>Labeo rohita</i> reared in untreated and treated sewage water. <i>Environ Sci Pollut Res</i> 28 :59306-316.	11.19
441	Bharathi M, Chhuneja P K and Singh J (2020). Validation of hygienic <i>Apis mellifera</i> L. colonies against <i>Varroa destructor</i> Anderson and Trueman infestation. <i>Indian J Exp Biol</i> 58(9) : 656-660.	6.94
442	Bhardwaj R, Singh B P, Sandhu N, Singh N, Kaur R, Rokana N and Panwar H (2020). Probiotic mediated NF- κ B regulation for prospective management of type 2 diabetes. <i>Mol Biol Rep</i> 47 :2301-13.	8.74
443	Bhathal S K, Kaur H, Bains K and Mahal A K (2020). Assessing intake and consumption level of spices among urban and rural households of Ludhiana district of Punjab, India. <i>Nutr J</i> 19(1) :1-12.	10.34
444	Bhatt R and Singh M (2020). Polycoated Urea performance in Wheat under Semi-Arid Tropics. <i>J Soil Water Conserv</i> 19 : 335-40.	5.20
445	Bhatt R and Singh P (2020a). Soil Fertility Status of Punjab Agricultural University Regional Research Station Kapurthala. <i>Agric Res</i> 57(2) : 260-65.	5.44
446	Bhatt R and Singh P (2020b). Inherent fertility status of university seed farm, Usman, Tarn Taran. <i>Agric Res</i> 57(3) : 425-29.	5.44
447	Bhatt R and Swami S (2020). Soil fertility status of Ratte Khara farm of Punjab Agricultural University, Punjab, India. <i>J Env Biol</i> 41 : 1665-75	6.56
448	Bhatt R, Hossain A and Sharma P (2020). Zinc biofortification as an innovative technology to alleviate the zinc deficiency in human health: A review. <i>Open Agric</i> 5(1) : 176-187.	6.20
449	Bhullar M B, Heikal H M and Kaur P (2020). Efficacy of natural products and biorationals against <i>Tetranychus</i> spp Koch, (Acari: Tetranychidae) infesting okra under open field conditions. <i>J Entomol Zool Stud</i> 8 : 949-51.	5.53
450	Bishnoi C (2020). Response of cherry tomato (<i>Lycopersicon esculentum</i> var. cerasiforme) to different magnesium levels under naturally ventilated polyhouse. <i>J Appl Hortic</i> 22 : 2020	5.13
451	Bisht D, Gupta R and Bal S K (2020). Ergonomic issues among indian children due to increased screen time from online classes during COVID-19 pandemic. <i>J Community Mobilization Sustain Dev</i> 15 : 694-703.	5.67
452	Bisht P and Vig D (2020). COVID 19 related anxiety and coping strategies among urban working and non working mothers in north India. <i>Int J Curr Microbiol Appl Sci</i> 9 : 2075-76.	5.38
453	Biswas B and Singh J (2020). Assessing yield-weather relationships in kharif maize under Punjab conditions using data mining method. <i>J Agrometeor</i> 22 :104-11	6.64
454	Biwalkar N, Kumar R and Sharda R (2020). Characterization of temperature regime under capsicum cropped naturally ventilated green house. <i>Int J Curr Microbiol App Sci</i> 9 :1140-53.	5.38



455	Bons H K and Paul A (2020). Characterization of Karonda (<i>Carissa carandus</i>) genotypes under Punjab conditions. <i>Indian J Agric Sci</i> 90 : 449-52.	6.25
456	BonsHarsimrat K, Dhillon SK and Kocher GS (2020). Fermentation of sapota (Manilkaraachras) into wine. <i>J Food Process and Preserv</i> 44 (8):e14577.	8.61
457	Brar H S and Vashist K K (2020). Drip irrigation and nitrogen fertilization alter phenological development and yield of spring maize (<i>Zea mays</i> L.) under semi-arid conditions. <i>J Plant Nutr</i> 43(12) :1757-67.	8.28
458	Brar HS, Thakur A, Singh H and Kaur N (2020). Photosensitive coverings influence plant growth, root development, and buddability of citrus plants in protected nursery. <i>Acta Physiol Plant</i> 42 : 18	8.74
459	Brar J S, Gill K S, Kaur K and Kaur G (2020). Soil temperature and horticultural traits as influenced by mulching materials and orchard floor management practices in ber (<i>Zizypus mauritiana</i> L amk.) <i>J Agrometeor</i> 22 (4) : 501-08	6.64
460	Brar J S, Gupta N, Kaur K, Kaur G and Manhas S S (2020). Appraisal of crop production in Agri-horti-silvicultural system under arid-irrigated conditions of Punjab. <i>Indian J Agric Sci</i> 90 : 64-68.	6.25
461	Brar SK and Singh A (2020). Evaluation of clusterbean (<i>Cyamopsis tetragonoloba</i>) intercrop in agri-silviculture system in south-western Punjab. <i>Indian J Agron</i> 65 : 476-78.	5.55
462	Brar SK, Singla N and Singla LD (2020). Morphomolecular characterization and histophysiological alterations induced by concurrent helminthosis in the liver of urban commensal rodents in Punjab, India. <i>Iran J Vet Res</i> 22(1) :15-23.	7.23
463	Buttar D S, Singh N, Slah P K and Choudhary A K (2020). Impact of endophytic bacteria against yellow rust (<i>Puccinia striiformis</i> f. sp. <i>tritici</i>) of wheat. <i>Indian J Agri Sci</i> 90 : 1646-52.	6.25
464	Buttar P S, Kingra P K, Singh S and Singh K B (2020). Crop Coefficient and Water Production Functions of Wheat under Variable Sowing Time, Mulch and Irrigation using Soil Moisture Depletion, Empirical and Simulation Models. <i>J Agric Phys</i> 20 : 94-105.	5.10
465	Chalotra J and Sooch S S (2020). Development and Optimization of Mild Steel Biogas Plant for utilizing Paddy Straw Residue. <i>Int J Curr Micr App Sci</i> 9 :2532-43.	5.38
466	Chandi R S (2020). Field efficacy of Solomon 300 OD (betacyfluthrin 90 + imidacloprid 210 OD) against wheat foliar aphid complex. <i>J Exptl Zool India</i> 23 : 1159-163.	5.25
467	Cheema H K, Kang B K, Jindal V, Kaur S and Gupta V K (2020). Biochemical mechanisms and molecular analysis of fenvalerate resistant population of <i>Spodoptera litura</i> (Fabricius) <i>Crop Prot</i> 127 :104951	9.04
468	Chhabra D and Gupta M (2020). Market efficiency and calendar anomalies in commodity futures market: A review. <i>Agric econ res rev</i> 33 : 263-78.	5.9
469	Chopra P, Kocher D K and Kaur S (2020). Incidence of helminth parasites on vegetables grown in polyhouses, open fields and sold in local markets and identifying their sources of contamination. <i>J Exp Zool</i> 23 : 1281-85.	5.51
470	Chopra S, Singh S and Sekhon M K (2020). Dynamics of changing sectoral employment and rural labour markets in India with special reference to Punjab. <i>Indian J Ext Educ</i> 56(1) : 142-48.	5.95
471	Choudhary A, Kumar A and Kaur N (2020). ROS and oxidative burst: Roots in plant development. <i>Plant Divers</i> 42 : 33-43.	9.36

472	Choudhary A, Kumar A, Kaur N and Paul A (2020). Plasmodesmata the Nano bridges in plant cell: Are the answer for all developmental processes ? <i>Russ J Plant Physiol</i> 67 : 785-96	7.42
473	Choudhary A, Singh J, Kaur R and Chhuneja P K (2020). Augmenting pear yield through <i>Apis mellifera</i> L. pollination <i>Indian J Entomol</i> 83 : 43-47.	5.89
474	Choudhary K and Alam MS (2020). Effect of different blanching pre-treatment and drying methods on quality of pea pods powder. <i>Int J Chem Stud</i> 8 : 914-19.	5.51
475	Choudhary K, Alam M S, Gupta S K and Kumar Satish (2020). Effect of blanching pre-treatment and drying methods on quality of radish leaf powder. <i>Agric Res J</i> 57(4) : 590-97.	5.44
476	Choudhary M, Grover K and Singh M (2020). Maize significance in Indian food situation to mitigate malnutrition. <i>Cereal Chem</i> 98 (2) : 212-21.	8.53
477	Chuchra D and Gupta N (2020). Effect of salt stress on physiological and biochemical parameters of <i>Sorghum bicolor</i> (L.) Moench. <i>Agric Res J</i> 57(4) : 491-97	5.44
478	Dar RA and Phutela U G (2020). Enzymatic and hydrothermal pretreatment of newly isolated <i>Spirulina subsalsa</i> BGLR6 biomass for enhanced biogas production. <i>Waste Biomass Valorization</i> 11 : 3639-51.	9.45
479	Dawar M, Utreja D, Rani R and Kaur K (2020). Synthesis and evaluation of Isatin derivatives as antifungal agents. <i>Lett Org Chem</i> 17 :199-205	6.80
480	Devgan K, Kaur P, Kumar N and Mahal A K (2020). Development and optimization of colour changing indicator labels for assessing headspace gas concentration of yellow bell pepper (<i>Capsicum annuum</i> L.). <i>J Food Saf Food Qual</i> 71 : 135-66.	6.38
481	Devgan K, Kaur P, Kumar N and Mahal A K (2020). Development of smart labels for storage quality assessment of yellow bell pepper (<i>Capsicum annum</i> L.) under active packaging. <i>Arch Lebensmittelhyg</i> 71 :138-45.	6.31
482	Devi I, Kaur S, Singh NP and Singh S (2020). Physico-chemical changes during fruity growth and maturation of Aonla cultivars. <i>Indian J Agric Sci</i> 90 : 103-06.	6.25
483	Devi O R, Bains S and Grewal S (2020). Comparative study of ultrasonic and conventional dyeing of cotton and wool with natural dye Arjun (<i>Terminalia arjuna</i>) bark. <i>Int J Chem Stud</i> 8 :18-23.	5.31
484	Devi O R, Bains S and Grewal S (2020). Ultrasonic dyeing of cotton fabric with roots of ratanjot (<i>Onosma echioides</i>) natural dye. <i>Intl J Ecol Env Sci</i> 2 : 781-84.	5.18
485	Dhakad AK, Chandra A, Thakur A, Shukla S and Barthwal S (2020). Molecular identification and phylogenetic studies in <i>Erythrina arborescens</i> Roxb. <i>Indian Forester</i> 16 : 55-62.	5.10
486	Dhaliwal I and Kaushik P (2020). Exploiting millets in the search of food security: a mini review. <i>J Exp Biol Agr Sci</i> 8 : 84-89.	5.07
487	Dhaliwal I, Banga S, Kumar N, Salisbury P and Banga SS (2020). A candidate gene-based association study of introgressed pod shatter resistance in Brassica napus. <i>Indian J Tradit Knowl</i> 20(1) : 267-76.	7.09
488	Dhaliwal I, Khosla G, Singh T P, Gill B S and Kaushik P(2020). DUS Characterization of some Released Varieties and Advanced Breeding Lines of Soybean (<i>Glycine max</i> L.) under Punjab Agroclimatic Conditions. <i>Int J Curr Microbiol App Sci</i> 9 : 2124-35.	5.38
489	Dhaliwal J, Kahlon M S and Kukal S S (2020). Deep tillage and irrigation impacts on soil water balance and water productivity of direct-seeded rice-wheat cropping system in north-west India. <i>Soil Res</i> 58(5) :498-508.	7.88



490	Dhaliwal J K, Singh M J, Sharma S, Gupta N and Kukal S S (2020). Medium-term impact of tillage and residue retention on soil physical and biological properties in dry-seeded rice-wheat system in north-west India. <i>Soil Res</i> 58(5) :468-477.	7.88
491	Dhaliwal K K, Ghai N and Jindal S K (2020). Variations in fruit quality parameters of chilli genotypes during early and timely sown conditions. <i>Int J Curr Microbiol App Sci</i> 9 : 2178-86.	5.38
492	Dhaliwal L K, Buttar G S, Kingra P K and Kaur Sukhjeet (2020). Yield response, water and radiation use efficiencies of wheat (<i>Triticum aestivum</i> L.) as influenced by sowing time, planting methods and irrigation scheduling in Punjab, India. <i>Ind J Agron</i> 65 : 53-60.	5.46
493	Dhaliwal L K, Buttar G S, Kingra P K, Kaur Sukhjeet and Singh Jagjeewan (2020). Growth, yield and water use efficiency of wheat under different sowing dates, planting methods and irrigation treatments. <i>Indian J Agric Sci</i> 90(3) : 519-23.	6.23
494	Dhaliwal M S, Jindal S K, Sharma A and Prasanna H C (2020). Tomato yellow leaf curl virus disease of tomato and its management through resistance breeding: A review <i>J Hortic Sci Biotechnol</i> 95 : 425-44.	7.92
495	Dhaliwal S K, Talukdar A, Gautam A, Sharma P, Sharma V and Kaushik P (2020). Developments and prospects in imperative underexploited vegetable legumes breeding: a review. <i>Int J Mol Sci</i> 21(24) :9615.	12.21
496	Dhaliwal S S, Singh J, Taneja P K and Mandal A (2020). Remediation techniques for removal of heavy metals from the soil contaminated through different sources: a review. <i>Environ Sci Pollut Res</i> 27 :1319-33.	11.19
497	Dhaliwal S S, Sandhu A S, Shukla A K, Sharma V, Kumar B and Singh R (2020). Bio-fortification of oats fodder through zinc enrichment to reduce animal malnutrition. <i>J Agric Sci Technol</i> 10 :98-108.	7.28
498	Dhaliwal S S, Taneja P K, Singh J, Bhatti S S and Singh R(2020). Cadmium accumulation potential of Brassica species grown in metal spiked loamy sand soil. <i>Soil Sediment Contam</i> 29(6) : 638-49.	9.06
499	Dhami P, Bains K, Kaur H and Jain S (2020). Appropriateness test of training module on culturally-competent emergency relief foods (ERFs) for disaster prone regions of India. <i>Indian J Ext Edu</i> 56 : 64-68.	5.95
500	Dhanoa A K, Kapoor R and Batra R (2020). Multiple gene transformation- Implications in Plant Breeding. <i>Int J Curr Microbiol App Sci</i> 8 : 1437-42.	5.38
501	Dhawan M, Joshi N, Kaur S, Sandhu S and Sharma M (2020). Deciphering the relationships among enzymatic systems and virulence of <i>B. bassiana</i> : A review. <i>J Exptl Biol Agric Sci</i> 8 : 730-42.	5.07
502	Dhillon B S, Uppal R S and Goyal M (2020). Forage quality and productivity of barley (<i>Hordeum vulgare</i> L.) as influenced by cutting management under staggered sowing in North-West India. <i>Arch Agron Soil Sci</i> 66(9) :1244-58.	8.24
503	Dhillon G, Bains S, Grewal S and Kocher D K (2020). Mosquito repellent eucalyptus and rosemary oil finishes for cotton fabric. <i>Int J Chem Stud</i> 9 : 31-34.	5.31
504	Dhillon G S, Kaur S, Das N, Singh R, Poland J, Kaur J and Chhuneja P (2020). QTL mapping for stripe rust and powdery mildew resistance in <i>Triticum durum</i> - <i>Aegilops speltoides</i> backcross introgression lines. <i>Plant Genet Resour</i> 18(4) :211-221.	7.28
505	Dhillon NK, Kaur S, Anupam and Buttar HS (2020) Allelopathic potential of <i>Streptomyces lydicus</i> strain WYEC 108 and <i>Verticillium chlamydosporium</i> strain IIHR VC-3 to control root knot nematode (<i>Meloidogyne incognita</i>) in tomato. <i>Allelopathy</i> J50 (1): 107-18.	7.28

506	Dhkal M, Sharma A and Kaur G (2020). First report of Tomato leaf curl New Delhi virus infecting Muskmelon in India. <i>J Plant Pathol</i> 102 :1325.	8.64
507	Dhkal M, Sharma A and Kaur G (2020). First report of tomato leaf curl Palampur virus infecting muskmelon in India. <i>J Plant Pathol</i> 102 : 1367.	8.64
508	Diksha, Kaur Sand Gupta R (2020). An analytical study of problems experienced by online shoppers of Ludhiana city. <i>Pharma Innov J</i> SP-9 : 119-22.	5.03
509	DinaN, AulakhCS, SharmaS and KukalSS (2020). Assessing soil quality under long-term organic vis-a-vis chemical farming after twelve years in north-western India. <i>J Plant Nutr</i> 44(8) :1-18.	8.28
510	Dinesh, Bhat M A, Sahoo J and Sharma M K (2020). Vertical distribution of nutrients vis-a-vis soil properties in different geomorphic units of north-eastern Haryana, India. <i>Indian J Ecol</i> 47 : 58-67.	5.79
511	Divya, Gill K K, Sandhu S S, Samanpreet Kaur, Walia S S and Mamta Rana (2020). Assessing the performance of wheat cultivars under present and futuristic climatic conditions using DSSAT model. <i>J Agrometeor</i> 22 :149-54	6.64
512	Dogra R, Waman D K, Dogra B and Kumar A (2020). Optimization of parameters of axial flow paddy thresher. <i>Agric Mech Asia Afr Lat Am</i> 51(2) : 22-27.	6.15
513	Dubey R, Kaur S, Sahota P P and Grewal I S (2020). Comparative Assessment of Antimicrobial Efficacy of Laboratory Prepared and Commercial Utensils and Floor Cleansers. <i>Int J Curr Microbiol App</i> 9(9) : 3534-39.	5.38
514	Faisal H, Kaur M and Anand A (2020). Perception of Breeders and Farmers Regarding Participatory Plant Breeding Programme and its Problems in Punjab. <i>IJEE</i> 56 : 61-68.	5.32
515	GargA K, Kaushal R and Rana V S (2020). Impact of vermicompost, poultry manure and jeevaamrit on growth parameters of kiwifruit (<i>Actinidia deliciosa</i>) cv. Allison. <i>Intl J Plant Soil Sci</i> 32 : 31-40.	5.07
516	Garnaik S, Sekhon BS, Sahoo S and Dhaliwal SS (2020). Comparative assessment of soil fertility status of various agroecological regions under intensive cultivation in Northwest India. <i>Environ Monit Assess</i> 192(5) :320.	9.31
517	Gautam T, Dhillon G S, Saripalli G, Rakhi, Singh V P, Prasad P and Gupta P K (2020). Marker-assisted pyramiding of genes/QTL for grain quality and rust resistance in wheat (<i>Triticum aestivum</i> L.). <i>Mol Breed</i> 40 :1-14.	9.30
518	Gayacharan Rani U, Singh S, Basandrai A K, Rathee V K, Tripathi K and Singh K (2020). Identification of novel resistant sources for ascochyta blight (<i>Ascochyta rabiei</i>) in chickpea. <i>Plos one</i> 15(10) : e0240589.	9.75
519	Gayas B, Kaur G and Singh A (2020). Ultrasound assisted extraction of apricot kernel oil: Effect on physicochemical, morphological characteristics, and fatty acid composition. <i>Acta Aliment</i> 49(1) : 23-31	7.00
520	Gill JS and Singh M (2020). Comparison of wheat production under different paddy residue management methods. <i>Curr J Appl Sci Technol</i> 38 : 1-9.	5.32
521	Gill K K, Satinder Kaur, Sandhu S S and Kukal S S(2020). Evaluation of real time weather-related fluctuations and wheat productivity in northern India. <i>J Agrometeor</i> 22 : 229-34	6.64
522	Godara AS and Mangotra A (2020). Effect of literacy and type of concentrate on peak milk yield in dairy animals. <i>J Entomol Zool Stud</i> 8 : 1795-97.	5.53



523	Goel R and Kochar G S (2020). Adoption of fermented vinegar making technology- An assessment. <i>Indian J Ext Edu</i> 56 (1): 197-200.	5.95
524	Goyal K, Kaur K and Kaur G (2020). Foliar treatment of potassium nitrate modulates the fermentative and sucrose metabolizing pathways in contrasting maize genotypes under water logging stress. <i>Physiol Mol Biol Plants</i> 26 (5): 899-906	9.02
525	Goyal M, Sohu R S, Bhardwaj R, Gill B S and Goyal M (2020). Genetic variance and predicted response for three types of recurrent selection procedures in forage sorghum (<i>Sorghum bicolor</i> (L.). <i>Range Manag</i> 41 (1): 43-51.	6.10
526	Goyal P, Sharda R, Siag M and Singh KG (2020). Development of an IoT based weighing type micro-lysimeter for soilless cultivation. <i>Indian J Agric Sci</i> 90 :1980-87.	6.25
527	Goyal S, Jindal J and Kaur K (2020). Physico-chemical bases of resistance in maize against shoot fly, <i>Atherigona</i> during spring season in north India. <i>Euphytica</i> 216 :154-174.	8.19
528	Grewal S K, Sharma K P, Bharadwaj R D, Hegde V, Tripathi S, Singh S and Mondal B (2020). Understanding genotypic variation and identification of promising genotypes for iron and zinc content in chickpea (<i>Cicer arietinum</i> L.). <i>J Food Compos Anal</i> 88 :103458.	10.52
529	Grover J, Chhuneja P, Midha V, Singh A, Mahajan R, Mehta V and Sood A (2020). An open-label randomised pilot trial on safety of wheat variety C273 in patients with adult celiac disease. <i>Therap Adv Gastroenterol</i> 13 :1756284820944089.	10.8
530	Gudi S, Atri C, Goyal A, Kaur N, Akhtar J, Mittal M and Banga S S (2020) Physical mapping of introgressed chromosome fragment carrying the fertility restoring (Rfo) gene for Ogura CMS in <i>Brassica juncea</i> L. Czern & Coss. <i>Theor Appl Genet</i> 133 :2949-59.	11.57
531	Gupta A and Jhanji S (2020). Evaluation of tinting induced changes in post harvest quality attributes of tuberoses. <i>Indian J Hort</i> 77 (1): 179-188.	6.11
532	Gupta A, Aggarwal R and Kaur S (2020). Field evaluation of abandoned open well for recharging surplus canal water. <i>Indian J Agric Sci</i> 90 :143-45.	6.25
533	Gupta M, Rattanpal HS, Sidhu GS and Singh G (2020). Morphological characterization of sweet orange (<i>Citrus sinensis</i> osbeck) germplasm under subtropical conditions. <i>IJPGR</i> 33 :224-29.	5.54
534	Gupta N, Gupta M, Akhtar J, Goyal A, Kaur R, Sharma S and Banga S S (2021). Association genetics of the parameters related to nitrogen use efficiency in <i>Brassica juncea</i> L. <i>Plant Mol Biol</i> 105 :161-75.	10.34
535	Gupta N, Pal R K, Kaur A and Mishra S K (2020). Thermal unit requirement of grape (<i>Vitis vinifera</i> L.) varieties under south western Punjab conditions. <i>J Agrometeor</i> 22 (4): 469-76	6.64
536	Gupta R and Bisht D (2020). Interventions to reduce drudgery of workers involved in small scale food processing units. <i>J Community Mobilization Sustain Dev</i> 15 : 555-58.	5.30
537	Gupta R M and Sharma P (2020). SWOT Analysis of Online Teaching During Lock Down: Blended Teaching the Way Forward. <i>IJEE</i> 56 :19-25.	5.32
538	Hadda M S, Singh G and Sumita C (2020). Soil organic carbon and soil physical characteristics as affected by land uses under semiarid irrigated conditions. <i>Commun Soil Sci Plant Anal</i> 51 (10): 1293-305	7.58
539	Heikal HM, Bhullar MB and Kaur P (2020). Acaricide resistance in field collected two-spotted spider mite, <i>Tetranychus urticae</i> , from okra in Punjab. <i>Indian J Ecol</i> 47 : 590-93.	5.79

540	Hiremath SS, Bhatia D, Jain J, Hunjan MS, Zaidi NW, Singh US, Zhou B and Lore JS (2020). Identification of potential donors and QTLs for resistance to false smut in a subset of rice diversity panel. <i>Eur J Plant Patho</i> 159 :461-70.	8.22
541	Hossain A, Sabagh AEL, Barutcular C, Bhatt R, Seydoşoğlu FCS, Turan Konuskan NO, Iqbal AM, Abdelhamid M, Soler CMT, Laing AM and Saneoka H (2020). Sustainable crop production to ensuring food security under climate change: A Mediterranean perspective. <i>Aust J Crop Sci</i> 14(03) :439-46	6.72
542	Hundal JS, Sharma A, Pal R and Grewal RS (2020). Harnessing the in vitro nutritional potential of different varieties of sugarcane tops silages enriched with molasses and bacterial inoculants as an unconventional feed resource. <i>Sugar Tech</i> 23 (1):923-932.	7.87
543	Hunjan M and Sabhikhi H (2020). Designing a crop rotation strategy to manage <i>Streptomyces</i> scabies causing potato scab in north India. <i>J Phytopathol</i> 168 (7-8): 469-77.	7.83
544	IrmilerC, AiharaH, Aziz T, Bacher S, Bahinipati S, Barberio E, Baroncelli Ti, Baroncelli To, Basith AK, Batignani G, Bauer A, Behera PK, Bertacchi V, Bettarani S, Bhuyan B, Bilka T, Bosi F, Bosisio L, Bozek A, Buchstenier F and Zani L (The Belle II SVD Collaboration) (2020). Run and slow control system for Belle II silicon vertex detector. <i>Nucl Inst Meth In Physics Res Sec-A</i> 958 :162706.	7.43
545	Jagtap A B, Vikal Y and Johal G S (2020). Genome-wide development and validation of cost-effective KASP marker assays for genetic dissection of heat stress tolerance in maize. <i>Int J Mol Sci</i> 21(19) :7386.	12.21
546	Jaidka M, Deol J S, Kaur R and Sikka R (2020). Source-sink optimization and morpho-physiological response of soybean (<i>Glycine max</i> L.) to detopping and mepiquat chloride application. <i>Legum Res</i> 43 : 401-03.	6.34
547	Jaidka M, Sharma M and Sandhu P S (2020). Evaluation of rice residue management options in district shaheed bhagat singhnagar of punjab - a survey. <i>Agric Res J</i> 57(3) : 358- 362.	5.44
548	Jain D, Grover K and Choudhary M (2020). Study on breakfast consumption pattern and its outcome in relation to haematological and body composition indices among adolescent girls. <i>Ecol Food Nutr</i> 59 (6):675-91.	7.76
549	Jalota S K, Prabhjyot-Kaur, Jatinder Kaur, P K Kingra and B B Vashisht (2020). Critical analysis of temporal climate change and ensuing frequency of crop yield constraining temperatures. <i>J Agrometeor</i> 22 (3):339-52	6.64
550	Jaspreet S, Chahal TS and Gill PPG (2020). Seasonal progression in nutrition density of mandarin cultivars and their relationship with dry matter accumulation during fruit development period. <i>Commun Soil Sci Plant Anal</i> 51(22) :2791-2804	7.58
551	Jassal R K and Singh H (2020). Influence of primed seed and varying seed rate on growth and productivity of soybean (<i>Glycine max</i> L.) under different planting techniques. <i>Leg Res</i> 43(3) : 394-400.	6.23
552	Jat H S, Jat R D, Nanwal R K, Lohan S K, Yadav A K, Poonia T and Jat M L (2020). Energy use efficiency of crop residue management for sustainable energy and agriculture conservation in NW India. <i>Renew Energy</i> 155 :1372-82.	14.63
553	Jatana B, Ram H and Gupta N (2020). Application of seed and foliar priming strategies to improve the growth and productivity of late sown wheat (<i>Triticum aestivum</i> L.). <i>Cereal Res Commun</i> 48 (3):383-90.	7.24
554	Jatinder K, Kaur P and Kaur S (2020). Analyzing uncertainties amongst the seventeen GCMs for prediction of temperature, rainfall and solar radiation in central irrigated plains in Punjab. <i>J Agrometeor</i> 22 (Spl. Issue): 15-23	6.64



555	Jhamb S and Rampal VK (2020). Constraints perceived in achieving lively hood Security by farmers in Malwa region of Punjab. <i>IJEE</i> 56 :111-15.	5.32
556	Jhanji S and Dhingra M (2020). Ameliorative effect of thiourea priming on germination characteristics of mungbean (<i>Vigna radiata</i> L.) under water and salinity stress. <i>Legum Res</i> 43 : 1-6.	6.34
557	Jindal SK, Dhaliwal MS and Meena OP (2020). Molecular advancements in male sterility systems of Capsicum: A review. <i>Plant Breed</i> 139 :42-64.	8.54
558	Jindal V(2020). Exploring the genetic variability of citrus butterfly Papilio demoleus using DNA barcode. <i>Indian J Agric Sci</i> 90 (8):1497-02.	6.80
559	Johal N, Kaur J, Grewal S K, Singh S and Kushwah A (2020). Physiological and biochemical responses of chickpea accessions at reproductive stage under receding moisture conditions. <i>Agric Res</i> 9 : 554-67.	5.90
560	Joshi N, Kocher G S, Kalia A and Banga H S (2020). Development of nano-silver alkaline protease bio-conjugate depilating eco-benign formulation by utilizing potato peel based medium. <i>Int J Biol Macromol</i> 152 :261-71.	14.03
561	Kakar R, Sharma JC, Mogta A, Guleria A and Thakur J (2020). Assessment of various nutrient management technologies for quality, fertilizer use efficiency, and economics of ginger production under subtropical to subtemperate conditions. <i>Commun Soil Sci Plant Anal</i> 51 (22):2805-820.	7.58
562	Kalia A and Singh S (2020). Myco-decontamination of azo dyes: Nano-augmentation technologies. <i>Biotech</i> 10 : 384.	9.20
563	Kalia A, Abd-Elsalam K A and Kuca K (2020). Zinc-based nanomaterials for diagnosis and management of plant diseases: Ecological safety and future prospects. <i>J Fungus</i> 6 (4):222.	11.72
564	Kalia A, Kaur J, Kaur A and Singh N (2020). Antimycotic activity of biogenically synthesised metal and metal oxide nanoparticles against plant pathogenic fungus <i>Fusarium moniliforme</i> (F. fujikuroi). <i>Indian J Exp Biol</i> 58 :263-70.	6.94
565	Kalia A, Manchanda P, Bhardwaj S and Singh G (2020). Biosynthesized silver nanoparticles from aqueous extracts of sweet lime fruit and callus tissues possess variable antioxidant and antimicrobial potentials. <i>Inorg Nano-Met Chem</i> 50 :1053-1062.	7.51
566	Kalia A, Sharma S P and Devi S(2020). Effect of surface microbiome and osmo-conditioning on restoration of storage-induced losses of viability in muskmelon (<i>Cucumis melo</i> L.). <i>J Agric Sci Technol.</i> 22 (1):221-33.	7.28
567	Kamboj R, Sharma S, Kumar R, Sharma P, Ravat VK, Chhuneja P, Vyas P, Sheikh I and Dhaliwal HS (2020). Introgression of powdery mildew resistance from <i>Aegilops triuncialis</i> into wheat through induced homeologous pairing. <i>J Plant Biochem Biotechnol</i> 29 :418-426.	7.53
568	Kapil Y, Kaur R and Singh M (2020). On question of Bhatia, Jain and Friedland, <i>Linear and Multilinear Algebra</i> 69 (16):1-12.	7.17
569	Kapoor R (2020). Variation and association studies for fodder yield and related traits in interspecific hybrids of bajra [<i>Pennisetum glaucum</i> (L.) R. Br.] × Napier grass [<i>Pennisetum purpureum</i> (K.) Schum.]. <i>Range Manag Agrofor</i> 41 (2): 363-67.	6.10
570	Kapoor R and Singh T P (2020). OL 12: A new high yielding fodder oat variety released for Punjab state, India. <i>Int J Curr Microbiol App Sci</i> 9 : 3174-78.	5.38
571	Kapoor S, Gandhi N, Kaur A, Tyagi S K and Mahajan B V C (2020). Effect of extraction methods on geometric, gravimetric and color aspects of tomato seeds. <i>Agric Res J</i> 57 : 904.	5.44

572	Kapoor S, Gandhi N, Tyagi S K, Kaur A and Mahajan B V C (2020). Extraction and characterization of guava seed oil: A novel industrial byproduct. <i>Lwt</i> 132 :109882.	12.06
573	Karedla A K, Choudhary A, Mandal K and Chhuneja P K (2020). Analytical method for the determination of thiamethoxam in mustard bloom and various matrices collected from honey bee colonies in mustard fields. <i>Pestic Res J</i> 32 :326-33.	5.49
574	Karuna and Dhaliwal L K (2020). Variability in meteorological parameters during kharif season and its impact on rice crop at Ludhiana, Punjab, India <i>J Agrometeorol</i> 22 : 92-96.	6.46
575	Kaul A, Sharma S and Singh B (2020). Yield gap analysis economics and adoption of sesame cultivation through front-line demonstrations in Pathankot district of Punjab, India. <i>Int J Curr Microbiol Appl Sci</i> 9 : 1536-44.	5.38
576	Kaur A and Mann SK (2020). Impact of RSETI EDPs on Income and Employment Generation. <i>J Community Mobilization Sustain Dev</i> 15 :95-98.	5.30
577	Kaur A, Chandi R S and Sharma S (2020). Field efficacy of green chemistry molecule (chlorantraniliprole) against tomato fruit borer, <i>Helicoverpa armigera</i> (Hubner). <i>IJEE</i> 56 : 149-152.	5.32
578	Kaur A, Kapoor R, Vikal Y and Kalia A (2020) Colchicine-induced chromosome doubling in <i>Penisetum</i> interspecific hybrids and its effect on plant morphology. <i>Indian J Genet Plant Breed</i> 80 (01):58-63.	7.34
579	Kaur A, Kaur N, Bassi G, Kaur N and Dhatt A S (2020). Morphological and molecular markers based assessment of genetic diversity in eggplant. <i>Indian J Hort</i> 77 (1): 116-124.	6.11
580	Kaur A, Kumar R and Vashisht B B (2020). Water content estimation of wheat under different irrigation regimes using β -radiation. <i>J Agri Res</i> 57 : 791.	5.20
581	Kaur A, Neelam K, Kaur K, Kitazumi A, de Los Reyes B G and Singh K (2020). Novel allelic variation in the Phospholipase D alpha 1 gene (<i>OsPLDα1</i>) of wild <i>Oryza</i> species implies to its low expression in rice bran. <i>Sci Rep</i> 10 (1):6571.	11.00
582	Kaur A, Neelam K, Kitazumi A, Kaur K, Sharma P, Mangat G S and Singh K (2020) Novel cis-acting regulatory elements in wild <i>Oryza</i> species impart improved rice bran quality by lowering the expression of phospholipase D alpha1 enzyme (<i>OsPLDα1</i>). <i>Mol Biol Rep</i> 47 :401-22.	8.74
583	Kaur A, Sharma V K, Kaur S, Kaur J and Lal C (2020). Characterization of barley entries for spot blotch resistance. <i>Int J Curr Microbiol App Sci</i> 9 : 161-71.	5.38
584	Kaur A, Singh H, Jawandha S K and Gill K S (2020). Influence of <i>Prunus</i> rootstocks and spacing on performance of Japanese plum grown under sub-tropical conditions. <i>Sci Hort</i> 268 :109380.	10.34
585	Kaur B, Singh K and Chawala N (2020). Evaluation of Garlic Germplasm for Yield Attributes and Quality Characters from Niche Area of District Jalandhar, India. <i>Int J Curr Microbiol App Sci</i> 9 : 706-12.	5.38
586	Kaur D, Singh G and Sharma P (2020). Symbiotic parameters, productivity and profitability in Kabuli chickpea (<i>Cicer arietinum</i> L.) as influenced by application of phosphorus and biofertilizers. <i>J Soil Sci Plant Nutr</i> 20 :2267-82.	9.61
587	Kaur G and Goswami T K (2020). Effect of stevia level on chemical, microbiological, and sensory properties of dairy dessert (rasgulla) at different storage periods and temperatures. <i>J Food Process Preserv</i> 44 (1):14293.	8.61
588	Kaur G and Kaur G (2020). Effects of process parameters on recovery and quality of groundnut oil. <i>J Oilseeds Res</i> 37 : 208-14.	5.02
589	Kaur G and Kaur N (2020). Development and nutritional evaluation of multigrain bread supplemented with sunflower seed (<i>Helianthus annuus</i>) flour. <i>Chem Sci Rev Lett</i> 9 :298-305.	5.21



590	Kaur G, Kalia A and Sodhi H S (2020). Size controlled, time-efficient biosynthesis of silver nanoparticles from <i>Pleurotus florida</i> using ultra-violet, visible range and microwave radiations. <i>Inorg Nano-Met Chem</i> 50 : 35-41.	7.51
591	Kaur G, Kaur M, Kaur N and Jeet K (2020). Removal of methylene blue dye from irrigation waste water by photocatalytic degradation using zinc doped magnesium ferrite nanoparticles. <i>Agri Res J</i> 57 (5): 7753-62.	5.44
592	Kaur G, Kaur N and Kaur A (2020). Lipid profile of hyperlipidemic males after supplementation of multigrain bread containing sunflower (<i>Helianthus annuus</i>) seed flour. <i>J Food Sci Tech</i> 58 (7): 2617-29.	9.12
593	Kaur G, Utreja D, Dhillon NK and Jain N (2020). Synthesis and evaluation of pyrazole derivatives as potent antinematic agents. <i>Russ J Org Chem</i> 56 (1):113-118.	6.80
594	Kaur H, Gill RS and Kaur S (2020). Rice bean (<i>Vigna umbellata</i> Thunb. Ohwi and Ohashi) protection against <i>Callosobruchus maculatus</i> F. by presence of protein profile. <i>J Stored Prod Res</i> 86 :101574.	8.83
595	Kaur H, Sardana V and Sharma P (2020). Optimizing sowing time of Spanish bunch groundnut (<i>Arachis hypogaea</i>) cultivars for spring-summer season in north-west India. <i>Indian J Agron</i> 64 : 88-93.	5.55
596	Kaur I, Chawla N, Dhatt A S and Kaur M (2020). Evaluation of physico-chemical composition in bulbs of red, yellow and white onion (<i>Allium cepa</i> L.) genotypes of sub tropical India. <i>Acta Aliment</i> 49 : 483-90	7.00
597	Kaur J (2020). Comparative studies on structural, magnetic and adsorptive properties of fused Fe ₂ O ₃ @ SiO ₂ and rattle shaped SiO ₂ @ Fe ₂ O ₃ nanospheres with reversal of core-shell. <i>Mater Chem Phys</i> 242 :122548.	10.78
598	Kaur J and Kaushal S (2020). Chemical Analysis, Antimicrobial and Antioxidant Activities of Harsingar (<i>Nyctanthes arbortristis</i>) essential oil. <i>J Essent Oil Bear Pl</i> 23 (2):230-45.	7.97
599	Kaur J and Kumar V (2020) Residual effect of neonicotinoids on the whitefly, <i>Bemisia tabaci</i> (Gennadius) in Bt cotton. <i>Indian J Entomol</i> 82 : 746-51.	5.89
600	Kaur J and Sidhu R K (2020) Assessment of training needs of farmers of south-western region of Punjab. <i>Agric Res J</i> 57 : 270-74.	5.30
601	Kaur J and Singh B (2020) Effect of nitrogen fertilization on decomposition and nutrient release from poplar litter in Punjab state of India. <i>Range Manag Agrofor</i> 41 (2): 284-92.	6.10
602	Kaur J, Akhatar J, Goyal A, Kaur N, Kaur S, Mittal M and Banga S S (2020). Genome wide association mapping and candidate gene analysis for pod shatter resistance in Brassica juncea and its progenitor species. <i>Mol Biol Rep</i> 47 :2963-74.	8.74
603	Kaur J, Gosal S K and Walia S S (2020). Effect of green manure and plant density on correlation between rhizospheric bio-chemical properties and rice (<i>Oryza sativa</i>) yield. <i>Indian J Agric Sci</i> 90 : 287-91.	6.37
604	Kaur J, Gosal S K, Walia S S, Kaur J and Khipla N (2020). Interaction of different carbon related microbial activities as influenced by green manure and bioinoculants in kharif maize crop. <i>Int J Curr Microbiol App Sci</i> 9 (2): 286-94.	5.38
605	Kaur J, Kaur P and Kaur S (2020). Climate change predictions by Ensemble model in different agroclimatic zones of Punjab. <i>Indian J Agric Phys</i> 20 : 231-42.	5.10
606	Kaur J, Pathak M and Pathak D (2020). Inheritance of resistance to yellow vein mosaic virus disease in interspecific crosses of <i>Abelmoschus</i> . <i>Indian J Agric Sci</i> 12 : 2302-6.	6.18

607	Kaur J, Ram H, Kaur H, Singh P (2020). Grain yield, nitrogen use efficiency and tillage intensity in wheat as affected by precision nutrient management. <i>Commun Soil Sci Plant Anal</i> 51 (11): 1483-98	7.58
608	Kaur J, Sharma R and Sharma P (2020). Floristic composition and distribution patterns of herbaceous plant diversity in fallow lands of the central districts of Punjab, India. <i>J Threat Taxa</i> 12 :15864-80.	5.64
609	Kaur J, Singh B, Singh A and Sharma S (2020). Characterization of extruded products from millets-legumes in combinations. <i>Pharma Innov J</i> 9 : 369-74.	5.03
610	Kaur J, Singh B, Singh A and Sharma S (2020). Geometric, physical and functional properties of selected pulses and millets for the formulation of complementary food products. <i>Int J Chem Stud</i> 8 : 2854-58.	5.31
611	Kaur J, Taggar M S, Sanghera G S, Kalia A and Javed M (2020). Cellulosic ethanol production potential from bagasse of elite sugarcane varieties/clones. <i>Int Sugar J</i> 122 (1462): 698-709.	6.12
612	Kaur J, Walia SS, Rani N and Singh J (2020). Impact analysis of frontline demonstrations on gobhi sarson in Patiala district of Punjab. <i>IJEE</i> 56 :190-93.	5.55
613	Kaur K and Gupta N (2020). Physiological parameters of salt tolerance in different genotypes of oats (<i>Avena sativa</i> L.) <i>Int J Curr Microbiol App Sci</i> 9 : 3041-50.	5.38
614	Kaur K, Duhan N, Singh J, Kaur G and Vikal Y (2020). Computational identification of maize miRNA and their gene targets involved in biotic and abiotic stresses. <i>J Biosci</i> 45 :1-17.	8.80
615	Kaur K, Kaur Gagandeep and Brar JS (2020). Pre-harvest application of hexanal formulations for improving post-harvest life and quality of mango (<i>Mangifera indica</i> L.) cv. Dashehari. <i>J Food Sci Tech</i> 57 (11):4257-4264.	7.85
616	Kaur K, Kaur H, Bains K and Kaur A (2020). Nutritional analysis and glycemic response of idli developed from cereal pulse blends. <i>J Pharmacogn Phytochem</i> 9 : 3024-29.	5.21
617	Kaur K, Kumar K, Kaur K, Arora P K and Singh K (2020). Microsatellites assisted rapid identification of mandarin hybrids and assessment of their phenotypic variability. <i>Indian J Agric Sci</i> 90 : 2307-12.	6.25
618	Kaur K, Singh J and Singh V (2020). Effect of encapsulated vitamin E on physical, storage and retention parameters in cookies. <i>J Food Sci Technol</i> 57 (9):3509-17.	9.12
619	Kaur K, Sohu V S, Sharma A, Srivastava P, Mavi G S, Kaur H, Chhuneja P and Bains N S (2020). Biofortification strategies to increase wheat nutrition and sustaining yield simultaneously. <i>Indian J Genet Plant Breed</i> 79 (01):15-24.	7.34
620	Kaur L, Kaur G and Kaur A (2020). Interpersonal relations of old aged people with their families in Punjab. <i>J Community Mobilization Sustain Dev</i> 16 :33-38.	5.30
621	Kaur M and Kumar M (2020). An innovation in magnetic field assisted freezing of perishable fruits and vegetables: A review. <i>Food Rev Int</i> 36 (8):761-80.	12.48
622	Kaur M and Kumar M (2020). Nesting preferences of birds in relation to exotic trees in Ludhiana, Punjab. <i>J Anim Res</i> 10 : 105-09.	5.68
623	Kaur M, Ghai N and Chahal G K (2020). Moisture stress induced changes in root anatomy and antioxidants level in maize (<i>Zea mays</i> L.). <i>J Pharmacogn Phytochem</i> 9 : 1152-59.	5.21
624	Kaur M, Goyal P and Goyal M (2020). Individual, interpersonal and economic challenges of underemployment in the wake of Covid-19. <i>Work</i> 67 (1):21-28.	7.80



625	Kaur M, Kaur K and Kaur S (2020). Adoption status of practices imparted under vocational training courses conducted by KVK, SBS Nagar, Nawanshahr, Punjab. <i>Multilogic in Sci</i> 10 : 1077-80.	5.20
626	Kaur M, Punia S S, Singh J and Singh S (2020). Evaluation of multiple herbicide resistance in littleseed canarygrass (<i>Phalaris minor</i>) populations from Haryana in India. <i>Indian J Weed Sci</i> 52 : 265-69.	5.84
627	Kaur M, Thind S K and Arora A (2020). Prevalence of ber black fruit spot <i>Alternaria alternata</i>) and its management. <i>Indian Phytopathol</i> 73 : 245-51.	5.90
628	Kaur M, Jeet K and KaurM (2020). Facile synthesis of graphene oxide nanocomposites membranes for effective removal of As (III) from water. <i>J Nanosci Nanotech</i> 21 :3596-610.	7.27
629	Kaur N and Kaur P (2020). Statistical analysis of projected climate data under diverse scenarios for kandi region of Punjab. <i>J Agric Phys</i> 20 : 199-207.	5.10
630	Kaur N and Singla N (2020). Comparison of efficacy of ready to use and cereal based formulations of Bromadiolone for rodent pest management in summer moong crop. <i>Indian J Plant Prot</i> 48 : 143-47.	5.07
631	Kaur N, Chhuneja PK, Singh J, Choudhary A and Dhillon S K (2020). Effect of weather factors and nitrogen application on nectar secretion and honey production potential in sunflower. <i>J Agrometeor</i> 22 (4): 457-68.	6.64
632	Kaur N, Gill K K, Singh B, Gill RIS and Parija B (2020). Heat unit requirement and radiation use efficiency of wheat cultivars under agroforestry systems in northern India. <i>J Agrometeorol</i> 22 :112-20.	6.36
633	Kaur N, Goyal P and Kaur M (2020). Employee satisfaction and client satisfaction in the banking sector. <i>Indian J Econ Dev</i> 16 : 443-48.	5.21
634	Kaur N, Gupta R, Kaur S and Aggarwal P (2020). Efficacy of CIPC on storage behaviour and processing quality of potato cultivars in Punjab. <i>Agric Res J</i> 57 (4): 623-26.	5.44
635	Kaur N, Kaur H and Bal SK (2020). Work related drudgery scores, body disorders and hazards experienced by female workers engaged in marigold cultivation. <i>Pharma Innov J</i> 9 : 279-81.	5.03
636	KaurN, Kaur H and Bal SK (2020). Work related risk factors faced by female workers engaged in flower cultivation. <i>Pharma Innov J</i> 9 : 202-07.	5.03
637	Kaur N, Randhawa H S and SaraoP S (2020). Effect of dates of sowing and insecticidal spray on arthropods diversity in direct seeded rice ecosystem. <i>J Entomol Zool Stud</i> 8 : 1729-35.	5.50
638	Kaur Oberoi H, Kaur M and Agrawal R K (2020). Hydrocyanic acid, fodder quality and yield variation in sorghum genotypes grown under varying fertilizer levels. <i>Range Manag Agrofor</i> 41 (2): 322-27.	6.10
639	Kaur P and Kumar P (2020). Evaluation of front line demonstrations on summer moong (<i>Vigna radiata</i>) in Sangrur district of Punjab. <i>IJEE</i> 56 : 1-4.	5.32
640	Kaur P, Grewal H S, Dubey R K and Dhatt K K (2020). The influence of plant growth regulator and rootstocks on budding in greenhouse rose (<i>Rosa hybrida</i> l.) first red. <i>Int J Curr Microbiol App Sci</i> 9 (5): 2319-7706.	5.38
641	Kaur P, Jindal S, Yadav B, Yadav I, Mahato A, Sharma P and Singh K (2020). Comparative analysis of chromosome 2A molecular organization in diploid and hexaploid wheat. <i>Mol Biol Rep</i> 47 :1991-2003.	8.74
642	Kaur P, Kaur H and Bhullar MS (2020). Influence of organic amendments on dissipation and leaching potential of penoxsulam under laboratory conditions. <i>Int J Environ Anal Chem</i> 102 (9): 2074-86.	8.73

643	Kaur P, Kaur P and Kaur K (2020). Adsorptive removal of imazethapyr and imazamox from aqueous solution using modified rice husk. <i>J Clean Prod</i> 244 : 118699.	17.07
644	Kaur P, Kaur P, Kaur N, Jain D, Singh K and Bhullar M S (2020). Dissipation and phytotoxicity of imazethapyr and imazamox in soils amended with β -cyclodextrin-chitosan biocomposite. <i>Sci Total Environ</i> 735 :139566.	16.75
645	Kaur P, Singh J, Kaur M and Jain R(2020). Metakaolin Based Geopolymer Mortar Reinforced with Multi-Walled Carbon Nanotubes – A Case Study. <i>Curr J Appl Sci Technol</i> 39 : 47-58.	5.32
646	Kaur P, Singh P and Singh A. (2020). Analysis of Karnal Bunt and Black Point of wheat in Tarn Taran District of Punjab. <i>Int J Curr Microboil App Sci</i> 9 (5): 914-21.	5.38
647	Kaur P, Taggar M S and Kaur J (2020). Cellulolytic microorganisms: diversity and role in conversion of rice straw to bioethanol. <i>Cellu Chem Tech</i> 54 (7-8): 613-34.	7.39
648	Kaur P, Zalpouri R, Singh M and Verma S (2020). Process optimization for dehydration of shelled peas by osmosis and three-stage convective drying for enhanced quality. <i>J Food Process Preserv</i> 44 (12):14983.	8.61
649	Kaur R and Dhatt K K (2020). Estimation of genetic parameters for quantitative traits in pansy (<i>Viola \times Wittrockiana</i> Gams.) <i>Indian J Agric Sci</i> 90 :835-37.	6.25
650	Kaur R and Kaur K (2020). Effect of processing on color, rheology and bioactive compounds of different sweet pepper purees. <i>Plant Foods Hum Nutr</i> 75 (3):369-75.	10.12
651	Kaur R and Rampal V K (2020). Impact of training programme on knowledge level of the FCI personnel. <i>J Community Mobilization Sustain Dev</i> 15 :186-91.	5.30
652	Kaur R, Alam MS, Prasad C and Kumar M (2020). Effect of storage pre-treatments on shelf-life of fresh coriander (<i>Coriandrum sativum</i> L). <i>Agric Res J</i> 57 (3): 438-43.	5.44
653	Kaur R, Babbar B K, Pathak D and Bala B (2020). Behavior responses and histological changes in sense organs of house rats exposed to methyl anthranilate: A known repellent. <i>Proc Indian Natl Sci Acad</i> 6 : 1423-33.	5.89
654	Kaur R, Bhullar M B, Sharma D R, Arora P K, Mahajan B V C and Kaur P (2020). Seasonal abundance and effect of thrips and mites damage on fruit quality characteristics of Kinnow. <i>J Entomol Zool Stud</i> 8 : 1327-35.	5.53
655	Kaur R, Chahal K K and Urvashi (2020). Isolation, chemical transformation and antifungal potential of sesquiterpene lactones from <i>Inula racemosa</i> . <i>Chem Nat Compds</i> 56 (2): 207-12	6.83
656	Kaur R, Das T K, Singh R, Jaidka M and Shekhawat K (2020). Managing weeds using sequential herbicides in maize for improving crop growth and productivity under irrigated conditions in North-Western India. <i>Maydica</i> 65 (2): 1-10	6.91
657	Kaur R, Grewal SK, Singh S, Kaur J and Bhardwaj RD (2020). Desi and kabuli chickpea cultivars had differential behavior towards salinity stress tolerance. <i>Biol Futur</i> 71 (1-2): 137-46.	6.68
658	Kaur R, Gupta M, Singh S, Joshi N and Sharma A (2020). Enhancing RNAi efficiency to decipher the functional response of potential genes in Bemisia tabaci Asiall-1 (Gennadius) through dsRNA feeding assays. <i>Front Physiol</i> 11 :123.	10.76
659	Kaur R, Kalia A, Lore J S and Sandhu J S (2020). Antifungal effect of Trichoderma spp. β 1,3-glucanase on Phytophthora parasitica: Hyphal morphological distortions. <i>J Phytopathol</i> 168 (11-12): 700-706.	7.83
660	Kaur R, Kaur G, Vikal Y, Gill G K, Sharma S, Singh J and Chawla J S (2020) Genetic enhancement of essential amino acids for nutritional enrichment of maize protein quality through marker assisted selection. <i>Physiol Mol Biol Plants</i> 26 :2243-54.	9.02



661	Kaur R, Kaur K, Wagh R V, Kaur A and Aggarwal P (2020). Red bell pepper (<i>Capsicum annuum</i> L.): Optimization of drying conditions and preparation of functional bread. <i>J Food Sci</i> 85 (8):2340-49.	9.69
662	Kaur R, Kumar S, Kumar M, Wahid A and Alam M S (2020). Multilayer drying kinetics of bitter-gourd (<i>Momordica charantia</i>). <i>Agric Res J</i> 57 (3): 385-94.	5.44
663	Kaur R, Manchanda P and Sidhu GS (2020). Phenolic compounds from peel and callus extracts of sweet lime (<i>Citrus medica</i>). <i>Indian J Agric Sci</i> 90 :1205-08.	6.37
664	Kaur R, Sharma S, Shera P S and Sangha K S (2020). Biocontrol based IPM module against insect pests of cauliflower. <i>Indian J Entomol</i> 82 : 324-29.	5.89
665	Kaur R, Singh A, Singh K G and Arora D (2020). Productivity of soybean [<i>Glycine max</i> (L.) Merrill] as influenced by drip irrigation, fertigation and mulching. <i>Ind J Agron</i> 65 :116-19.	5.46
666	Kaur R, Singh B and Dhaliwal S S (2020). Dynamics of soil cationic micronutrients in a chronosequence of poplar (<i>Populus deltoides</i> Bartr.)-based agroforestry system in India. <i>J Soil Sci Plant Nutr</i> 20 :2025-41.	9.87
667	Kaur Rajbir, Alam MS, Prasad Chavan and Kumar M (2020). Effect of storage pre-treatments on shelf-life of fresh coriander (<i>Coriandrum sativum</i> L). <i>Agric Res J</i> 57 (3): 438-43.	5.44
668	Kaur S (2020). Effect of foliar feeding of plant growth regulators on vegetative growth, yield and quality of phalsa (<i>Grewia ubinaequalis</i>). <i>Int J Curr Microbiol App Sci</i> 9 (6): 3209-3220.	5.38
669	Kaur S (2020). To study the effect of different concentrations of plant growth regulators on rooting of litchi (<i>Litchi chinensis</i> Sonn.) air layers. <i>Int J Chem Stud</i> 8 : 532-37.	5.31
670	Kaur S, Kaur J, Mavi G S, Dhillon G S, Sharma A, Singh R and Chhuneja P (2020). Pyramiding of high grain weight with stripe rust and leaf rust resistance in elite Indian wheat cultivar using a combination of marker assisted and phenotypic selection. <i>Front Genet</i> 11 :593426.	10.77
671	Kaur S, Kaur P and Kumar P (2020). Constraints faced by the farmers in the use of soil health card. <i>Multilogic in Sci</i> 9 : 487-88.	5.20
672	Kaur S, Kaur P and Kumar P (2020). Farmers' knowledge of soil health card and constraints in its use. <i>IJEE</i> 56 : 28-32.	5.32
673	Kaur S, Saini MK and Bakhshi DK (2020). Effect of planting time, nitrogen application and planting geometries on growth and yield of citronella (<i>Cymbopogonwinterianus</i> Jowitt.) under sub-montaineous region of Punjab. <i>J Crop Weed</i> 16 : 60-66.	5.46
674	Kaur S, Singh R, Vashisht B B, Gill K K and Aggarwal R (2020). Modelling the response of paddy water balance on groundwater level fluctuations in Central Punjab. <i>J Hydroinformatics</i> 22 (6):1663 -71	9.06
675	Kaur S, Gill MS, Gill PPS and Singh N (2020). Effect of plant bio-regulators on photosynthesis, growth and yield efficiency of pear trained on Y-trellis system. <i>J Agrometeor</i> 22 (2): 140-47	6.64
676	Kaur T, Bhullar M S, Kaur N and Singh R (2020). Early post-emergence application of penoxsulam for weed control in transplanted rice. <i>Pestic Res J</i> 32 : 117-22.	5.49
677	Kaur T, Dhall R K and Sharma S P (2020). Gene effect studies for quality characters in cucumber (<i>Cucumis sativus</i> L.) using gynoecious parent. <i>Genetika</i> 52 : 727-34.	6.39
678	Kaur V, Kaur R and Bhardwaj U (2020). A review on dill essential oil and its chief compounds as naturalBiocide. <i>Flavour Fragr J</i> 36 (3): 412-31.	8.50
679	Kaur Y, Dhall R and Sharma P (2020). Characterization of bolting behaviour in garlic (<i>Allium sativum</i> L.) using SNP identification. <i>Indian J Agric Sci</i> 90 : 112-17.	6.37

680	Kaur BH and Kaur M (2020). Role of Plant Growth Regulators in improving fruit set, quality and yield of fruit crops-a review. <i>J Hortic Sci Biotechnol</i> 95 :137-146	7.92
681	Khosla G, Gill B S, Sirari A, Sharma P and Dhaliwal I (2020). Identifying QTL for seed weight in a cross between vegetable and grain type soybeans. <i>Indian J Genet</i> 80 : 475-79.	6.28
682	Khushboo T S and Singh D (2020). Fortification of cookies using <i>Nelumbo nucifera</i> rhizome (Lotus stem) to meet the nutritional requirement of toddlers. <i>Int J Food Sci Nutr</i> 5(3) :44-49.	10.44
683	Kingra PK, Aatralarasi S, Setia R, Kukal SS and Singh SP (2020). Computation of reference evapotranspiration, its variability and trends in different agroclimatic regions of Punjab. <i>J Agrometeor</i> 22 (2): 226-32.	6.64
684	Kivuyo N and Sharma S (2020). Dietary acculturation among African emigrant students in India: determinants and problems. <i>Public Health Nutr.</i> 23 (13):2402-09.	10.54
685	Kukreja N, Saini S and Vig D (2020). The gendered interplay between intellectual abilities, metacognition and academic performance of rural adolescents. <i>Pharma Innov J</i> 9 :129-34.	5.23
686	Kumar A and Dhillon T S (2020). Responses of EMS on growth and yield of French bean (<i>Phaseolus vulgaris</i> L.). <i>Indian J Agric Sci</i> 90 (2): 436-8.	6.23
687	Kumar A and Dhillon T S (2020) Stability of French bean (<i>Phaseolus vulgaris</i> L.) genotypes under diverse environments. <i>Indian J Agric Sci</i> 90 (1): 157-62.	6.23
688	Kumar A, Bhople B S and Kumar A(2020). Prospective of Indian agriculture: highly vulnerable to huge unproductivity and unsustainability. <i>Curr Sci</i> 119 (7):1079-1080.	7.17
689	Kumar A, Birah A, Tanwar R K, Khokar M, Monga D, Kumar R and Arora J K (2020). Validation of IPM strategies in Bt cotton in Whitefly (<i>Bemisia tabaci</i>) hot spot of North-West India. <i>Indian J Agric Sci</i> 91 : 1088-92.	6.37
690	Kumar A, Gill GPS, Bedi JS and Chhuneja PK (2020). Residues of antibiotics in raw honeys from different apiaries of Northern India and evaluation of human health risks. <i>Acta Aliment</i> 49 (3): 314-20	7.00
691	Kumar A, Gill J P S, Bedi J S, Chhuneja P K and Kumar A (2020). Determination of antibiotic residues in Indian honeys and assessment of potential risks to consumers. <i>JApic Res</i> 59 (1): 25-34.	8.41
692	Kumar A, Gill R K and Singh M (2020). Genetic Variability and Association Analysis for Various Agro Morphological Traits in Lentil (<i>Lens culinaris</i> M.). <i>Legum Res</i> 43 :776-79.	6.50
693	Kumar A, Sandhu N, Venkateshwarlu C, Priyadarshi R, Yadav S, Majumder R R and Singh V K (2020). Development of introgression lines in high yielding, semi-dwarf genetic backgrounds to enable improvement of modern rice varieties for tolerance to multiple abiotic stresses free from undesirable linkage drag. <i>Sci Rep</i> 10 (1):13073.	11.00
694	Kumar A, Sharma S, Chunduri V, Kaur A, Kaur S, Malhotra N and Garg M (2020). Genome-wide identification and characterization of Heat Shock Protein Family reveals role in development and stress conditions in <i>Triticum aestivum</i> L. <i>Sci Rep</i> 10 (1):7858.	11.00
695	Kumar D, Dogra B, Dogra R, Bains T S and Manes G S (2020). Optimization of operational parameters for mechanized harvesting of mungbean [<i>Vignaradiata</i> (L.) <i>Wilczek</i>] with combine harvester. <i>Legum Res</i> 42 : 216-21.	6.34
696	Kumar H, Arora R, Thakur A and Sharma S (2020). Impact assessment of growing media and bioinoculents on growth and bud take of rough lemon. <i>Indian J Hort</i> 77 (3): 439-49.	6.11



697	Kumar K, Neelam K, Bhatia D, Kaur R, Khanna R, Mangat G S, Vikal Y and Singh K (2020). High resolution genetic mapping and identification of a candidate gene(s) for the purple sheath color and plant height in an interspecific F2 population derived from <i>Oryza nivara</i> Sharma & Shastry × <i>Oryza sativa</i> L. Cross. <i>Genet Resour Crop Evol</i> 67 :97–105.	7.88
698	Kumar N, Kaur P, Devgan K and Attkan A K (2020). Shelf life prolongation of cherry tomato using magnesium hydroxide reinforced bio-nanocomposite and conventional plastic films. <i>J Food Process Preserv</i> 44 (4):14379.	8.61
699	Kumar P and Boparai A K (2020). Impact of summer moong through improved technology in Jalandhar district of Punjab, India. <i>Int J Curr Microbiol App Sci</i> 9 (5): 2319-7692	5.38
700	Kumar R (2020). Study of Optical, Electrical and Acoustical Properties of CuSO ₄ Doped Polyvinyl Pyrrolidone (PVP) based Polymer Solutions. <i>J Polym Mater</i> 37 : 119-30.	6.32
701	Kumar R and Cheema H K (2020). Restricting lepidopteran herbivory through trap cropping and bird perches in Egyptian clover (<i>Trifolium alexandrinum</i> L.) <i>Egypt J Biol Pest Control</i> 30 :1-8.	6.38
702	Kumar R, Kashyap L, Anuradha and Singh B (2020). Bioefficacy and persistence of Ferterra (chlorantraniliprole) for the management of top borer <i>Scirpophaga excerptalis</i> in sugarcane in Punjab India. <i>Pestic Res J</i> 32 (1): 69-77.	5.90
703	Kumar R, Monga D, Naik VCB, Singh P and Waghmare V N (2020). Incipient infestations and threat of pink bollworm <i>Pectinophora gossypiella</i> (Saunders) on Bollbard-II cotton in the northern cotton-growing zone of India. <i>Curr Sci</i> 118 (9): 1454-1456.	7.17
704	Kumar R, Rana DS, Kumari R, Gupta R and Singh M (2020). Effect of area specific mineral mixture feeding on productive and reproductive performance of dairy animals. <i>J Entomol Zool Stud</i> 8 : 2407-09.	5.32
705	Kumar R, Sheena G S and Singh ND (2020). Performance of Pulse Based Crop Rotations at Small Farms under Irrigated Conditions of Punjab. <i>Indian J Ecol</i> 11 : 834-39.	5.76
706	Kumar R, Singh D P and Tiwana U S (2020). Forage yield compensation in maize (<i>Zea mays</i> L.) with differential seed rates against insect herbivory of <i>Chiloptartellus</i> (Swinhoe.) (Crambidae: Lepidoptera). <i>Range Manag Agrofor</i> 41 (1): 81-86.	6.10
707	Kumar S, Narjary B, Kumar N, Kaur S, Yadav R K and Kamra S K (2020). A GIS-based Methodology for Assigning a Flux Boundary to a Numerical Groundwater Flow Model and Its Effect on Model Calibration. <i>J Geol Soc India</i> . 96 : 507-12.	7.46
708	Kumar S, Singh M, Arora J and Manes G S (2020). Comparative field evaluation of auto-rotate gun sprayer for control of <i>Bemisia tabaci</i> in a cotton crop. <i>Afr Entomo</i> 28 (2): 300–11	6.57
709	Kumar S, Singh M, Manes G and Pathania M (2020). Development and evaluation of PAU multi-purpose sprayer to control whitefly (<i>Bemisia tabaci</i>) in cotton. <i>Indian J Agric Sci</i> 90 : 1160-65.	6.37
710	Kumar S, Singh M, Manes G S, and Pathania M (2020). Development and evaluation of PAU multi-purpose high clearance sprayer to control whitefly incidence in cotton crop. <i>Indian J Agric Sci</i> 90 (6): 116-121.	6.24
711	Kumar S, Singh M, Manes GS and Arora J(2020). Comparative field evaluation of Auto rotator gun sprayer for control of <i>Bemisia tabaci</i> in Cotton Crop. <i>Afr Entomol</i> 2 (25): 300-11.	8.18
712	Kumar V, Aulakh CS, Kaur J and Chawla N (2020). Nutrition management effects on productivity and tuber quality of potato (<i>Solanum tuberosum</i>). <i>Indian J Agron</i> 65 : 337-43.	5.55
713	Kumar V, Joshi V K, Thakur N S, Sharma N and Gupta R K (2020). Effect of Artificial Ageing Using Different Wood Chips on Physico-chemical, Sensory and Antimicrobial Properties of Apple Tea Wine. <i>Braz Arch Biol Technol</i> 63 : e20180413.	7.18

714	Kumar V, Kular J S, Kumar R, Sidhu S S and Chhuneja P K (2020). Integrated whitefly [<i>Bemisia tabaci</i> (Gennadius)] management in Bt cotton in north India: an agroecosystem-wide community based approach. <i>Curr Sci</i> 119 (4): 618-24.	7.17
715	Kumar V, Shekhawat A S, Kumar Y, Kaur S, Swati, Kharub A S and Singh G P (2020). G × E models for yield adaptation and target environment analysis in barley (<i>Hordeum vulgare</i>). <i>Indian J Agric Sci</i> 90 (1): 128-32.	6.21
716	Kumari A, Sangha M K, Goyal P and Pathak D (2020). Effectiveness of elicitors in cotton against cotton leaf curl virus (CLCuV) in relation with parthenogenesis related proteins. <i>Res J Biotechnol</i> 15 : 19-27.	5.00
717	Kumari A, Sangha M K, Pashupat V, Akhatar J and Pathak D (2020). Role of 2,6 Dichloroisonicotinic acid inducing resistance in cotton against cotton leaf curl disease. <i>Res J Biotechnol</i> 15 : 67-74.	5.00
718	Kumari P, Sharma P and Sharma S (2020). Synergism of Rhizobium and rhizobacteria on growth, symbiotic parameters, soil quality and grain yield in summer mungbean (<i>Vigna radiata</i> L. Wilczek). <i>Int J Curr Microbiol AppSci</i> 9 (3): 136-151.	5.38
719	Kumari S and Khanna V (2020). Induction of systemic resistance in chickpea (<i>Cicer arietinum</i> L.) against <i>Fusarium oxysporum</i> f. sp. <i>ciceris</i> by antagonistic rhizobacteria in assistance with native mesorhizobium. <i>Curr Microbiol</i> 77 :85-98.	13.00
720	Kumari S, Chhuneja P K, Singh J and Choudhary A (2020). Relative foraging intensity of various honey-bee species on <i>Brassica juncea</i> (L.). <i>Agric Res J</i> 57 (5): 730-37.	5.44
721	Kumari S, Gupta R and Gill J K (2020). Assessment of wor related musculoskeletal problems among workers engaged in Ironing clothes. <i>Int J Curr Microbiol App Sci</i> 9 (5): 223-230.	5.38
722	Kumari S, Khanna V and Routray S (2020). Biomangement of seedling rot of mungbean (<i>Vigna radiata</i> (L.) Wilczek) caused by <i>Rhizoctonia solani</i> by dual inoculation of antagonistic rhizobacteria and native Rhizobium. <i>Chemical Sci Rev Lett</i> 9 : 622	5.21
723	Kumari, S and Kaur H (2020). Occupational Stress among Nurses in Multispecialty hospitals of Ludhiana City. <i>Pharma Innov J</i> 9 :104-06.	5.03
724	Kumawat K C, Sharma P, Nagpal S, Gupta R K, Sirari A, Nair R M and Singh S (2021). Dual microbial inoculation, a game changer–bacterial biostimulants with multifunctional growth promoting traits to mitigate salinity stress in spring mungbean. <i>Front Microbiol</i> 11 :600576.	12.06
725	Kumawat K C, Singh I, Nagpal S, Sharma P, Gupta R K and Sirari A (2022). Co-inoculation of indigenous <i>Pseudomonas oryzihabitans</i> and <i>Bradyrhizobium</i> sp. modulates the growth, symbiotic efficacy, nutrient acquisition, and grain yield of soybean. <i>Pedosphere</i> 32 (3): 438-51.	11.51
726	Kundal M, Thakur S and Dhillon G P S (2020). Evaluation of growth performance of half sib progenies of <i>Toonaciliata</i> M. Roem under field conditions. <i>Genetika</i> 52 :651-60.	6.46
727	Lata K, Sahota P P, Bhatia S, Kaur R, Kaur N and Natt S K (2020). Amino acids, Microbial and Physicochemical Profiling of Lactic Fermented Vegetable Pickles. <i>Int J Curr Microbiol AppSci</i> 10 (1): 1-13.	5.38
728	Mahajan S and Bains S (2020). Impact of lockdown due to covid 19 on apparel and knitwear industries of Ludhiana. <i>J Community Mobilization Sustain Dev</i> 15 :65-69.	5.30
729	Maini A, Sharma V and Sharma S (2020). Assessment of soil carbon and biochemical indicators of soil quality under rainfed land use systems in North Eastern region of Punjab, India. <i>Carbon Manag</i> 11 (2):169-82.	9.52
730	Maini A, Sharma V, Sharma S, Arora Rand Dhaliwal SS (2020). Soil biochemical properties of various land use under rainfed conditions in Shiwalik foothills of Punjab, India. <i>ArchAgron Soil Sci</i> 68 (5):688-703.	8.24



731	Makkar GS, Chhuneja PK and Singh J (2020). Morphometric characterization of Apis species (Hymenoptera: Apoidea). <i>Vegetos</i> 33 : 538-44.	5.27
732	Malhotra N, Sharma S, Sahni P, Singh B and Sharma S P (2022). Nutritional composition, techno-functionality, in-vitro starch digestibility, structural characteristics and storage stability of sweet potato flour and mash supplemented specialty pasta. <i>Lwt</i> 168 :113886.	12.06
733	Mandal A, Majumder A, Dhaliwal S S, Toor A S, Mani P K, Naresh R K and Mitran T (2022). Impact of agricultural management practices on soil carbon sequestration and its monitoring through simulation models and remote sensing techniques: A review. <i>Crit Rev Environ Sci Technol</i> 52(1) :1-49.	17.75
734	Mandal A, Toor AS and Dhaliwal SS (2020). Assessment of sequestered organic carbon and its pools under different agricultural land-uses in the semi-arid soils of south-western Punjab, India. <i>J Soil Sci Plant Nutr</i> 20 : 259-273.	9.61
735	Manuja A, Raguvaran R, Kumar B, Kalia A and Tripathi B N (2020). Accelerated healing of full thickness excised skin wound in rabbits using single application of alginate/acacia based nanocomposites of ZnO nanoparticles. <i>Int J BiolMacromol</i> 155 :823-33.	14.03
736	Martolia D and Gupta R (2020) Assessment of changing consumer behaviour in the wake of COVID-19. <i>J Community Mobilization Sustain Dev</i> 15 : 359-64.	5.3
737	Martolia D and Gupta R (2020). Assistive technology for autistic children: A Review. <i>Int J Curr Microbiol App Sci</i> 9(7) : 2170-75.	5.38
738	Martolia D, Gupta R and Gill JK (2020). Assessment of musculoskeletal problems of hairsalon workers. <i>Pharma Innov J</i> 9 : 302-05.	5.03
739	Martolia D, Kaur N and Bal S K (2020). Participation of farm women in value addition of farm produce and constraints faced by them. <i>J Community Mobilization Sustain Dev</i> 15 : 207-10.	5.30
740	Mavi M S, Bhullar R S and Choudhary O P (2020). Differential ability of pyrolysed biomass derived from diverse feedstocks in alleviating salinity stress. <i>Biomass Convers. Biorefin.</i> 1-12.	10.05
741	Meena O P, Dhaliwal M S, Jindal S K and Rani M (2020). Cytoplasmic male sterile lines with desirable combining ability enhance the concentration of biochemical attributes and total yield in Capsicum annum under temperature stress conditions. <i>Ind Crops Prod</i> 145 :112107.	12.45
742	Meena OP, Dhaliwal MS and Jindal SK (2020). Heterosis breeding in chilli pepper by using cytoplasmic male sterile lines for high-yield production with special reference to seed and bioactive compound content under temperature stress regimes. <i>Sci Horti</i> 262 :109036.	10.34
743	Mittal A, Yadav I S, Arora N K, Boora R S, Mittal M, Kaur P and Singh K (2020). RNA-sequencing based gene expression landscape of guava cv. Allahabad Safeda and comparative analysis to colored cultivars. <i>BMC Genomics.</i> 21 :1-19.	10.55
744	Mittal R and Sharma P (2020). SWOT Analysis of Online Teaching During Lock Down: Blended Teaching the Way Forward. <i>IJEE</i> 56 : 19-25.	5.32
745	Mittal R, Sidhu K and KaurJ (2020). Enrollment, retention and progression of Home Science post graduates in Northern India. <i>J Community Mobilization Sustain Dev</i> 15 : 32-38.	5.30
746	Mohan A and Sharma A (2020). Transmission studies on viruses associated with yellow mosaic disease of bitter melon. <i>Indian Phytopathol</i> 73 : 329-37.	5.90
747	Mohan A, Sharma A and Pathak M (2020). Germplasm screening and molecular characterization of begomovirus associated with bitter melon yellow mosaic disease in Punjab. <i>J Entomol Zool Stud</i> 8 : 331-35.	5.53
748	Mouzam S M (2020). Trade competitiveness and market access issues in India's coconut and cashew nut trade. <i>Indian J Agric Econ</i> 75 : 587-99.	5.30

749	Mukherjee S, Mavi MS and Singh J (2020). Differential response of biochar derived from rice-residue waste on phosphorus availability in soils with dissimilar pH. <i>Int J Environ Sci Technol</i> 17 :3065–3074.	9.52
750	MundiW, GosalSK and Kaur J (2020). Effect of pesticides on growth kinetics and plant growth promoting activities of biofertilizer. <i>Pharma Innov J</i> 9 :442-46.	5.03
751	MundiW, GosalSK, Walia SS, Kaur J and Kaur J (2020). Effect of biofertilizers along with pesticides on soil biological, chemical properties and yield of wheat crop. <i>Chemical Sci Rev Lett</i> 9 : 714-21.	5.21
752	Nag S, Bhullar MB and Kaur P (2020). Efficacy of biorationals against two-spotted spider mite, <i>Tetranychus urticae</i> Koch, (Acari: Tetranychidae) infesting green pepper cultivated under protected conditions. <i>Int J Acarology</i> 46 (1):1-7.	7.21
753	Nagar B L, Yadav D L and Singh J (2020). Response of different cultivars of potato to various soil moisture regimes under South Eastern Rajasthan. <i>Indian J Hort</i> 77 (1): 218-21.	6.11
754	Nagpal S, Sharma P, Sirari A and Gupta R K (2020). Coordination of Mesorhizobium sp. and endophytic bacteria as elicitor of biocontrol against Fusarium wilt in chickpea. <i>Eur J Plant Pathol</i> 158 :4143-161.	8.22
755	Nair I J, Sharma S and Kaur R (2020). Efficacy of the green lace wing, <i>Chrysoperla zastrowi sillemi</i> (Esben-Peterson) (Neuroptera: Chrysopidae), against sucking pests of tomato: an appraisal under protected conditions. <i>Egypt J Biol Pest Control</i> 30 : 1-6.	6.38
756	Narang D, Kaur S, Steuernagel B, Ghosh S, Bansal U, Li J and Chhuneja P (2020). Discovery and characterisation of a new leaf rust resistance gene introgressed in wheat from wild wheat <i>Aegilops peregrina</i> . <i>Sci Rep.</i> 10 (1):7573.	11.00
757	Narang M K, Chandel R, Dogra B and Manes G S (2020). Development of mat nursery raising and uprooting techniques for paddy (<i>Oryza sativa</i> L.) crop and their field evaluation with mechanical transplanter for South East Asia. <i>AMA-AGR Mech Asia AF</i> 51 : 79-90.	6.29
758	Nayal A and Sharma P (2020). An Analysis of Extent of Use of Online Utility Services in Punjab, India. <i>Curr J Appl Sci Technol</i> 39 : 109-17.	5.32
759	Neelam K, Mahajan R, Gupta V, Bhatia D, Gill B K, Komal R and Singh K (2020). High-resolution genetic mapping of a novel bacterial blight resistance gene xa-45 (t) identified from <i>Oryza glaberrima</i> and transferred to <i>Oryza sativa</i> . <i>Theor Appl Genet</i> 133 :689-705.	11.57
760	Neelam K, Yadav IS, Yadav B, Lore J, Hunjan M S, Rawat N and Singh K (2020). Effector diversification underwrites the rapid evolution of <i>Xanthomonas oryzae</i> pv. <i>oryzae</i> in the Indian Subcontinent. <i>Phytopathology</i> 110 (7): 37.	10.01
761	Neha, Bhople BS and Sharma S (2020). Seasonal variation of rhizospheric soil properties under different land use systems at lower Shivalik foothills of Punjab, India. <i>Agrofor Syst</i> 94 :1959-1976.	8.42
762	Nikhanj P and Kocher GS (2020). Optimization of malolactic fermentation parameters with isolated and characterized lactic acid bacteria associated with grape berries. <i>J Food Process and Preserv</i> 44 (12):14905-912	8.61
763	Nima D, Aulakh CS, Sharma S and Kukal S S (2020). Assessing soil quality under long-term organic vis-a-vis chemical farming after twelve years in north-western India. <i>J Plant Nutr</i> 44 (8):1-18	8.28
764	Nisar S and Benbi D K (2020). Stabilization of organic C in an Indo-Gangetic alluvial soil under long-term manure and compost management in a rice–wheat system. <i>Carbon Manag</i> 11 (6):533-47	9.52



765	Oberoi H K, Pandove G and Kaur A (2020). Effect of pre-sowing seed inoculation with liquid biofertilizers on fodder yield and quality of sorghum (<i>Sorghum bicolor</i>). <i>Ind J Agron</i> 65 : 100-06.	5.46
766	Pal A, Singh D and Dhaliwal R K (2020). Identification and relevance of e-readiness assessment tools for ICT use in agriculture. <i>Curr J Appl Sci Technol</i> 39 : 93-102.	5.32
767	Pal D K, Dutt B, Dhiman R, Attri V(2020). Economic utility of different plant species occurring in mid Himalayan region of Himachal Pradesh. <i>Pharma Innov J</i> 9 : 176-84.	5.23
768	Pal D K, Dutt B, Dhiman R, Attri V(2020). Studies on important medicinal plants of mid Himalayan region of Himachal Pradesh. <i>Pharma Innov J</i> 9 : 158-75.	5.23
769	Pal R, Mahajan G, Sardana V, Asthir B and Chauhan B S (2020). Performance of dry-seeded rice genotypes under varied soil moisture regimes and foliar-applied hormones. <i>Plants</i> 9(4) :539.	10.66
770	Pal RK (2020). Impact of varying nitrogen levels on seed cotton yield using CRO PGRO-cotton model for South-Western region of Punjab. <i>J Agrometeor</i> 22 (special issue) 222-28.	6.64
771	Pal V, Singh G and Dhaliwal S S (2020). Symbiotic parameters, growth, productivity and profitability of chickpea as influenced by zinc sulphate and urea application. <i>J Soil Sci Plant Nutr</i> 20 :738-50.	9.61
772	Pandey K, RattanpalHS, Singh J (2020). Effect of ten rootstocks on flowering and pollen viability of Kinnow mandarin. <i>Int J Chem Stud</i> 8 :2180-82.	5.31
773	Pandey S, Thakur A and Singh H (2020). Evaluation of biochemical properties of peach and nectarine cultivars and Hybrids. <i>Indian J Agric Sci</i> 90(6) : 1076-1080.	6.23
774	Pandher LK, Gupta RK and Kukal SS (2020). Soil organic carbon, its fractions and soil organic carbon stocks under different land use systems in Typic Ustrochrepts of northwest India. <i>Trop Ecol</i> 61 :258-66.	7.33
775	Pandit M and Kaur N (2020). Development and organoleptic evaluation of bakery products and extruded snacks prepared from composite flour. <i>IJCMAS</i> 9 :1680-90.	5.38
776	Pandit M and Kaur N (2020). Physio-chemical characteristics and antinutritional factors of wheat, soybean, oats and pumpkin leaves. <i>Chem Sci Rev Lett</i> 9 : 260-67.	5.21
777	Panwar P, Sharma S and Kang T K (2020). An exploratory study on relationship of social-emotional learning with aggression among adolescents. <i>Int J Curr Microbiol App Sci</i> 9(1) : 1-11.	5.38
778	Panwar P, Sharma S and Kang T K (2020). Influence of social-emotional learning on pro-social behavior among adolescents. <i>Pharma Innov J</i> 9 :253-58.	5.23
779	Pathania M and Thakur A (2020). Effect of plant products on oviposition, adult emergence and weight loss of pulse beetle, <i>Callosobruchus chinensis</i> (linn.) in stored black gram grains. <i>J Entomol Zool Stud</i> 8 : 2070-73.	5.56
780	Pathania M, Pal RK, Kumar S, Singh S and Singh P (2020). Seasonal incidence of whitefly (<i>Bemisia tabaci</i> Gennadius) and jassid (<i>Amrasca bigutulla bigutulla</i> Ishida) on transgenic cotton in south-western Punjab. <i>Indian J Agromet</i> 22 : 545-50.	6.47
781	Pathania M, Verma A, Singh M, Arora PK and Kaur N (2020) Influence of abiotic factors on the infestation dynamics of whitefly, <i>Bemisia tabaci</i> (Gennadius 1889) in cotton and its management strategies in North-Western India. <i>Int J Trop Insect Sci</i> 40(4) : 969-981.	7.02
782	Peshin R, Hansra BS, Nanda R, Singh K, Sharma R, Garg L, Bajiya MR, Showkat A, Kumar R and Yangsdon S (2020). Pesticides hazardous hotspots: Empirical evidences from North India. <i>Environ Manage</i> 66(5) : 899-915.	9.64

783	Pinakin D J, Kumar V, Kumar S, Kaur S, Prasad R and Sharma B R (2020). Influence of pre-drying treatments on physico-chemical and phytochemical potential of dried mahua flowers. <i>Plant Foods Hum Nutr</i> 75 :576-82.	10.12
784	Pooja and Kocher GS (2020). Optimization of malolactic fermentation parameters with isolated and characterized lactic acid bacteria associated with grapes. <i>J Food Process and Preserv</i> 44 (12):e14905.	8.61
785	Prasad V, Yousuf A and Sharma N (2020). GIS based morphometric analysis of forest watershed using high resolution satellite data. <i>J Soil Water Conserv</i> 19 : 292-99.	5.20
786	Priyadarshini S and Brar J K (2020). Biofortification of chromium in fenugreek seeds. <i>J Trace Elem Med Biol</i> 61 :126521.	10.00
787	Prom-U-Thai C, Rashid A, Ram H, Zou C, Guilherme LRG, Corguinha APB and Cakmak I (2020). Simultaneous biofortification of rice with zinc, iodine, iron and selenium through foliar treatment of a micronutrient cocktail in five countries. <i>Front Plant Sci</i> 11 :589835.	12.63
788	R Sethi, N Kaur and Manpreet Singh (2020). Morphological and physiological characterization of seed heteromorphism in <i>Medicago denticulata</i> Willd. <i>Plant Physiol Rep</i> 25 : 107-19.	5.18
789	RaiS, TyagiA, KaliaA, Kumar BTN, GargP and Singh NK (2020). Characterization and genome sequencing of three <i>Aeromonas hydrophilaspecific</i> phages, CF8, PS1, and PS2. <i>ArchViro</i> 165 : 1675-1678.	8.69
790	Rajwinder K S, Preetinder S S and Neelam K (2020). Biochemical Responses Associated with Resistance to <i>Nilaparvata lugens</i> (Stål) in Wild Rice Accessions. <i>Rice Sci</i> 27 (6):449.	10.41
791	Ram H (2020). Mulching, farmyard manure and exogenous application of osmo-protectants confer terminal heat tolerance in wheat (<i>Triticum aestivum</i>). <i>Indian J Agron</i> 65 : 271-77.	5.55
792	Ramya S, Pandove G, Kalia A, Brar S K, Oberoi H and Yadav B K (2021). Appraisal of seed priming with liquid microbial inoculants on growth and yield attributes of forage cowpea. <i>Legume Res</i> 44 : 1109-17.	6.34
793	Randhawa H S and Pandey V K (2020). Efficacy of selected insecticides against leafhopper [<i>Amrasca biguttula biguttula</i> (Ishida)] of okra [<i>Abelmoschus esculentus</i> (L) Moench]. <i>Int J Curr Microbiol Appl Sci</i> 9 : 281-86.	5.30
794	Randhawa H S, Kaur P and Damanpreet (2020). Bioefficacy of Oberon 22.9 % (spiromesifen) against red spider mite, <i>Tetranychus urticae</i> Koch in okra and effect on its natural enemies. <i>J Entomol Zool Stud</i> 8 : 1740-43.	5.50
795	Randhawa H S, M Singh and Damanpreet (2020). Screening of wheat varieties to rust red flour beetle <i>Tribolium castaneum</i> (Herbst). <i>Indian J Entomol</i> 82 : 688-90.	5.80
796	Randhawa H S, R S Chandi and Damanpreet (2020). Bioefficacy of chlorantraniliprole and spinosad against fruit borer, <i>Helicoverpa armigera</i> (Hübner) on Chilli Crop. <i>Pestic Res J</i> 32 (2): 291-95.	5.90
797	Reena, Kaur A, Singh M, Sinha BK, Kumar A and Ahmad S (2020). Impact of abiotic factors on population dynamics of <i>Bactrocera dorsalis</i> Hendel and <i>Bactrocera zonata</i> (Saunders) at different ecological zones in NW Plains of India. <i>J Agrometeor</i> 22 (3): 250-57.	6.64
798	Roop K, Sharma P, Kaur G and Srivastava P (2020). Generation and Characterization of Doubled Haploid Plants in Maize. <i>Agric Res J</i> 57 : 148-53.	5.17
799	RuchikaZ, Kaur P, Kaur A and Kaur G (2020). Comparative analysis of optimized physiochemical parameters of dried potato flakes obtained by refractive and convective drying techniques. <i>J Food Process Preserve</i> 45 : e15077.	8.61
800	Sabhikhi H S, Hunjan M S and Tak P S (2020). Biochemical characterization of streptomyces isolates associated with scab of potato in punjab. <i>Agric Res</i> 57 : 877-86.	6.00



801	Sagare D B, Abbai R, Jain A, Jayadevappa P K, Dixit S, Singh A K and Kumar A (2020). More and more of less and less: Is genomics-based breeding of dry direct-seeded rice (DDSR) varieties the need of hour?. <i>Plant Biotechnol J</i> 18(11) :2173-86.	19.26
802	Sahar M F and Dharminder Singh (2020). Access and Use of Information and Communication Technologies by the Farmers: A Case Study of Punjab. <i>J Community Mobilization Sustain Dev</i> 15 : 247-53.	5.30
803	Sahni P and Sharma S (2020). Influence of processing treatments on cooking quality, functional properties, antinutrients, bioactive potential and mineral profile of alfalfa. <i>Lwt</i> 132 :109890.	12.06
804	Sahni P, Sharma S and Singh B (2021). Impact of different processing treatments on techno and biofunctional characteristics of dhaincha (<i>Sesbania aculeate</i>). <i>Food Sci Technol Int</i> 27(3) :251-63.	8.64
805	Sahni P, Sharma S and Surasani V K R (2020). Influence of processing and pH on amino acid profile, morphology, electrophoretic pattern, bioactive potential and functional characteristics of alfalfa protein isolates. <i>Food Chem</i> 333 :127503.	15.23
806	Sahoo J, Dinesh, BhatM A, Anil A S and Raza M B (2020). Nutrient distribution and relationship with soil properties in different watersheds of Haryana. <i>Indian J Agric Sci</i> 90 :172-77.	6.37
807	Saini A K, Singh H, Jawandha S K and Gill K S (2020). Influence of Prunus rootstocks and spacing on performance of Japanese plum grown under sub-tropical conditions. <i>Sci Hortic</i> 268 :109380.	10.34
808	Saini K S, Brar N S, Walia S S and Sachdev P A (2020). Effect of planting techniques plant densities on different depths of sowing on production, economics, water and sugar productivity of sugarbeet. <i>J Crop Weed</i> 16 : 190-96.	5.46
809	Saini K, Kaur J, Singh T, Chahal T S and Manhas S S (2020). Productivity, economics and energetics of potato (<i>Solanumtuberosum</i>)-based systems as an alternative to rice (<i>Oryza sativa</i>)-wheat (<i>Triticumaestivum</i>) in Doaba region of Punjab. <i>Indian J Agron</i> 65 : 125-29.	5.55
810	Salotra R and Utreja D (2020). A comprehensive appraisal of chalcones and their heterocyclic analogs as antimicrobial agents. <i>Curr Org Chem</i> 24(23) : 2755-2781.	8.22
811	Salotra R, Utreja D and Sharma P (2020). A convenient one pot approach for the synthesis of chalcones and its derivatives and their evaluation as antimicrobial agents. <i>Russ J Org Chem</i> 56(12) : 2207-2211.	7.72
812	Samim A W, Kumar P and Kaur P (2020). Information seeking behaviour of post graduate students of Punjab Agricultural University, Ludhiana. <i>J Community Mobilization Sustain Dev</i> 15 : 413-19.	5.30
813	Sandhu A S, Dhaliwal S S, Shukla A K, Sharma V and Singh R (2020). Fodder quality improvement and enrichment of oats with Cu through biofortification: A technique to reduce animal malnutrition. <i>J Plant Nutr</i> 43(10) :1378-89.	8.28
814	Sandhu O S, Gupta R K, Thind H S, Jat M L, Singh Y and Sidhu H S (2020). Evaluation of N fertilization management strategies for increasing crop yields and nitrogen use efficiency in furrow-irrigated maize-wheat system under permanent raised bed planting. <i>Arch Agron Soil Sci</i> 66(9) :1302-17.	9.09
815	Sandhu PS, WaliaSS, GillRS and DheriGS (2020). Thirty-one years study of integrated nutrient management on physico-chemical properties of soil under rice-wheat cropping system. <i>Commun Soil Sci Plant Anal</i> 51(12) :1641-57.	7.58
816	Sandhu RK, Sarao PS and Kumari N (2020). Biochemical responses associated with resistance to Nilaparvatalugens (Stal) in wild rice accessions. <i>Rice Sci</i> 27 (6) :449-453.	10.41
817	Sandhu RK, Sarao PS and Sharma N (2020). Antibiosis in wild rice accessions induced by Nilaparvatalugens (Stal) feeding. <i>Phytoparasitica</i> 48 : 801-12.	7.81

818	Sandhu SK, Singh P, Kaur J, Singh M and Kaur K (2020). Selection indices for enhanced selection efficiency in Indian mustard under terminal heat stress conditions. <i>Indian J Genet Plant Breed</i> 80 : 103-06.	6.47
819	Sandhu S S, Kaur P, Gill K K and Vashisth B B (2020). The effect of recent climate shifts on optimal sowing windows for wheat in Punjab, India. <i>J Water Clim Chang</i> 11 (4):1177-90.	8.80
820	Sandhu S S, Kaur Pand K K Gill (2020). Change in timing of occurrence of temperature extremes in central Punjab. <i>J Agrometeor</i> 22 (Spl. Issue): 155-62.	6.64
821	Sangwan A K, Batth M K, Arora P K and Raheja S (2020). Fruit drop pattern and phenological behaviour under arid irrigated zone of Punjab in Kinnow mandarin. <i>J Agrometeor</i> 22 : 90-97	6.64
822	Sekhona A, Dhillon N K, Kaur S, Jindal S K and Buttar H S (2020). Phenotypic and Genotypic characterization of tomato genotypes for resistance to root-knot nematode, <i>Meloidogyne incognita</i> . <i>Phytoprotection</i> 100 :28-33.	6.29
823	Sekhona K S, Kaur A, Thaman S, Sidhu A S, Garg N, Choudhary O P and Chawla N (2020). Irrigation water quality and mulching effects on tuber yield and soil properties in potato (<i>Solanum tuberosum</i> L.) under semi-arid conditions of Indian Punjab. <i>Field Crops Res</i> 247 :107544.	12.15
824	Sethi G P S, Gandotra V K, Honparkhe M, Singh A K, Arora A K and Ghuman S P S (2020). Efficacy of antiprogestosterone and PGF2 α therapy for treating canine pyometra. <i>Int J Curr Microbiol App Sci</i> 9 : 2117-23.	5.38
825	Sethi G, Gandotra V K, Honparkhe M, Singh A and Ghuman S (2020). Association of age, breed, estrus and mating history in occurrence of pyometra. <i>J Entomol Zool Stud</i> 8 : 852-55.	5.53
826	Sethi V P and Dhiman M (2020). Design, space optimization and modelling of solar-cum-bio-mass hybrid greenhouse crop dryer using flue gas heat transfer pipe network. <i>Sol Energy</i> 206 :120-35.	13.19
827	Setia M, Bala M and Singh S (2020). Induction of novel inflorescence traits in Chrysanthemum through Co60 gamma irradiation. <i>Int J Radiat Biol</i> 96 (10):1309-1316.	9.35
828	Setia R, Dhaliwal S S, Kumar V, Singh R, Kukal S S and Pateriya B (2020). Impact assessment of metal contamination in surface water of Sutlej River (India) on human health risks. <i>Environ Pollut</i> 265 :114907.	15.99
829	Setia R, Dhaliwal S S, Singh R, Kumar V, Taneja S, Kukal S S and Pateriya B (2021). Phytoavailability and human risk assessment of heavy metals in soils and food crops around Sutlej river, India. <i>Chemosphere</i> , 263 :128321.	14.94
830	Shaik T, Garcha S and Bhullar M S (2020). Edaphic behaviour relation to transition of tillage in wheat rhizosphere- A short conclusive. <i>Intl J Curr Microbiol Appl Sci</i> 9 : 360-70.	5.38
831	Shambhavi S, Bihari B, Kumar R, Verma G, Sharma S P, Sharma S K and Sharma R P (2020). Fractions of copper in soil and their contribution to copper availability and uptake in maize-wheat cropping system under Typic hapludalfs. <i>Cereal Res Commun</i> 48 : 555-63.	7.24
832	Shambhavi S, Kumar R, Padbhushan R, Verma G, Sharma SP, Sharma SK and Sharma RP (2020). Dynamics of zinc under long-term application of chemical fertilizers and amendments by maize-wheat cropping sequence in Typic Hapludalfs. <i>Soil Use Manag</i> 36 (3):507-23.	9.67
833	Shankar A, Gupta R K and Singh B (2020). Site-specific fertilizer nitrogen management in Bt cotton using chlorophyll meter. <i>Exp Agric</i> 56 : 397-06.	8.23
834	Sharma A and Singh R (2020). Correlation of soil temperature and moisture with burrow dimensions of Indian gerbil (<i>Tatera indica</i>) in loamy-sand soil of Punjab. <i>J Agrometeorol</i> 22 (1): 71-75.	6.64
835	Sharma I, Dhaliwal I, Bijalwan P, Yadav V K and Kaushik P (2020). A brief perspective on lost traditional grains and food habits of Indians. <i>J Expl Biol Agric Sci</i> 9 : 2295-305.	5.07



836	Sharma K K and Kumar V (2020). Varietal performance of taramira (<i>Erucasativa</i> Mill.) against alternaria blight in sub-mountainous Punjab. <i>Agric Res J</i> : 430-32.	5.44
837	Sharma K, Dhaliwal N S, Singh G and Bishnoi C (2020). Assessment of socio-digital approaches for agricultural extension in Sri Muktsar Sahib District of Punjab. <i>Indian J Ext Edu</i> 56 (3): 60-63.	5.95
838	Sharma N, Kaur P, Jain D and Bhullar M S (2020). In-vitro evaluation of rice straw biochars' effect on bispyribac-sodium dissipation and microbial activity in soil. <i>Ecotoxicol Environ Saf</i> 191 :110204.	13.13
839	Sharma N, Sharma S, Singh B and Kaur G (2020). Stability evaluation of iron & vitamin A during processing & storage of fortified pasta. <i>Qual Assur Saf Crop Foods</i> 12 : 50-60.	7.67
840	Sharma N, Shukla Y R, Singh K and Mehta D K (2020). Soil fertility, nutrient uptake and yield of bell pepper as influenced by conjoint application of organic and inorganic fertilizers. <i>Commun Soil Sci Plant Anal</i> 51 (12): 1626-40.	7.58
841	Sharma P and Nayal A (2020). An empirical study on intention to use online utility services. <i>J Community Mobilization Sustain Dev</i> 15 : 169-74.	5.30
842	Sharma P, Riar T S and Garg L(2020). Buying behaviour and farmers' practices regarding agro-chemicals use on rice crops in Punjab. <i>IJEE</i> 56 : 87-91.	5.32
843	Sharma P, Riar T S and Garg L (2020). Buying behaviour of farmers regarding agrochemicals use on cotton crop in Punjab. <i>J Community Mobilization Sustain Dev</i> 15 : 467-70.	5.30
844	Sharma P, S. R. Sharma, R. K. Dhall and T. C. Mittal (2020). Effect of γ -radiation on post-harvest storage life and quality of onion bulb under ambient condition. <i>J Food Sci Technol</i> 57 (7): 2534–2544	7.85
845	Sharma P, Sharma S and Mittal T C (2020). Effects and Application of Ionizing Radiation on Fruits and Vegetables: A Review. <i>J Agric Engg</i> 57 : 97-126.	5.59
846	Sharma P, Sharma SR, Dhall R K, Mittal T C and Bhatia S (2020). Physio-chemical behavior of γ -irradiated garlic bulbs under ambient storage conditions. <i>J Stored Prod Res</i> 87 :101629	8.83
847	Sharma P, Singh I, Sirari A, Singh S and Khosla G (2020). Genetic divergence studies through microsatellite markers in pigeonpea [<i>Cajanus cajan</i> (L) Millsp.]. <i>Leg Res</i> 43 (3): 312-19.	6.12
848	Sharma R K, Bhullar M B and Kaur P (2020). Current Status of acaricide resistance in two spotted spider mite, <i>Tetranychus urticae</i> Koch and its underlying mechanism: A review. <i>Pestic Res J</i> 32 : 201-20.	5.49
849	Sharma S and Chopra S (2020). Influence of Sulphur Application on the Yield of Gobhi Sarson (<i>Brassica napus</i> L.). <i>Int J Curr Microbiol App Sci</i> 9 (1): 858-63.	5.38
850	Sharma S and Dhaliwal SS (2020). Rice residue incorporation and nitrogen application: effects on yield and micronutrient transformations under rice–wheat cropping system. <i>J Plant Nutr</i> 48 :1-15.	8.28
851	Sharma S and Dharni K (2020). Measurement and reporting of intangible assets: Orientation of Indian practitioners. <i>Decision</i> 47 :125-35.	7.50
852	Sharma S and Sahni P (2021). Germination behaviour, techno-functional characteristics, antinutrients, antioxidant activity and mineral profile of lucerne as influenced by germination regimes. <i>J Food Meas Charact</i> 15 :1796-1809.	9.01
853	Sharma S and Singh J (2020). Evaluation of split application of potassium for improving yield and potassium uptake in wheat. <i>Int J Chem Stud</i> 8 : 459-64.	5.31
854	Sharma S, Sharma A, Kaur S and Kang S S (2020). Occurrence and incidence of Pepper mottle virus infecting chilli in Punjab, India. <i>Indian Phytopathol</i> 73 : 573-76.	5.9

855	Sharma S, Shera P S, Kaur R and Sangha K S (2020). Evaluation of augmentative biological control strategy against major borer insect pests of sugarcane – a large scale field appraisal. <i>Egypt J Biol Pest Control</i> 30 : 1-10.	6.38
856	Sharma S, Shera PS and Sangha K S (2020). Species composition of parasitoids and predators in two rice agro-farming systems-effect of ecological intensification. <i>Int J Trop Insect Sci</i> 40 : 233-238.	7.02
857	Sharma S, Singh P and Sodhi G P S (2020). Soil organic carbon and biological indicators of un-cultivated vis-à-vis intensively cultivated soils under rice–wheat and cotton–wheat cropping systems in South-Western Punjab. <i>Carbon Manag</i> 11 (6):691-95.	9.52
858	Sharma SP, Leskovar DI, Crosby KM and Ibrahim AMH (2020). GGE biplot analysis of genotype-by-environment interactions for melon fruit yield and quality traits. <i>Hortic Science</i> 55 :533-42.	7.19
859	Sharma V, Singh M J and Khokhar A K (2020). Productivity, nutrient uptake and soil properties as influenced by integrated nutrient management in maize-wheat cropping system under rainfed conditions of sub-montane Punjab. <i>Agric Res J</i> 57 (6).	5.44
860	Sharma Y and Singh H (2020). Training system and in row spacing effect on growth and yield of peach in the sub-tropics of India. <i>Env Ecol</i> 38 :178-82.	5.25
861	Sharma Y, Sheikhl, Sharma Y, Kumar K, ChhunejaP, Ram S, Kumar S, Vyas P and Dhaliwal HS (2020). Transfer of grain softness from 5u-5a wheat-Aegilops triuncialis substitution line to bread wheat through induced homeologous pairing. <i>J Plant Biochem Biotechnol</i> 29 : 407-417.	7.53
862	Sharma P, Bawa P, Yadav B, Kaur P, Jindal S, Yadav I, Kaur S, Singh K and Chhuneja P (2020). Physical mapping of an adult plant stripe rust resistance gene from Triticum monococcum. <i>J Plant Biochem Biotechnol</i> 29 :47-55.	7.53
863	Shilpa, Mahajan B V C, Singh NP, Sharma S and Kaur S (2020). Alleviation of enzymatic browning and maintenance of postharvest quality of litchi fruit with packaging films under cold storage conditions. <i>Indian J Agri Sci</i> 90 :142-45.	6.25
864	Sidhu A, Singla N, Lonare M and Mahal A K (2020). Effect of quinestrol on body weight, vital organs, biochemicals and genotoxicity in adult male lesser bandicoot rat, <i>Bandicota bengalensis</i> . <i>Pesticide Biochem Physiol</i> 165 :104544.	10.97
865	Sidhu H S, Singh S K and Pandey H S (2020). Performance evaluation of automatic vis-à-vis manual topographic survey for precision land levelling. <i>Precis Agric</i> 21 :300-10.	11.77
866	Sidhu N S, Pruthi G, Singh S, Bishnoi R and Singla D (2020). Genome-wide identification and analysis of GRAS transcription factors in the bottle gourd genome. <i>Sci. Rep.</i> 10 (1):14338.	11.00
867	Sidhu R K and Kaur J (2020). Kitchen gardening in south-western Punjab. <i>Indian J Ext Educ</i> 56 (4): 237-40.	5.90
868	Sidhu R K and Sharma M (2020). Preferences of pregnant ladies for maternity clothes in rural areas of Punjab. <i>IJEE</i> 55 : 232-34.	5.32
869	Sidhu R K and Sharma M (2020). Critical analysis of vegetable consumption pattern in Rural and Urban Community of Punjab. <i>J Community Mobilization Sustain Dev</i> 15 : 387-90.	5.67
870	Singh A and Kocher GS (2020). Standardization of seed and peel infused <i>Syzygium cumini</i> wine fermentation using response surface methodology. <i>LWT-Food Sci Technol</i> 134 (2):109994.	12.06
871	Singh A and Singh K G (2020). Growth and yield of soybean [<i>Glycine max</i> (L.) Merrill] as influenced by drip irrigation, fertigation and plastic mulching. <i>Indian J Agron</i> 66 :56-60.	5.55



872	Singh A, Deb S K, Singh S, Sharma P and Kang JS (2020). Effects of non-leguminous cover crops on yield and quality of baby corn (<i>Zea mays</i> L.) Grown under Subtropical conditions. <i>Horticulturae</i> 6 : 21.	8.92
873	Singh A, Dhillon G P S and Singh P (2020). Survival and growth performance of Eucalyptus clones irrigated with effluents from liquor factory. <i>Intl J Chemical Stud</i> 8 : 2321-24.	5.21
874	Singh A, Gupta A, Reddy V K S and Sharma S (2020). Influence of supplementation with pangs protein isolates on textural attributes and sensory acceptability of semolina pasta. <i>J Food Meas Charact</i> 15 : 1317-26.	9.01
875	Singh A, Sharma S, Singh B and Gupta A (2020). Impact of grain germination on in vitro antioxidative properties, nutrient digestibility and functional attributes of brown rice flour. <i>Acta Aliment</i> 50 : 259-68.	7.00
876	Singh A, Singh G, Kalia A, Rattanpal HS and Gupta M (2020). Leaf morpho-anatomical diversity analysis in mandarin (<i>Citrus reticulata</i> Blanco) genotypes using scanning electron microscopy. <i>Genet Resour Crop Evol</i> 67 :173-94.	7.88
877	Singh B (2020). Evaluation of Strawberry cultivars under sub-mountain zones of Punjab. <i>Indian J Ecol</i> 47 : 716-19.	5.79
878	Singh B and Ram H (2020). Agroclimatic indices and yield of barley (<i>Hordium vulgare</i>) under different cutting management and sowing dates. <i>Indian J Agron</i> 65 : 209-13.	5.55
879	Singh B, Kapoor S, Sharma S and Sodhi H S (2020). Screening of <i>Agaricus bisporus</i> strains and casing variables for improving the yield potential of mushrooms. <i>Indian J Hort</i> 77(2) : 301-06.	6.00
880	Singh B, Kaur B and Singh D (2020). Assessment of different multipurpose tree species for phytoextraction of lead from lead-contaminated soils. <i>Bioremediat J</i> 24 (4):215-230.	8.14
881	Singh B, Ram H, Kaur R (2020). Impact of insecticide and tillage methods in wheat on the populations of aphid and their coccinellid predators in rice-wheat cropping system of India. <i>Agric Res J</i> 57 : 707-13.	5.44
882	Singh D and Kaur P (2020). An analytic study of prospects of zero till technology in Punjab. <i>Agric Res J</i> 57(5) : 959-64.	5.44
883	Singh D and Kaur P (2020). Post-adoption behaviour of farmers towards Resource Conservation Technologies in Punjab. <i>Ind J Soil Conserv</i> 48 : 286-91.	5.28
884	Singh D, Kaur P and Kumar P (2020). A scale to measure attitude of farmers towards happy seeder technology. <i>Multilogic in Sci</i> 9 : 299-301.	5.20
885	Singh D, Kaur P and Singh D (2020). Comparative analysis of socio-psychological characters of farmers adopting various resourceconservation technologies. <i>Indian Res J Ext Edu</i> 20 : 61-66	5.22
886	Singh D, Leskovar D I, Sharma S P, Sarao N K and Vashisht V K (2020). Genetic diversity and interrelationship among Indian and exotic melons based on fruit morphology, quality components and microsatellite markers. <i>Physiol Mol Biol Plants</i> 26 : 985-1002.	7.54
887	Singh G (2020). Flowering and fruiting behaviour of bottle gourd as influenced by off-season cultivation under poly film in low tunnel. <i>Intl J Chem Stud</i> 8 : 2813-16.	5.31
888	Singh G and Grover J (2020). Influence of nodal pruning on vegetative and reproductive attributes of Sardar guava. <i>Intl J Chem Stud</i> 8 : 921-24.	5.31
889	Singh G and Grover J (2020). Management of purpal blotch complex in onion seed crop in faridkot district of south western Punjab. <i>Intl J Curr Microbiol Appl Sci</i> 9(2) : 2400-05.	5.38

890	Singh G and Jain S (2020). Field and In Vitro effectiveness of fungicides against gummy stem disease, sudden death and leaf blight, the emerging syndromes of bottle gourd. <i>Pestic Res J</i> 32 (2): 316-25.	5.90
891	Singh G and Kaur BH(2020). Influence of naphthalene acetic acid on fruit setting, fruit retention and fruit quality in sapota cv. Kalipatti under sub-tropical conditions. <i>Indian J Exp Biol</i> 58 : 661-66	6.94
892	Singh G, Dhillon GPS, Dhakad AK and Kaur N (2020). Variability among seed sources of shisham (<i>Dalbergia sissoo</i> Roxb.) for morphometric and biochemical traits. <i>Ind J Agroforestry</i> 22 : 37-43.	5.19
893	Singh G, Ram H, Gupta N and Dhaliwal SS (2020). Control of mixed weed flora with different herbicides in barley. <i>Indian J Weed Sci</i> 52 : 138-42.	5.84
894	Singh G, Rattanpal H S, Gupta M and Sidhu GS (2020). Standardization of stage wise water requirement in drip irrigated Kinnow mandarin orchards under sub-tropical conditions. <i>J Agro-meteor</i> 22 (3) :305-12.	6.64
895	Singh G, Singh I, Taggar G K, Rani U, Sharma P, Gupta M and Singh S (2020). Introgression of productivity enhancing traits, resistance to pod borer and Phytophthora stem blight from <i>Cajanus scarabaeoides</i> to cultivated pigeonpea. <i>Physiol Mol Biol Plants</i> 26 : 1399-1410.	9.02
896	Singh G, Singh P and Sodhi GPS (2020). Assessment and analysis of agricultural technology adoption in cotton (<i>Gossypium hirsutum</i> L.) cultivation in South-Western Punjab. <i>Agric Res J</i> 58 (2): 324-33.	5.44
897	Singh G, Singh P, Sodhi GPS and Tiwari D (2020). Adoption status of rice residue management technologies in south-western Punjab. <i>IJEE</i> 56 : 76-82.	5.32
898	Singh G, Singh R and Taggar G K (2020). Feeding preference of <i>Mylabris pustulata</i> (Thunberg) towards different grain legumes under laboratory conditions. <i>Agric Res J</i> 57 (3): 369-73	5.44
899	Singh G, Virk H K and Khanna V (2020). Effect of land configuration and weed management on productivity of greengram (<i>Vigna radiata</i>). <i>Indian J Agric Sci</i> 90 : 947-51.	6.37
900	Singh G, Virk H K, Kaur R, Kaur C, Khokhar A, Kaur J and Singh J (2020) Effect of planting systems and varieties on the growth, productivity and economics of rajmash. <i>Agric Res J</i> 57 (5): 685-90.	5.44
901	Singh G, Virk H R, Kaur C, Hundal R K, Khokhar A, Kaur J and Singh J (2020) Effect of sowing dates on production potential of rajmash under Punjab conditions. <i>Agric Res J</i> 57 (2): 178-183.	5.44
902	Singh G, Virk HK, Aggarwal N and Gupta RK (2020). Growth, symbiotic traits, productivity and nutrient uptake as influenced by dose and time of nitrogen application and Rhizobium inoculation in mungbean [<i>Vigna radiata</i> (L.) Wilczek]. <i>J Plant Nutr</i> 44 (13) : 1-12.	8.28
903	Singh G, Virk H K, Kaur C, Hundal R K, Khokhar A, Kaur J and Singh J (2020). Effect of sowing dates on production potential of rajmash under Punjab conditions. <i>Agric Res J</i> 57 (2): 178-183.	5.44
904	Singh G, Virk H K, Kaur R, Kaur C, Khokhar A, Kaur J and Singh J (2020). Effect of planting systems and varieties on the growth, productivity and economics of rajmash. <i>Agric Res J</i> 57 (5): 685-690.	5.44
905	Singh H and Joshi N (2020). Management of the aphid, <i>Myzus persicae</i> (Sulzer) and the whitefly, <i>Bemisia tabaci</i> (Gennadius), using biorational on capsicum under protected cultivation in India. <i>Egypt J Biol Pest Control</i> 30 : 1-9.	6.38
906	Singh H, Arora A, Kaur S and Kaur K (2020). Evaluation of germplasm, fungicides and biocontrol agents against anthracnose (<i>Colletotrichum gloeosporioides</i>) in mango (<i>Mangifera indica</i>) nursery. <i>Indian J Agric Sci</i> 90 (6): 1125-29.	6.23



907	Singh H, Cheema HK and Singh R (2020). Field evaluation of horticultural mineral oils and botanicals against bean thrips, <i>Megalurothrips distalis</i> (Karny) (Thysanoptera: Thripidae), in summer mung bean. <i>Egypt J Biol Pest Control</i> 30 : 1-8.	6.38
908	Singh H, Chhuneja P K, Singh J, Choudhary A and Sandhu SK (2020). <i>Apis mellifera</i> Linnaeus contribution in augmenting seed yield of <i>Brassica carinata</i> A. Braun. <i>J Entomol Zool Stud</i> 8 : 1949-53.	5.53
909	Singh H, Kaur J, Bala R, Srivastava P and Bains N S(2020). Virulence and genetic diversity of <i>Puccinia striiformis</i> f.sp. <i>tritici</i> isolates in sub-mountainous area of Punjab, India. <i>Phytoparasitica</i> 48 :383–395.	7.81
910	Singh H, Siag M, Biwalkar N, Sharma P and Sharda R (2020). Impact of drip irrigation on soil biological activity, symbiotic traits and yield in summer mungbean. <i>Indian J Ecol</i> 47 :703-07.	5.79
911	Singh I, Gautam A, Dixit A K, Manes G S and Singh A (2020). Development and Evaluation of Inclined Plate Metering Mechanism for the Sowing of Maize (<i>Zea mays</i> L.) Seed, <i>Curr J Appl Sci Technol</i> 39 : 118-28.	5.32
912	Singh I, Singh S, Hans V S and Singh J (2020). Development of Inclined Plate Honey Moisture Reduction System. <i>J Food Sci Tech</i> 59(2) : 615-624.	9.12
913	Singh I, Singla M and Kaur R (2020). Physical properties of shelled maize cobs. <i>Env Cons J</i> 22 : 107-08.	5.66
914	Singh J and Biswas B (2020). Effect of nitrogen management on yield and water productivity of rajmash (<i>Phaseolus vulgaris</i>) in sub-humid climate of Indian Punjab. <i>J Agric Phys</i> 20 : 40-47.	5.10
915	Singh J and Garg L (2020). Socio-economic Reasons for Non- adoption of Crop Diversification. <i>J Community Mobilization Sustain Dev</i> 15 : 165-68.	5.30
916	Singh J and Sharma S (2020). Lentil Response to Varying Levels of Potassium under Potassium Deficient Soils. <i>Legum Res</i> 44 : 1348-52.	6.34
917	Singh J, Chahal T S and Gill P S (2020). Variation in nutrients during the fruit development of Daisy tangerine. <i>Indian J Hort</i> 77(4) : 633-39.	6.00
918	Singh J, Dhaliwal HS, Thakur A, Sidhu G S, Chhuneja P and Pandey K (2020). Ex vitro recovery of rough lemon (<i>Citrus jambhiri</i>) hybrids and identification with SSR markers. <i>Indian J Agric Sci</i> 90 : 823-27.	6.37
919	Singh J, Dhaliwal H S, Thakur A, Sidhu G S, Chhuneja P, Gmitter Jr and Frederick G (2020). optimizing recovery of hybrid embryos from interspecific citrus crosses of polyembryonic rough lemon (<i>Citrus jambhiri</i> Lush.). <i>Agronomy</i> 10 : 1940.	9.75
920	Singh J, Dhaliwal HS, Thakur A, Singh G, Arora A and Devi I (2020). In vitro leaf inoculation as an early screening test for citrus rootstock hybrids for Phytophthora root rot. <i>Fruits</i> 75(3) : 104-14.	6.81
921	Singh J, Sharma V K and Kaur A (2020). Evaluation of barley genotypes for resistance against covered smut disease. <i>Indian Phytopathol</i> 73 : 359-60.	5.90
922	Singh J, Singh V and Kaur S (2020). Precision nitrogen management improves grain yield, nitrogen use efficiency and reduces nitrous oxide emission from soil in spring maize. <i>J Plant Nutr</i> 43(15) : 1-11.	8.28
923	Singh K, Sharma S, Kaur R and Sodhi H S (2020). Evaluation of <i>Calocybe indica</i> strains for ligno-cellulolytic enzymes and mushroom yield potential. <i>Indian J Hort</i> 77(4) : 671-75.	6.00

924	Singh K, Verma G and ManchandaJS (2020). Soil and foliar zinc application for enhancing grain zinc content of aromatic rice genotypes grown in zinc deficient and sufficient soil. <i>J Soil Water Conserv</i> 19 :1-4.	5.20
925	Singh L, Kumar A, Kaur S and Gill R K (2020). Multivariate analysis of yield contributory traits for selection criteria in urdbean (<i>V. mungo</i> L. Hepper) <i>Elect J Plant Breed</i> 11 : 1134-142.	5.14
926	Singh L, Singh D and Sharma S P (2020). An appraisal of potato seed production practices adopted by the farmers of Punjab. <i>J Community Mobilization Sustain Dev</i> 15 : 607-15.	5.30
927	Singh M C, Singh A, Singh J P and Singh K G (2020). Economic viability of soilless cucumber cultivation under naturally ventilated greenhouse conditions. <i>Indian J Hort</i> 77(2) : 315.	6.11
928	Singh MP, Nikhanj P and Sodhi H S (2020). Physico-chemical and nutritional studies on vinegar dips for shelf life extension of <i>Agaricus bisporus</i> . <i>J Food Process and Preserv</i> 44(1) :1-11.	8.61
929	Singh P and Benbi DK (2020). Modeling soil organic carbon with DNDC and RothC models in different wheat-based cropping systems in north-western India. <i>Commun Soil Sci Plant Anal</i> 51 (9) :1184-203	7.58
930	Singh P and Benbi DK (2020). Nutrient management impacts on net ecosystem carbon budget and energy flow nexus in intensively cultivated cropland ecosystems of north-western India. <i>Paddy Water Environ</i> 18(4) : 697-715.	7.55
931	Singh P, Dhaliwal A P S, Vinay Singh and Dhillon G S (2020). Economic Impact of Lockdown on Livestock and Poultry Production in Punjab and Remedial Measures. <i>Int J Curr Microbiol App Sci</i> 9(12) : 230-34.	5.38
932	Singh P, Dhillon B S and Singh S (2020). Assessment of farmers knowledge and their perceive constraints to recommended chilli production practices in Punjab, India. <i>Int J Curr Microbiol App Sci</i> 9(08) : 1423-30.	5.38
933	Singh P, Dhillon G S and Dhaliwal A P S (2020). Supplementing Rural Families through Backyard Poultry System in Bathinda District of Punjab (India). <i>Int J Curr Microbiol App Sci</i> 9(03) : 10-16.	5.38
934	Singh P, Dhillon G. S. and Dhaliwal. A. P. S. (2020). Impact of Skill Development Training Programmes on Scientific Backyard Poultry Farming in Bathinda District of Punjab (India). <i>Int J Curr Microbiol App Sci</i> 9(06) : 604-611.	5.38
935	Singh P, G S Dhillon and Dhaliwal A P S (2020). Supplementing Rural Families through Backyard Poultry System in Bathinda District of Punjab (India). <i>Int J Curr Microbiol App Sci</i> 9(03) : 10-16.	5.38
936	Singh P, Kaur P, Khehra S, Chahal S S and Bhatt R (2020). Interventions of farm advisory service centre in improving farm livelihoods of Tarn Taran district of Punjab. <i>Agric Res J</i> 57(4) : 627-32.	5.44
937	Singh P, Saini SP and Singh P (2020). Zinc sorption characteristics and release kinetics from soils with long-term zinc and phosphate application. <i>Indian J Agric Sci</i> 90 : 2156-60.	6.25
938	Singh P, Singh G and Sodhi G P S (2020). Energy and carbon footprints of wheat establishment following different rice residue management strategies vis-à-vis conventional tillage coupled with rice residue burning in north-western India. <i>Energy</i> 200 :117554.	14.86
939	Singh P, Singh G and Sodhi GPS (2020). Productivity, profitability and sustainability of rice-(capsicum+peas) and rice-wheat cropping systems in sub-tropical south-western Punjab. <i>IJEE</i> 56 : 88-95.	5.32
940	Singh P, Singh G and Sodhi GPS (2020). On-farm participatory assessment of short and medium duration rice genotypes in south-western Punjab. <i>Indian J Ext Edu</i> 56(3) : 88-94.	5.95



941	Singh P, Singh S, Dhaliwala P S, Brar J K and Singh V (2020). Impact of skill development trainings for boosting up the new entrepreneurs in Punjab India. <i>J Pharmacogn Phytochem</i> 9 : 443-47.	5.21
942	Singh P, Tiwari D, and Singh G (2020). Yields gaps and economic efficiency of mustard cultivation in south-western Punjab <i>J Community Mobilization Sustain Dev</i> 15 : 441-47.	5.67
943	Singh R and Bala M (2020). Effect of different sources of light as night break on growth characteristics of Korean chrysanthemum (<i>Chrysanthemum morifolium</i> Ramat.) Genotypes. <i>Bangladesh J Bot</i> 49 : 967-74.	6.27
944	Singh R and Singh G (2020). Effect of pendimethalin and imazethapyr on the development of microorganisms in vitro and at field conditions. <i>Toxicol Environ Chem</i> 102(9) :439-454.	7.57
945	Singh R and Singh G (2020). Weed management in green gram: A review. <i>Indian J Weed Sci</i> 52 : 10-20.	5.84
946	Singh R, Singh P and Dhillon T S (2020). Physiological Maturity and Longevity of Pumpkin seeds in Relation to Fruit Age and Duration of in situ Storage. <i>Int J Curr Microbiol App Sci</i> 9(08) : 2633-41.	5.38
947	Singh S and Bhogal S (2020). Punjab's agricultural labourers in transition: A longitudinal study of three decades. <i>Econ Polit Wkly</i> 55 :21-28.	5.22
948	Singh S and Sharma D K (2020). Losses in stored wheat in Punjab. <i>Agric Res</i> 57 : 721-29.	6.00
949	Singh S and Sharma D K (2020). Screening of wheat varieties against lesser grain borer, <i>Rhyzopertha dominica</i> . <i>Indian J Entomol</i> 83 : 602-05.	5.89
950	Singh Sand Sharma S (2020). Temporal changes in rhizosphere biological soil quality indicators of wheat in response to nitrogen and straw incorporation. <i>Trop Ecol</i> 61 : 328-44.	7.33
951	Singh S, Gill P P S, Sangwan A K, Singh N P and Kaur A (2020). Induction of branching in nursery pear plants through benzyladenine and heading back. <i>Indian J Hort</i> 77 (1): 192-95.	6.11
952	Singh S, Gill R K, Kumar A, Singh I and Singh G (2020). Notification of crop varieties and registration of germplasm: Lentil variety LL 1373. <i>Indian Journal of Genetics and Plant Breeding</i> 80 : 118-23.	6.47
953	Singh S, Kataria S K, Pathania M and Singh P (2020). Impact of weather conditions on seasonal abundance of thrips, <i>Thrips tabaci</i> in Bt cotton. <i>Indian J Entomol</i> 83 : 589-91.	5.89
954	Singh S, Kaur P and Bhullar M B (2020). Predatory potential of the phytoseiid <i>Neoseiulus longispinosus</i> (Evans) on <i>Tetranychus urticae</i> Koch infesting brinjal. <i>Indian J Entomol</i> 82 : 467-75.	5.89
955	Singh S, Kuca K and Kalia A (2020). Alterations in growth and morphology of <i>Ganoderma lucidum</i> and <i>Volvariella volvacea</i> in response to nanoparticle supplementation. <i>Mycobiology</i> 48(5) : 383-391.	8.15
956	Singh S, Sekhon M K, Kumar S, Kaur A and Bhardwaj S (2020). Status and performance of display boards in Regulated agricultural markets in Punjab. <i>Agric Res J</i> 57(5) : 779-84.	5.44
957	Singh S, Singh N P, Sharda R and Sangwan A K (2020). Effect of drip irrigation, fertigation and mulching on fruit quality of strawberry (<i>Fragaria × ananassa</i>). <i>Indian J Agric Sci</i> 90 :541-45.	6.25
958	Singh T, Sandhu P S, Chahal G K and Jaidka M (2020). Foliar application of thiourea ameliorates drought stress by elevating antioxidant level in rainfed maize (<i>Zea mays</i> L.). <i>Agric Res J</i> 57(4) .	5.44
959	Singh V and Singh K. (2020). Identifying potential sugarcane families for cane yield and juice quality traits in early selection stages. <i>Agric Res</i> 58(3) : 390-98.	5.40

960	Singh V P, Singh G and Dhaliwal S S (2020). Symbiotic parameters, growth, productivity and profitability of chickpea as influenced by zinc sulphate and urea application. <i>J Soil Sci Plant Nutr</i> 20 :738–750	9.61
961	Singh V, Jawandha S K and Gill P P S (2021). Effect of exogenous putrescine treatment on internal browning and colour retention of pear fruit. <i>J Food Meas Charact</i> 15 : 905-13.	6.11
962	Singh V, Jawandha S K, Gill P P S and Singh D (2020). Preharvest putrescine application extends the shelf life and maintains the pear fruit quality. <i>Int J Fruit Sci</i> 22 : 514-24.	7.53
963	Singh V, Jawandha S K and Gill P P S (2020). Storage behaviour of pear fruit in response to putrescine application at room temperature. <i>J Agrometeor</i> 20 : 273-77.	6.64
964	Singh V, Jawandha S K and Gill P P S (2020). Putrescine application reduces softening and maintains the quality of pear fruit during cold storage. <i>Acta Physiol Plant</i> 42 :28.	8.74
965	Singh V, Kaundal P and Sood A K (2020). An inventory of thrips of Himachal Pradesh. <i>Indian J Entomol</i> 82 : 793-801.	5.08
966	Singh V, Kaur J and Kumar V (2020). Evaluation of IPM modules against whitefly, <i>Bemisia tabaci</i> (Gennadius) in cotton. <i>Indian J Entomol</i> 82 : 617-20.	5.89
967	Singh V, Kaur S, Singh J, Kaur A and Gupta RK (2020). Rescheduling fertilizer nitrogen top-dressing timings for improving productivity and mitigating N ₂ O emissions in timely and latesown irrigated wheat (<i>Triticum aestivum</i> L.). <i>Arch Agron Soil Sci</i> 67(9) :647-59.	8.24
968	Singh V, Sharma K , Gosal S, Choudhary SK, SinghRR, Adholeya A and Singh B(2020). Optical Sensing and Arbuscular Mycorrhizal Fungi for Improving Fertilizer Nitrogen and Phosphorus Use Efficiencies in Maize. <i>J Soil Sci Plant Nutr</i> 20 :2087-98.	9.61
969	Singh V, Sharma S, Gosal S K, Choudhary R, Singh R, Adholeya A and Singh B(2020). Synergistic use of plant growth-promoting rhizobacteria, arbuscular mycorrhizal fungi, and spectral properties for improving nutrient use efficiencies in wheat (<i>Triticum aestivum</i> L.). <i>Commun Soil Sci Plant Anal</i> 51(1) : 14-27.	7.58
970	Singh V P, Kaur S, Singh J, Kaur A and Gupta R K (2020). Rescheduling fertilizer nitrogen top-dressing timings for improving productivity and mitigating N ₂ O emissions in timely and late sown irrigated wheat (<i>Triticumaestivum</i> L.), <i>Arch Agron Soil Sci</i> 67(5) : 647-659	8.24
971	Singh YJ, Grewal S K and Gill R K (2020). Role of glutathione in methylglyoxal detoxification pathway during yellow mosaic virus (YMV) infection in black gram (<i>Vigna mungo</i> (L.) Hepper). <i>Physiol Mol Plant Pathol</i> 111 :101513.	8.74
972	SinghV, Jawandha S K and Gill P P S (2020). Effect of exogenous putrescine treatment on internal browning and colour retention of pear fruit. <i>J Food Meas Charact</i> 15 : 905-913.	9.01
973	Singla A and Singh R (2020). Estimation of avoidable yield losses in chickpea caused by <i>Helicoverpa armigera</i> (Hübner) (Lepidoptera : Noctuidae). <i>Phytoparasitica</i> 48 :755-65.	7.81
974	Singla A, Sharma S, Mandal K and Kaur A (2020). Persistence and dissipation kinetics of chlorantraniliprole in okra and soil. <i>Pestic Res J</i> 32 : 172-78.	5.49
975	Singla M, Kumar A, Kaur P and Goraya R K (2020). Respiratory properties of fresh black carrot (<i>Dacus Carota</i> L.) based upon non-linear enzyme kinetics approach. <i>J Food Sci Technol</i> 57 :3903-12.	9.12
976	Singla M, Singh M and Dogra R (2020). Experimental investigation of imbert down-draft gasifier using rice straw briquettes. <i>Energy Source Part A: Recovery Util Environ Eff</i> 10.1080/15567036.2020.1771478	8.90
977	Singla P and Bhardwaj RD (2020). Enzyme promiscuity- A light on the “darker” side of enzyme specificity. <i>Biocatal Biotransformation</i> . 38 : 81-92.	8.33



978	Singla P, Bhardwaj R D, Kaur S and Kaur J (2020). Stripe rust induced defence mechanisms in the leaves of contrasting barley genotypes (<i>Hordeum vulgare</i> L.) at the seedling stage. <i>Protoplasma</i> 257 :169-81.	9.19
979	Singla P, Bhardwaj R D, Kaur S, Kaur J and Grewal S K (2020). Metabolic adjustments during compatible interaction between barley genotypes and stripe rust pathogen. <i>Plant Physiol Biochem</i> 147 :295-302.	11.44
980	Soni P G, Yadav R K, Kumar A, Kumar R, Gajender G, Yadav T, Sharma A and Kushwaha M (2020). Effect of water quality regimes, irrigation schedules, RSC levels and neutralizer on physiological and biochemical behaviour of fodder sorghum (<i>Sorghum bicolor</i>). <i>Indian J Agric Sci</i> 90 : 1702-07.	6.37
981	Spall S and Sethi V P (2020). Design, modeling and analysis of efficient multi-rack tray solar cabinet dryer coupled with north wall reflector. <i>Sol Energy</i> 211 :908-19.	13.19
982	Thakur A and Kocher DK (2020). Impact of antagonist crustaceans on population of <i>Aedes aegypti</i> larvae under laboratory conditions. <i>J Vector Borne Dis</i> 57 : 58-62.	7.47
983	Thakur H, Jindal S K, Sharma A and Dhaliwal M S (2020). Molecular mapping of dominant gene responsible for leaf curl virus resistance in chilli pepper (<i>Capsicum annuum</i> L). <i>Biotech</i> 10 (4) :182.	8.89
984	Thakur, M and Kumar R (2020). Combining ability and gene action studies for different yield contributing traits in Cucumber (<i>Cucumis sativus</i> L.). <i>Indian J Hort</i> 77(3) : 491-95.	6.16
985	Tinna D, Garg N, Pandove G, Sharma S, Chawla N and Dhatt A S (2020). Response of rabi onion to biofertilizers in a sandy loam alluvialsoil. <i>Indian J Agric Sci</i> 90 :1102-06.	6.25
986	Tinna D, Garg N, Sharma S, Pandove G and Chawla N (2020). Utilization of plant growth promoting rhizobacteria as root dipping of seedlings for improving bulb yield and curtailing mineral fertilizer use in onion under field conditions. <i>Sci Hort</i> 270 :109432.	10.34
987	Tiwari S and Kaur M (2020). Mechanistic insight into structural and adsorptive properties of core shell reversal nanocomposites of rice husk silica and magnesium ferrite. <i>Adv Powder Technol</i> 31(6) :2315-26.	10.97
988	Toor AK and Singh A (2020). Estimates of variability, heritability and genetic advance for yield components in linseed (<i>Linum usitassimum</i> L.) genotypes. <i>J Oilseeds Res</i> 7 : 278.	5.20
989	Toor A K (2020). Character Association and Variability Studies in Forage Sorghum. <i>Int J Curr Microbiol App Sci</i> 9 : 1679-90.	5.30
990	Utreja D, Kaur J, Kaur K and Jain P (2020.) Recent advances in 1,3,5-Triazine derivatives as Antibacterial agents. <i>Mini Rev Org Chem</i> 17 : 991-1041.	8.15
991	Vashisht BB, Maharjan B, Sharma S and Kaur S (2020). Soil quality and its potential indicators under different land use systems in the shivaliks of Indian Punjab. <i>Sustainability</i> 12(8) :3490.	9.89
992	Verma A, Khurana R, Dixit A K and Singh S K (2020). Studies on selected mechanized solutions for efficient incorporation of green manure crop. <i>J Agric Engg</i> 57 : 1-15.	5.59
993	Vij S, Pathak D, Rathore P and Pooja (2020). Genetic analysis of some morphological traits in synthetic naturally polyploid cotton derivatives. <i>J Genet</i> 99 : 73.	7.51
994	Vikal Y, Kaur A, Jindal J, Kaur K, Pathak D, Garg T and Yadav I (2020). Identification of genomic regions associated with shoot fly resistance in maize and their syntenic relationships in the sorghum genome. <i>Plos one</i> 15(6) : e0234335.	9.75

995	Vikram P, Franco J, Burgueño-Ferrera, Li H, Sehgal D, Saint-Pierre C, Ortiz C, Singh VK, Sneller C, Sharma A, Tattaris M, Guzman C, Pena J, Sansaloni CP, Serna JAC, Thiyagarajan K, Davila GF, Reynolds M, Sonder K, VeluGovinda, Ellis M, Bhavani S, Jalal Kamali MR, MozaffarRoosatei, Basandari SSD, Bains NS, Basandari A, Payne T, Crossa J and Singh S (2020). Strategic Use of Iranian Bread Wheat Landrace Accessions for Genetic Improvement: Core Set Formulation and Validation. <i>Plant Breed</i> 139 (6):1-13.	8.54
996	Virk H K, Singh G and Manes G S (2020). Nutrient uptake, nitrogen use efficiencies, and energy indices in soybean under various tillage systems with crop residue and nitrogen levels after combine harvested wheat. <i>J Plant Nutr</i> 43 (3): 407-17	8.28
997	Vik V, Saini J S, Chandora R, M S S, Kamil D, Gupta S and Aggarwal R (2020). First report of stem smut caused by <i>Tranzscheliella hypodytes</i> (Schltld.) Vanky & McKenzie on <i>Leymus secalinus</i> (Georgi) Tzvelev in India. <i>Plant Dis</i> 105 (2):709.	10.61
998	Wadhwa M, Sidhu P K and Bakshi M P S (2020). Herbal feed additives containing tannins: Impact on in vitro fermentation and methane mitigation from total mixed ration. <i>Turkish J Vet Anim Sci</i> 44 : 47-58	6.60
999	Walia G S, Sidhu SS and Grewal IS (2020). An alternative estimator of population mean using imputation method. <i>Intl J Agric Stats Sci</i> 16 :329-33.	5.13
1000	Walia S S, Singh G and Saini K S (2020). Effect of integrated nutrient management on microclimatic environment, quality and yield of baby corn (<i>Zea mays</i>) in North-Western India. <i>Indian J Agron</i> 65 (1): 83-87.	5.95
1001	Yadav A K and Singla D (2020). VacPred: Sequence-based prediction of plant vacuole proteins using machine-learning techniques. <i>J Biosci</i> 45 :1-9.	8.80
1002	YadavBK (2020). Bio-chemical properties and nutrient availability in soil as influenced by in-situ paddy residue burning in semi-arid region of Punjab. <i>J Pharmacogn Phytochem</i> 9 : 1275-83.	5.21
1003	YadavBK (2020). Effect of Agricultural Residue Biochar on Soil Properties and Crop Yield – Review. <i>J Agric Phys</i> 19 : 133-47.	5.10
1004	Yadav T, Kumar A, Yadav R K, Yadav G, Kumar R and Kushwaha M (2020). Salicylic acid and thiourea mitigate the salinity and drought stress on physiological traits governing yield in pearl millet-wheat. <i>Saudi J Biol Sci</i> 27 (8):2010-17.	10.05
1005	Yadava VK, Jhaa RK, Yadav CK, Singh SK, Yadav KD and Dhaliwal I (2020). Oxidative stress and anti-obesity approach in behavior of COVID-19: A review. <i>Indian J Tradit Knowl</i> 19 :139-42.	7.09
1006	Zalopuri R, Kaur P and Mahal A K (2020). Influence of developed refractance based drying method on physical parameter of potato flakes. <i>IntJ Chem Stud</i> , 8 : 2833-38.	5.31
1007	Zalpouri R, Kaur P, Kaur A and Sidhu G K (2021). Comparative analysis of optimized physiochemical parameters of dried potato flakes obtained by refractive and convective drying techniques. <i>J Food Process Preserv</i> 45 (1):15077.	8.61
1008	Zhawar V K, Kandpal R P and Athwal R S (2020). Senescence of normal human fibroblasts relates to the expression of ionotropic glutamate receptor <i>glur6/grik2</i> . <i>Cancer Genomics Proteomics</i> 17 (6):707-14.	10.07

Sr.No.	2021	NAAS Score
1009	A Sharma and Brar A S (2021). Investigations on in-situ paddy straw management technology implemented under different mechanical treatments for wheat establishment. <i>Paddy and Water Environment</i> 19 (4): 649-660.	7.26
1010	A Sharma and Brar AS (2021). Investigation on baler technology for ex situ paddy residue biomass management with energy consumption analysis for wheat establishment. <i>Int J Env Sci Tec</i> 19 : 6267-6284.	8.54
1011	Aatralarasi S, Dhaliwal L K, Kingra P K and Jain G (2021). Prediction of Future Milk Production Trend in India and Central Punjab. <i>J Animal Res</i> 1 : 1051-1058.	5.43
1012	Abdrabbo M A A, Farag A A, Radwan H A, Heggi M A M, Aboelsoud H M, Singla C and Sharda R (2021). Climate change impact on economic and irrigation requirements for sugarcane crop in Egypt Future of Food. <i>J Food Agri Soc</i> 9 (2).	6.143
1013	Acharya S, Kumar K, Sharma N, Tiwari V K and Chaurasia O P (2021). Yield and quality attributes of lettuce and spinach grown in different hydroponic systems. <i>J Soil Water Conserv</i> 20 : 342-349.	5.08
1014	Adhikary T, Gill PPS, Jawandha SK, Bhardwaj R D, Anurag R K (2021). Browning and quality management of pear fruit by salicylic acid treatment during low temperature storage. <i>J Sci Food Agric</i> 101 : 853-862.	8.61
1015	Adhikary T, Gill P P S, Jawandha S K, Bhardwaj R D, Anurag R K (2021). Efficacy of postharvest sodium nitroprusside application to extend storability by regulating physico-chemical quality of pear fruit. <i>Food Chem</i> 346 : 128934.	12.31
1016	Aggarwal R and Bains K (2021). Food Consumption Pattern and Dietary Intake among Young Punjabi Women. <i>Ind J Ecol</i> 48 (5): 1515-20.	5.79
1017	Agnotra K, Kumar R and Ranguwal S (2021). Sources, replacement of seed and adoption gaps in berseem fodder production in Punjab. <i>Ind J Ext Edu</i> 57 :101-108.	5.95
1018	Agrawal N, Gupta M, Atri C, Akhtar J, Kumar S, Heselop-Harrison J S and Banga S S (2021). Anchoring alien chromosome segment substitutions bearing gene(s) for resistance to mustard aphid in Brassica juncea-B. fruticulosa introgression lines and their possible disruption through gamma irradiation. <i>Theoretical and Applied Genetics</i> 134 (10): 3209-3224, doi: 10.1007/ s00122-021-03886-z.	11.57
1019	Ahmad MWZ, Mohapatra L and Kaur M (2021). Opinion of stakeholders regarding design of Agricultural Insurance in Punjab. <i>Agri Res J</i> 58 (2): 355-59.	5.44
1020	Akao P K, Singh B, Kaur P, Sor A, Avni A, Dhir A, Verma S, Kapoor S, Phutela U G, Satpute S, Sharma S, Avisar D, Sandha K S, Mamane H (2021). Coupled microalgal–bacterial biofilm for enhanced wastewater treatment without energy investment. <i>J Water Process Engineering</i> 41 : 102029.	11.485
1021	Anjali, Sharma P and Nagpal S (2021). Effect of liquid and charcoal-based consortium bio-fertilizers amended with additives on growth and yield in chickpea (<i>Cicer arietinum</i> L.). <i>Legume Res</i> , DOI: 10.18805/LR-413.	6.34
1022	Ankit, Kaur R, Mohapatra L and Rathore S (2021). Factors Determines Awareness of Management Practices of Over Exploitation of Ground Water among Farmers of Punjab, India. <i>Ind J Ext Edu</i> 3 : 67-71.	5.95
1023	Anwari M and Garg L (2021). Benefits and Challenges of ATMA Kisan Bazaar in Ludhiana District of Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 : 887-896.	5.65
1024	Aparna S, Kansal. K, Singh J and Hundal J S (2021). Dairy Cattle Nutrition Technologies: Pre and Post Intervention Awareness and its Retention in Relation with Independent Variables. <i>J Community Mobilization and Sustain Dev</i> 16 (1): 245-254.	5.67

1025	Arora N, Mishr S P, Nitnavare R B, Jaba J, Kumar A A, Bhattacharya J, Sohu Singh R and Sharma H C (2021). Morpho-physiological and leaf surface chemicals as markers conferring resistance to sorghum shoot fly (<i>Atherigona soccata</i> Rondani) infestation. <i>Field Crops Research</i> 261 :1-12, https://doi.org/10.1016/j.fcr.2020.108029 .	9.87
1026	Arora R K, Singh M, Singh Pand Arora J K (2021). Yield loss in relation to cotton leaf curl virus disease in Bt cotton hybrid in North-Western India. <i>Agri Res J</i> 58(4) : 728-734.	5.44
1027	Arora R, Gupta M and Singh H (2021). Fortification of fertilizers with organic amendments and bio-inoculants for augmenting yield and quality in papaya. <i>Agri Res J</i> 58(6) :1065-70.	5.44
1028	Arora R, Sharma V and Sharma S (2021). Temporal changes in soil biochemical properties with seasons under rainfed land use systems in Shiwalik foothills of northwest India. <i>AgroforestSyst</i> 95 1479–1491, https://doi.org/10.1007/s10457-021-00654-2 .	8.55
1029	Arora R, Singh NP, Gill MS and Kaur S (2021). Influence of foliar feeding of KNO ₃ on fruit yield and quality parameters of mango". <i>Agri Res J</i> 58(5) :828-834.	5.44
1030	Arora S, Chaudhary G, Yadav U, Singh T P and Bathla S (2021). Evaluation of physio-chemical and organoleptic characteristics of sweetened stirred plum (<i>Prunus domestica</i>) yogurt during storage. <i>Ind J Dairy Sci</i> 74(4) :294-300.	5.95
1031	Arora, S, Kaur, S, Dhillon G S, Singh R, Kaur J, Sharma A, Chhuneja P (2021). Introgression and genetic mapping of leaf rust and stripe rust resistance in <i>Aegilops triuncialis</i> . <i>Journal of Genetics</i> 100 :6.	7.51
1032	Ashraf A, Singh K G and Singh A (2021). Development and evaluation of nutrient reuse system in soilless media grown cucumber under protected cultivation. <i>Journal of Plant Nutrition</i> 44 (9) : 1241-57.	7.13
1033	Aslam A, Mohammed S, Kaur J, Panayampadan A S, Dar O, Kothakota A, and Pandiselvam R (2021). Understanding the effects of ultrasound processing on texture and rheological properties of food. <i>Journal of Texture Studies</i> , DOI: 10.1111/jtxs.12644.	7.90
1034	Aslam R, Alam M S, Kaur P (2021). Comparative study on efficacy of sanitizing potential of aqueous ozone and chlorine on keeping quality and shelf-life of minimally processed onion (<i>Allium Cepa</i> L.). <i>Ozone: Science & Engineering</i> 44 (2) : 196-207, DOI: 10.1080/01919512.2021.1904204.	8.60
1035	Aslam R, Alam M S, Singh S, Kumar S (2021). Aqueous ozone sanitization of whole peeled onion: Process optimization and evaluation of keeping quality during refrigerated storage. <i>LWT-Food sc and tech</i> 151 :1-10.	10.01
1036	Attri A, Sandhu S and Bala R (2021). Effect of microclimate modification on Karnal bunt of wheat under Ludhiana conditions. <i>Agri Res J</i> 58(6) : 1036-1041.	5.44
1037	Aulakh CS, Sharma S, Thakur M and Kaur P (2021). A review of the influences of organic farming on soil quality, crop productivity and produce quality. <i>J Plant Nutr</i> , DOI: 10.1080/01904167.2022.2027976.	7.13
1038	Aulakh S K, Singh N, Buttar D S and Choudhary A K(2021). Antagonistic potential and molecular characterization of <i>Trichoderma asperellum</i> against <i>Rhizoctonia solani</i> AG-3 causing black scurf of Potato. <i>Agri Res J</i> 58(2) : 216-223.	5.44
1039	Badiyal A, Chaudhary HK, Jamwal NS and Bhatt AK (2021). Comparative efficiency of triticale × wheat derived F1, F2, F3, BC1F1 and BC1F2 recombinants towards <i>Imperata cylindrica</i> -mediated doubled haploid induction. <i>Cereal Research Communications</i> 50 :329–334.	6.81
1040	Bains N S, Sohu V S, Mavi G S, Sharma A, Bhagat I, Srivastava P and Chhuneja P (2021). Notification and germplasm registration –Bread wheat variety PBW 725. <i>Ind J Genet</i> 81(4) : 606.	6.55
1041	Bains T S, Gill R K, Singh S and Singh I (2021). Notification of crop varieties and registration of germplasm: Mungbean Variety SML1827. <i>Ind J Genet Plant Breed</i> 80 : 484-494.	6.55



1042	Bala P and Gill TS (2021). Multimode excitation and modulational instability of beam plasma system with Tsallis distributed electrons. <i>Praman J Phys</i> 95 : 59.	8.219
1043	Bala P and Kaur A (2021). Quantum electron acoustic solitons and double layers with κ -deformed Kaniadakis distributed electrons. <i>Indian J Pure Appl Phys</i> 59 : 577-585	6.846
1044	Bala P and Sharma A (2021). Electron-acoustic dressed solutions with nonthermal-Tsallis distributed hot electrons. <i>Indian J. Phys</i> 96 : 1841-1851.	7.947
1045	Bala P, Kaur A and Kaur K (2021). Arbitrary amplitude electron-acoustic solitons and double layers with Cairns-Tsallis distributed hot electrons. <i>Pramana J Phys</i> 95 : 20.	8.219
1046	Bala S, Asthir B, Taggar M S, Goyal M, Bains N S, Sharma A and Chhuneja P (2021). Grain carbon metabolism and stem reserve mobilization compensate high temperature stress in wheat. <i>Agroch</i> 65 :39-52.	6.65
1047	Bali M, Chawla N and Jindal S K (2021). Correlation between various biochemical constituents and fruit yield in lycopene rich genotypes of tomato. <i>Agri Res J</i> 58 : 29-33.	5.44
1048	Banoo R, Kaur N, Dhatt A S and Gill RIS (2021). Growth and yield performance of Cucurbita spp. transplanted at different times under poplar block plantation. <i>Ind J Agroforestry</i> 23(2) :90-98.	5.19
1049	Bansal M, Adamski N M, Toor P I, Kaur S, Sharma A, Srivastava P, Bansal U, Uauy C, Chhuneja P (2021). A robust kasp marker for selection of four pairs of linked leaf rust and stripe rust resistance genes introgressed on chromosome arm 5ds from different wheat genomes. <i>Molecular biology reports</i> 48(6) :5209-5216.	8.74
1050	Bansal R and Katyal P (2021). Optimization of α -amylase and glucoamylase production using cull potatoes as substrate. <i>Starch / Starke</i> , 2100105.	8.23
1051	Bansal R and Katyal P and Jain D (2021). Enzymatic and acidic hydrolysis of cull potatoes for production of fermentable sugars. <i>Starch / Starke</i> , 2100202.	8.23
1052	Barman P, Kumar R, Pandey A K, Bishnoi C, Gora J S, Berwal M K, Dhaka S, Sarolia, Kumar M, Pratibha, Akshay and Kumar D (2021). Can canopy management increase quality fruit production in <i>Syzygiumcumini</i> (L.) <i>Eur. J. Hort. Sci</i> 86 (4) : 371-383.	7.18
1053	Bathla S and Arora S (2021). Prevalence and approaches to manage Iron Deficiency Anemia (IDA). <i>Critical reviews in Food Science and Nutrition</i> 7 : 1-14. PMID: 34096415, DOI: 10.1080/10408398.2021.1935442.	17.1
1054	Benipal S K, Singh R, Kaur N and Garg L (2021). Impact of Transfer of Rodent Management Technologies in Paddy and Wheat Crops Among Different Categories of Farmers in Punjab. <i>J Community Mobilization and Sustain Dev</i> 16(2) : 367-74.	5.67
1055	Bhanot R and Hundal S S (2021). Biochemical and histopathological effects in muscular tissue of carp fish (<i>Labeo rohita</i> , Hamilton 1822) following exposure to untreated and treated sewage water. <i>Environ Sci Pollut Res</i> , DOI: 10.1007/s11356-021-13906-6.	9.06
1056	Bhardwaj A, Navneet K, Dhatt A S and Gill RIS (2021). Optimization of onion planting time and variety under <i>Populus deltoides</i> -based agroforestry system in North-Western India. <i>Agroforestry System</i> 95 : 533-546.	7.79
1057	Bhardwaj A, Sharma A, Cooper R, Bhardwaj G, Gaba J, Mutreja V, Chauhan A (2021). A comprehensive phytochemical, ethnomedicinal, pharmacological ecology and conservation status of <i>Picrorhiza kurroa</i> Royle ex Benth.: An endangered Himalayan medicinal plant. <i>Process Biochem</i> 109 : 72-86.	8.85
1058	Bhardwaj M, Dogra R, Javed M, Singh M and Dogra B (2021). Optimization of conventional combine harvester to reduce combine losses for basmati rice (<i>Oryza Sativa</i>). <i>Agril Sci</i> 12 : 259-72.	7.01
1059	Bhardwaj R D, Singh N, Sharma A, Joshi R and Srivastava P (2021). Hydrogen peroxide regulates antioxidant responses and redox related proteins in drought stressed wheat seedlings. <i>Physiology and Molecular Biology of Plants</i> 27(1) : 151-163.	8.01

1060	Bhardwaj R, Sohu R S and Dhaliwal I (2021). Millets for Crop Diversification: Punjab Perspective. <i>Agri Res J</i> 58 (4): 750-758.	5.44
1061	Bhati M I, Dubey R K and Singh S (2021). Review on Approaches to Floral Waste Management for Sustainable Environment. <i>Climate Change Environ Sustain</i> 9 (2):110-116.	5.28
1062	Bhatt D and Bains S (2021). Commercial viability of screen printed silk stoles using aipan motifs. <i>The Pharma Innovation J</i> 10 (8): 839-42.	5.23
1063	Bhatt R and Arora S (2021). Soil matric potential-based irrigation using tensiometers for conserving irrigation water. <i>Current Science</i> 121 (2): 197-200	7.10
1064	Bhatt R and Singh P (2021). Adoption status of crop production practices in direct seeded rice (DSR): A case study of Kapurthala district of Punjab (India). <i>Ind J Ext Edu</i> 57 (3): 24-27.	5.95
1065	Bhatt R and Singh P (2021). Sugarcane response to irrigation and potash levels in subtropics. <i>Agri Res J</i> 58 (4): 709-715.	5.44
1066	Bhatt R, Singh J and Kashyap L (2021). Effect of irrigation and potash levels on growth, yield, and quality of spring sugarcane (<i>Saccharum officinarum</i>). <i>Ind J Agri Sci</i> 92 (5): 663-666.	6.37
1067	Bhatt R, Singh J, Laing A M, Meena R S, Alsanie W F, Gaber A, Hossain A (2021). Potassium and Water-Deficient Conditions Influence the Growth, Yield and Quality of Ratoon Sugarcane (<i>Saccharum officinarum</i> L.) in a Semi-Arid Agroecosystem. <i>Agronomy</i> 11 (11), 2257. https://doi.org/10.3390/agronomy11112257 .	9.40
1068	Bhatt R, Singh P, Ali O M, Latef A AH A, Laing A and Hossain A (2021). Polyhalite positively influences the growth, yield, and quality of sugarcane (<i>Saccharum officinarum</i> L.) in potassium and calcium-deficient soils in the semi-arid tropics <i>Sustainability</i> 13 (19):10689.	9.42
1069	Bhatt R, Singh P, Ali O M, Latef AAHA, Laing A M and Hossain A (2021). Yield and Quality of Ratoon Sugarcane Are Improved by Applying Potassium under Irrigation to Potassium Deficient Soils. <i>Agronomy</i> 11 : 1381.	9.42
1070	Bhatt R, Singh P, Hussain A and Tamsina J (2021). Rice-wheat system in the north-west Indo-Gangetic Plains of South Asia: Issues and technological interventions for increasing productivity and sustainability. <i>Paddy and Water Environment</i> 1-21.	7.55
1071	Bhatt R, Singh M (2021). Comparative efficiency of polymer-coated urea for lowland rice in semi-arid tropics. <i>Communications in soil science and plant analysis</i> 52 (19), 2331-2341.	7.58
1072	Bhattacharyya P, Bisen J, Bhaduri D, Priyadarsini S, Munda S, Chakraborti M, Adak T, Seelvam P, Mukherjee A K, Swain S, Dash L P K, Padhy S R, Nayak A K, Pathak H, Kumar S and Nimbrayan P (2021). Economic and environmental gain of sustainable rice straw management practices over field burning: Turn the wheel from waste to wealth. <i>Science of the Total Environment</i> 775 : 1-17.	12.55
1073	Bhogal S and Vatta K (2021). Can crop diversification be widely adopted to solve the water crises in Punjab? <i>Current Science</i> 120 (8): 1303.	7.17
1074	Bhoi P B, Wali V S, Swain D K, Sharma K, Bhoi A K, Bacco M and Barsocchi P (2021). Input use efficiency management for paddy production systems in India: a machine learning approach. <i>Agriculture</i> 11 (9): 837.	8.925
1075	Bhullar H S and Gill RS (2021). Ovipositional preference of tobacco caterpillar, <i>spodopteralitura</i> (<i>fabricius</i>) to different transgenic Bt cotton cultivars. <i>Agri Res J</i> 58 : 808-13.	5.44
1076	Bhullar M B, Heikal H M, Kaur P and Kaur R (2021). Efficacy of natural products and biorationals against two-spotted spider mite, <i>Tetranychus urticae</i> Koch (Acari: Tetranychidae) infesting brinjal (<i>Solanum melongena</i> L.) under protected cultivation. <i>Int J Acarology</i> , DOI: 10.1080/01647954.2021.1987982.	7.24
1077	Bhullar MB, Kaur P, Kumar S, Sharma RK, Kumar R, Kumari S, Singh V, Kaur A, Kaur J, Sharma U, Kaur J (2021). Management of mites with homemade neem fruit aqueous extract in capsicum under protected cultivation. <i>Persian J Acarology</i> . 10 (1): 85-94	6.73



1078	Bhullar R K, Kaur S, Deol J S, Sharma R, Kaur T, Brar A S and Choudhary O P (2021). Soil properties and weed dynamics in wheat as affected by rice residue management in the rice-wheat cropping system in South Asia: A Review. <i>Plants</i> 10 : 953, https://doi.org/10.3390/plants100509 .	8.76
1079	Bindra S, Singh I, Gill B S, Grewal S K, Kaur J, Kaur L, Salaria S, Kaur A, Kushwah A, Srinivasan S and Singh S (2021). Inheritance and biochemical basis of yellowing of apical leaves: a unique trait in chickpea (<i>Cicer arietinum</i> L.). <i>J Genetics</i> 100 :53	6.99
1080	Bindra S, Singh I, Singh S, Kushwah A, Gill B S, Salaria S, Kapoor K, Grewal S K, Bharadwaj C, Nayyar H and Singh S (2021). Use of morpho-physiological and biochemical traits to identify sources of drought and heat tolerance in chickpea (<i>Cicer arietinum</i>). <i>Crop & Pasture Science</i> 72 : 801-814.	7.57
1081	Boparai AK, Raj R and Singh K (2021). Increasing Chickpea (<i>Cicer arietinum</i> L.) Production through frontline Demonstrations in Irrigated Regions of Central Punjab, India. <i>Int J Plant Soil Sci</i> 33 : 47-55.	5.07
1082	Brar A S, Sraw P K, Kumar R and Parkash O (2021). Effect of planting methods and plant populations on productivity of turmeric (<i>Curcuma longa</i> L.) and soil physical properties. <i>Agric Res J</i> 58 (3): 412-418.	5.44
1083	Brar A S, Buttar G S, Singh M, Singh S, and Vashist K K (2021) Improving bio-physical and economic water productivity of menthol mint (<i>Mentha arvensis</i> L.) through drip fertigation. <i>Irrigation Science</i> 39 : 505-516.	8.44
1084	Brar H S and Singh P (2021). Relationship of Agro-Meteorological Indices with Cotton Yield Under Varied Pre-Sowing Irrigation Levels, Sowing Dates and Time of First Irrigation in North-Western India. <i>Communications in Soil Science and Plant Analysis</i> 53 (2): 170-179.	7.58
1085	Brar J S, Arora N K, Kumar K, Boora R S and Kaur G (2021). Effect of temperature variations on phenology and horticultural traits of guava under North-west Indian conditions. <i>J Agrometeorology</i> 23 (3): 360-63.	6.47
1086	Brar S K and Bhullar H S (2021). Assessment of avoidable yield losses due to sucking insect pests in Bt cotton. <i>Ind J Ent</i> 21127	5.08
1087	Brar S K, Singla N and Singla L D (2021). Comparative Comprehensive analysis on natural infections of <i>Hymenolepis diminuta</i> and <i>Hymenolepis nana</i> in commensal rodents. <i>Helminthologia</i> 58 (3): 248-62.	6.73
1088	Brar S K, Singla N and Singla L D (2021). Concurrent infection of <i>Cryptosporidium</i> and <i>Giardia</i> in synanthropic rodents: First report from Punjab, India. <i>Indian Vet J</i> 17 (1): 45-47.	5.25
1089	Buttar P S, Kingra P K, Pal R K, Singh S P and Kaur S (2021). Analysing water productivity response to sowing window, irrigation level and mulching using CERES-Wheat model. <i>J Agrometeorology</i> 23 (3): 286-291.	6.47
1090	Cambay S R, Bains N S, Sandhu S K and Puja S (2021) Reconsidering the direct cross approach for gene transfer from <i>Aegilops tauschii</i> to hexaploid wheat using diversified D genome donors. <i>Cereal Research Communications</i> 49 (1): 125-131.	6.81
1091	Chahal G K, Kaur A and Dhatt A S (2021). A SingleGene Mutation Changed the Architecture of Pumpkin Seed: A Review. <i>J Plant Grow Regul</i> , https://doi.org/10.1007/s00344-020-10289-9 .	8.67
1092	Chandel S, Datta A, Yadav R K, Dheri G S (2021). Does saline water irrigation influence soil carbon pools and nutrient distribution in soil under seed spices? <i>Journal of Soil Science and Plant Nutrition</i> 21 :949-966.	8.01
1093	Chander A and Dhatt K K (2021). Mulching effect on weeds and corm production in <i>Gladolus hortensis</i> . <i>Ind J Weed Sci</i> 53 (2): 198-201.	5.84
1094	Chandi R S and Kaur A (2021) Field Efficacy of sulfoxaflor against aphids in potato. <i>Pesticide Res J</i> 33 (1): 109-13.	5.49

1095	Chandi R S, Kataria S K and Fand B B (2021). Effect of temperature on biological parameters of cotton whitefly, Bemisia tabaci (Gennadius) (Hemiptera: Aleyrodidae). <i>Int J Tropical Insect Science</i> 41(2) : 1823-1833.	6.85
1096	Chandi R S, Kaur A, Biwalkar N and Sharma S (2021). Forecasting of insect pest population in brinjal crop based on Markov chain model. <i>J Agrometeorology</i> 23(1) : 132-136.	6.64
1097	Chaudhary V, Katyal P, Poonia A K, Kaur J, Puniya A K, Panwar H (2021). Natural pigment from Monascus: The production and therapeutic significance. <i>J Appl Micro</i> , DOI: 10.1111/jam.15308. 1	12.00
1098	Chauhan S K, Dhillion W S, Gupta N, Panwar P and Rajni (2021). Effect of wind breakers using Euclyptus on cultivation of kinnow mandarin. <i>Ind J Hort</i> 30 :268-272.	6.16
1099	Chavan P, Kaur G, Alam M S and Kumar M (2021). Mathematical design and performance investigation of evaporator water cooled storage-cum-mobile thermoelectric refrigerator for preservation of fruits and vegetables. <i>J Food Process Engineering</i> , DOI: 10.1111/jfpe.13770:1-14.	8.38
1100	Cheema H K, Jindal J, Aggarwal N, Kumar S and Sharma U (2021). Insecticidal management of Spodoptera frugiperda (JE Smith) on grain and fodder maize in Punjab. <i>Pesticide Res J</i> 33(1) : 72-77.	5.49
1101	Chhabra R, Sharma R and Kaur T (2021). Phyto-allelopathic effect of different tree leaves aqueous extracts on seed germination and seedling growth of Echinochloa crus-galli (L) Beauv. <i>Ind J Weed Sci</i> 53(3) : 318-323.	5.84
1102	Choudhary A K, Singh N and Singh D (2021). Evaluation of the bioformulation of potent native strains of Trichoderma spp. against the foot rot/gummosis of Kinnow mandarin. <i>Egyptian J Biological Pest Control</i> 31 :1-12	6.76
1103	Choudhary A, Kaur N, Sharma A and Kumar A (2021). Evaluation and screening of elite wheat germplasm for salinity stress at the seedling phase. <i>Physiologia Plantarum</i> , https://doi.org/10.1111/ppl.13571 .	10.15
1104	Choudhary A, Kumar A, Kaur H and Kaur N (2021). MiRNA: The taskmaster of plant world. <i>Biologia</i> 76 : 1551-67.	6.81
1105	Choudhary A, Mohindru B, Karedla A K, Singh J and Chhuneja P K (2021). Sub-lethal effects of thiamethoxam on Apis mellifera Linnaeus. <i>Toxin Reviews</i> (DOI: 10.1080/15569543.2021.1958868).	8.85
1106	Choudhary A, Singh J and Chhuneja P K (2021). Nest architecture and nesting site preference of Tetragnola iridipennis Smith in North-Western plains of India. <i>J Apicultural Sciences</i> 65(1) : 1-11.	6.8
1107	Damanpreet, Chandi R S, Kaur A and Aggarwal N (2021). Seasonal biology of Helicoverpaarmigera (Hubner) on tomato. <i>Ind J Ent</i> 83(3) : 438-41.	5.89
1108	Dar E A, Brar A S, Showket A D, Aljuaid B , Ahmed M E, Rizwan R, Zahoor A S, Abrar Y, Mohammad A B, Mushtaq A, Fayaz A B, Hesham E E, Marian B, Maria B, Marek Z, Shahid F and Mohd S (2021). Quantitative response of wheat to sowing dates and irrigation regimes using CERES-Wheat model. <i>Saudi Journal of Biological Sciences</i> 29 : 6198-6208.	10.22
1109	Dar R A, Parmar M, Dar E A, Sani R K and Phutela U G (2021). Biomethanation of agricultural residues: Potential, limitations and possible solutions. <i>Ren Sust Energ Rev</i> 135 :1-23.	18.11
1110	Dar RA, Gupta RK and Phutela U G (2021). Enhancement of euryhaline Asterarcysquadricellulare biomass production for improving biogas generation through anaerobic co digestion with carbon rich substrate. <i>Biotech</i> 11 :251-72.	7.80
1111	Das R, Purakayastha T, Das D, Ahmed N, Kumar R, Walia S S, Singh R, Shukla V K, Yadava M S, Ravisankar N and Dutta S C (2021). Effect of chemical pre-treatment for identification of clay minerals in four soil orders by X-ray diffraction technique. <i>Proceedings of the National Academy of Sciences India Section A-Physical Sciences</i> , https://doi.org/10.1007/s40009-021-01077-4 .	7.29



1112	Das S, Kaur S, Jutla A (2021). Earth Observations Based Assessment of Impact of COVID-19 Lockdown on Surface Water Quality of Buddha Nala, Punjab, India. <i>Water</i> 13 (10):1363, https://doi.org/10.3390/w13101363 .	8.54
1113	Dash S P, Dipankar P, Burange P S, Rouse B T and Sarangi P P (2021). Climate change: how it impacts the emergence, transmission, resistance and consequences of viral infections in animals and plants. <i>Crit Rev Microbiol</i> 47 (3): 307-22.	13.35
1114	Delorean E, Gao I, Lopez JF C, Wulff BB H, IBBA M I, Poland J (2021). High molecular weight glutenin gene diversity in <i>Aegilopstauschii</i> demonstrates unique origin of superior wheat quality. <i>Communications Biology</i> 4 :1242.	12.55
1115	Deol J K, Sharma S P, Rani R, Kalia A, Chhuneja P and Sarao N K (2021). Inheritance analysis and identification of SSR markers associated with fusarium wilt resistance in melon. <i>J Horti Science and Biotech</i> , https://doi.org/10.1080/14620316.2021.1948360 .	7.16
1116	Dey D, Mavi M S (2021). Biochar and urea co-application regulate nitrogen availability in soil. <i>Environmental Monitoring Assessment</i> 193 :326-339.	7.90
1117	Dhaliwal J, Kahlon M S and Kuka L S S (2021). Deep tillage and irrigation impacts on crop performance of direct seeded rice-wheat cropping system in northwest India. <i>Paddy and Water Environment</i> 19 :113-126.	7.26
1118	Dhaliwal N K and Aggarwal N (2021). Development and survival of brinjal shoot and fruit borer <i>Leucinode orbonalis</i> Guenee (Crambidae: Lepidoptera) at constant and alternating temperatures. <i>International Journal of Tropical Insect Science</i> , Doi: 10.1007/s42690-020-00376-5.	7.77
1119	Dhaliwal N K and Aggarwal N (2021). Effect of ambient temperature on food consumption and utilization by eggplant shoot and fruit borer, <i>Leucinodes orbonalis</i> Guenee (Lepidoptera: crambidae). <i>J Agromet</i> 23 : 252-55.	6.00
1120	Dhaliwal R K, Kashyap N, Malhotra P, Dash S K, Dhaliwal L K and Kaur S (2021). Determination of heat stress zone for daily milk yield using carry over heat effect model in Murrah buffaloes. <i>Tropical Animal Health and Production</i> 53 : 1-9.	7.33
1121	Dhaliwal R K, Dhaliwal P S and Mohapatra L (2021). A Case Study of A Crossbred Dairy Cattle Farm in Ludhiana District of Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 : 897-900.	5.67
1122	Dhaliwal S S, Sharma S, Shukla A K, Sharma V, Bhullar M S, Kaur T, Alorabi M, Alotaibi S S, Gaber A and Hossain A (2021). Removal of biomass and nutrients by weeds and direct-seeded rice under conservation agriculture in light-textured soils of North-Western India. <i>Plants</i> 10 (11):2431, https://doi.org/10.3390/plants10112431 .	9.39
1123	Dhaliwal S S, Sharma V, Shukla A K, Kaur J, Verma V, Singh P, Singh H, Abdel-Hafez, Sayed S, Gaber A, Ali R and Hossain A (2021). Enrichment of zinc and iron micronutrients in lentil (<i>Lens culinaris</i> Medik.) through biofortification. <i>Molecules</i> 26 : 7671.	10.41
1124	Dhaliwal S S, Sharma V, Shukla A K, Verma V, Behera S K, Sandhu P S, Kaur K, Gaber A, Althobaiti Y S, Abdelhadi A A and Hossain A (2021). Assessment of agro-economic indicators of <i>Sesamum indicum</i> L. as influenced by application of boron at different levels and plant growth stages. <i>Molecules</i> 26 : 6699.	10.41
1125	Dhaliwal S S, Sharma V, Shukla A K, Verma V, Sandhu P S, Behera S K, Singh P, Kaur J, Singh H, Abdel-Hafez S H, Gaber A, Sayed S and Hossain A (2021). Interactive Effects of Foliar Application of Zinc, Iron and Nitrogen on Productivity and Nutritional Quality of Indian Mustard (<i>Brassica juncea</i> L.). <i>Agronomy</i> 11 : 1-13, doi.org/10.3390/agronomy11112333 .	8.60
1126	Dhaliwal S S, Sharma V, Taneja P K, Shukla A K, Kaur L, Verma G, Verma V and Singh J (2021). Effect of cadmium and ethylenediamine tetra acetic acid supplementation on cadmium accumulation by roots of Brassica species in Cd spiked soil. <i>Environmental Science and Pollution Research</i> , https://doi.org/10.1007/s11356-021-16084-7 .	10.2

1127	Dhaliwal S S, Sharma S, Sharma V, Shulka A K, Walia S S, Alhomrani M, Gaber A, Toor A S, Verma V, Randhawa M, Pandher L, Singh P and Hussain A (2021). Long-term integrated nutrient management in the maize-wheat cropping system in alluvial soils of North-Western India: influence on soil organic carbon, microbial activity and nutrient status. <i>Agronomy</i> 11 : 2258, https://doi.org/10.3390/agronomy11112258 .	9.95
1128	Dhami M and Sharma S (2021). Situational analysis of guidance needs of adolescents across various levels. <i>J Community Mobilization and Sustain Dev</i> 16 (1): 81-87.	5.30
1129	Dhanda S, Kaur S, Chaudhary A, Jugulam M, Hunjan M S, Sangha M K and Bhullar MS (2021). Characterization and management of metsulfuron-resistant Rumex dentatus biotypes in North-West India. <i>Agronomy Journal</i> , https://doi.org/10.1002/agj2.20849 .	8.28
1130	Dharni K and Jameel S (2021). Trends and relationship among intellectual capital disclosures, patent statistics and firm performance in Indian manufacturing sector. <i>J Intellectual Capital</i> 23 (4): 936-956, https://doi.org/10.1108/JIC-05-2020-0148	13.198
1131	Dhatt K K and Jhanji S (2021). Evaluating gladiolus varieties for off season planting using agrometeorological indices. <i>J Agrometeorology</i> 23 (1): 46-53.	6.64
1132	Dhawan G, Dheri G S and Gill A A S (2021). Nitrogen budgeting of rice-wheat cropping system under long-term nutrient management in an Inceptisol of north India. <i>Eur J Agron</i> 130 :126376.	11.72
1133	Dheri G S and Nazir G (2021). A review on carbon pools and sequestration as influenced by long-term management practices in a rice-wheat cropping system. <i>Carbon Management</i> 12 : 559-80.	9.18
1134	Dheri G S, Saini S P, Brar B S and Sandhu O S (2021). Response of soybean (Glycine max) to different sources and levels of sulphur application. <i>Ind J Agri Sci</i> 91 (8): 1242-6.	6.37
1135	Dhillon B S and Kaur M (2021). Growth and productivity of oats (Avena sativa L.) as influenced by fly ash and phosphorous levels in Indo-Gangetic plains of India. <i>Asian J Dairy Food Res</i> 40 (4): 408-414.	5.75
1136	Dhillon B S, Kaur G, Mangat G S and Kaur P (2021). Influence of seedling age on growth, productivity and heat use efficiency of rice genotypes in North West India. <i>J Agrometeorology</i> 23 (1): 30-37.	6.47
1137	Dhillon B S, Khosla G, Singh T P and Lore J S (2021). Grain yield, economics and disease severity of rice (Oryza sativa L.) in response to foliar application of potassium nitrate. <i>Agri Res J</i> 58 (5): 789-93.	5.44
1138	Dhillon G S, Das N, Kaur S, Srivastava P, Bains N S, Chhuneja P (2021). Marker assisted mobilization of heat tolerance qtls from Triticum durum-Aegilops speltoides introgression lines to hexaploid wheat. <i>Indian Journal of Genetics and Plant Breeding</i> 81 (2), DOI: 10.31742/IJGPB.81.2.2.	7.34
1139	Dhillon H S, Gill MS, Kocher G S, Panwar H and Arora M (2021). Preparation of Lactobacillus acidophilus enriched probiotic mango juice. <i>J Environ Bio</i> 42 :371-378.	6.56
1140	Dhir A, Pal R K, Kingra P K and Mishra S K (2021). Effect of sowing date, row spacing and orientation on growth and yield of Bt cotton hybrid in south-west Punjab. <i>Agri Res J</i> 58 (3): 446-450.	5.44
1141	Dhir A, Pal R K, Kingra P K, Mishra S K and Sandhu S S (2021). Cotton phenology and production response to sowing time, row orientation and plant spacing using CROPGRO-cotton model. <i>Mausam</i> 72 (3): 627-634.	6.37
1142	Dhkal M, Sharma A, Kaur G (2021). First report of tomato leaf curl New Delhi virus infecting Tinda (Benincasa fistulosa) in India. <i>Journal of Plant Pathology</i> . 103 : 339.	7.15
1143	Ekta and Utreja D (2021). Fluorescence Based Comparative Sensing Behavior of the Nano-Composites of SiO ₂ and TiO ₂ towards Toxic Hg ²⁺ Ions. <i>Nanomaterials</i> 11 : 3082.	10.32



1144	Ekta, Utreja D, Singh K and Sharma S (2021). A Schiff-base Molecular Keypad Lock and turn-on Sensor for Selective Detection of Fe ³⁺ with INHIBIT logic behavior. <i>Chem Select</i> 6 : 12323-12330.	7.81
1145	Elkot A F, Singh R, Kaur S, Kaur, J, Chhuneja P (2021). Mapping novel sources of leaf rust and stripe rust resistance introgressed from triticum dico ccoides in cultivated tetraploid wheat background. <i>J plant biochemistry and biotechnology</i> 30 : 336–342.	7.53
1146	Farmaha B S, Singh P and Singh B (2021). Spatial and temporal assessment of nitrate-N under rice-wheat system in riparian wetlands of Punjab, north-western India. <i>Agronomy</i> 11 :1284, https://doi.org/10.3390/agronomy11071284 .	8.60
1147	Gaba J, Sharma S, Kaur P, Joshi S (2021). Synthesis and biological evaluation of thymol functionalized oxadiazole thiol, triazole thione and β-lactam derivatives. <i>Lett Org Chem</i> 18(6) : 453-64.	6.78
1148	Gandhi N, Singh B, Singh P and Sharma S (2021). Functional, rheological, morphological, and micro-structural properties of extrusion-processed corn and potato starches. <i>Starch-Stärke</i> 73 : 2000140.	8.68
1149	Garg R K and Kaushik N (2021). Heritability, genetic gain and correlation among progenies of Pongamiapinnata (L.) Pierre for morphological traits. <i>Range Mgmt Agroforestry</i> 42(1) : 175-180.	6.58
1150	Garg R K, Bassi P, Nicodemus A, Choudhary O P and Kaur N (2021). Estimates of components of variance, genetic gain and heritability for growth, physiological and biochemical traits of Casuarina clones under varying levels of salinity stress. <i>Ind Forester</i> 147(4) : 361-365.	5.1
1151	Garg R K, Sra M S, Nicodemus A, Singh Avtar and Singh G (2021). Evaluation of inter specific hybrid clones of Casuarinafor adaptability and growth in arid and semi-arid regions of North-West India. <i>J Envi. Biology</i> 43 :317-325	6.68
1152	Garg R K, Bassi P, Nicodemus A, Choudhary O P and Kaur N (2021). Character association and path analysis for growth, physiological and biochemical traits of Casuarina clones under salinity stress. <i>Ind Forester</i> 147(11) : 1056-1060.	5.1
1153	Garg N (2021). Response of garlic (<i>Allium sativum</i>) to potassium application in loamy sand alluvial soil. <i>Ind J Agri Sci</i> 91(7) :951-955.	6.21
1154	Gautam A K, Avasthi S, Verma R K, Devadatha B, Jayawardena R S, Sushma, Ranadive K R, Kashyap P L, Bhadauria R, Prasher I B, Sharma V K, Niranjana M and Jeewon R (2021). Indian Pucciniales: taxonomic outline with important descriptive notes. <i>Mycosphere</i> 12(1) , 89–162, Doi 10.5943/Mycosphere/12/1/2.	8.09
1155	Gautam A, Singh V and Aulakh G S (2021). Performance of Paddy Cultivation under Different Methods in South-Western Part of Punjab, India. <i>Ind J Ext Edu</i> 57(4) : 131-134.	5.95
1156	Gautam T, Kumar K, Agarwal P, Tyagi S, Jaiswal V, Gahlaut V, Kumar S, Prasad P, Chhuneja P, Balyan H S (2021). Development of white-grained phs-tolerant wheats with high grain protein and leaf rust resistance. <i>Molecular breeding</i> 41 , https://doi.org/10.1007/s11032-021-01234-z .	9.3
1157	Geetanjali, Kumar P and Kaur P (2021). Contract farming of potato in Punjab: A Comparative study. <i>Ind J Ext Edu</i> 57(03) : 32–36.	5.95
1158	Ghuman L and Ram H (2021). Enhancing wheat (<i>Triticum aestivum</i> L.) grain yield and quality by managing lodging with growth regulators under different nutrition levels. <i>Journal of Plant Nutrition</i> 44 (13) : 1916-1929	7.13
1159	Gill JS (2021). Rapeseed and Pulses Demonstrations as Cultivation Push in District Ferozepur of Punjab. <i>Ind J Ext Edu</i> 57(4) : 18-22.	5.95

1160	Gill K S, Kaur G, Kaur G, Kaur J, Kaur S S, Kaur K, Kaur G, Sharma M, Bansal M, Chhuneja P (2021). Development and validation of kompetitive allele-specific pcr assays for erucic acid content in indian mustard [Brassica Juncea (l.) Czern and coss.]. <i>Frontiers in plant science</i> 12 , https://doi.org/10.3389/fpls.2021.738805 . Impact Factor: 6.627	12.63
1161	Gill M K, Kocher G S, Panesar AS (2021). Optimization of acid-mediated delignification of corn stover, an agriculture residue carbohydrate polymer for improved ethanol production. <i>Carbohydrate Polymer Technologies and Applications</i> 2 : 100029.	14.00
1162	Gill N K, Sharma P and Sardana V (2021). Nitrogen metabolising enzymes and photosynthetic pigments as influenced by nitrogen application in oilseed rape (Brassica napus L.). <i>J Agricultural Science and Technology</i> B11 : 95-108.	7.10
1163	Gill R S, Singh S, Hans V S and Mittal T C (2021). Turmeric (Curcuma longa) drying in natural circulation solar dryer: an experimental evaluation. <i>Journal of Food Process Engineering</i> , https://doi.org/10.1111/jfpe.13765	7.20
1164	Gill R S, Hans V S and Singh R P (2021). Optimization of artificial roughness parameters in a solar air heater duct roughened with hybrid ribs. <i>Applied Thermal Engineering</i> 191 : 116871.	10.70
1165	Gill R, Sandhu P S and Sharma P (2021). Genetic and pathogenic variability among Sclerotinia sclerotiorum isolates of rapeseed-mustard. <i>Agri Res J</i> 58 : 460-67.	5.44
1166	Gill R, Sandhu P S, Sharma S and Sharma P (2021). Pathogenicity determinants of Sclerotinia sclerotiorum and their association to its aggressiveness on Brassica juncea. <i>Plant Pathology J</i> 37 (4): 365-374.	7.57
1167	Ginwal P and Sharma P (2021). Effectiveness of personal versus online extension methods in disseminating knowledge on household waste management. <i>Ind J Ext Edu</i> 58(2) : 120-23.	5.95
1168	Ginwal P and Sharma P (2021). Survival under heaps of trash- A scheme of household waste management. <i>J Community Mobilization and Sustain Dev</i> 17(1) :1-6.	5.67
1169	Goel V, Hans V S, Singh S, Kumar R, Pathak S, Singla M, Bhattacharyya S, Almatrafi E, Gill RS and Saini RP (2021). A comprehensive study on the progressive development and applications of solar air heaters. <i>Solar Energy</i> 229 : 112-147.	13.13
1170	Gopal V, Gosal S K and Kaur J (2021). Diversity of nitrogen fixing bacteria in rhizospheric soils of citrus–poplar cropping system of Punjab. <i>Ind J Agroforestry</i> 23(1) :5-12.	5.19
1171	Goyal L, Kaushal S and Dhillon N K (2021). Nematicidal potential of Citrus reticulata peel essential oil, isolated major compound and its derivatives against Meloidogyne incognita. <i>Arch Phytopathol Plant Prot</i> 54(9-10) : 449-467.	6.563
1172	Goyal R and Kahlon M S (2021). Soil physico-chemical properties and water productivity of maize as affected by biochar application under different irrigation regimes in north-west India. <i>Communication in Soil Science and Plant Analysis</i> , https://doi.org/10.1080/0013624.2022.2039179 .	7.33
1173	Green A S, Dixit S, Garg K K, Sandya N R, Singh G, Vatta K, Whitbread A M, Jones M K, Singh R N and Petrie C A (2021). An interdisciplinary framework for using archaeology, history and collective action to enhance India’s agricultural resilience and sustainability. <i>Environmental Research Letters</i> 15 : 105021.	12.79
1174	Grewal G K, Joshi N and Suneja Y (2021). Pathogenicity of Metarhizium rileyi (Farlow) Kepler, S.A. Rehner and Humber isolates against Spodoptera litura (Fabricius) and their extracellular enzymatic activities. <i>Egy J Biological Pest Control</i> 31 : 59.	6.16
1175	Grover K S, Pal R K, Kingra P K and Mishra S K (2021). The effect of heat and moisture stress on wheat and possible mitigation strategies using CERES-wheat model. <i>Mausam</i> 72(2) : 435-442.	6.37



1176	Gulati D, Satpute S, Kaur S and Aggarwal R (2021). Estimation of potential recharge through direct seeded and transplanted rice fields in semi-arid regions of Punjab using HYDRUS 1D. <i>Paddy and Water Environment</i> : 1-4, https://doi.org/10.1007/s10333-021-00876-1 .	7.26
1177	Gupta A and Jhanji S (2021). Tinting efficiency of different food colours in relation to physiological and post harvest quality parameters in Tuberose. <i>Ind J Agri Sci</i> 91(1) :154-158.	6.25
1178	Gupta A, Banga G and Kumar B (2021). Influence of social media on consumer buying decision process. <i>Ind J Econ Dev</i> 17(1) : 120-127.	5.15
1179	Gupta A, Sharma S and Reddy V K S (2021). Quinoa protein isolate supplemented pasta: Nutritional, physical, textural and morphological characterization. <i>LWT - Food Sci Technol</i> 135 : 1-7.	12.06
1180	Gupta A, Singh P, Singh G, Sekhon B S and Sodhi G P S (2021). On farm testing of rice residue management techniques for wheat (<i>Triticumaestivum</i> L.) establishment in Punjab. <i>Ind J Ext Edu</i> 57(4) : 85-88.	5.95
1181	Gupta D, Kashyap G, Ashutosh M, Ashutosh, Punetha M, Para I, Pal R (2021). Minerals response to transportation stress at different flocking densities in hot humid and winter seasons and the assessment of ameliorative effect of pretreatment with vitamin C, electrolyte and jaggery in goats. <i>Biological Rhythm Research</i> : 52(2) , 171-185.	7.36
1182	Gupta M, Kaur G and Singh H (2021). Phenology and yield attributes of cape gooseberry as affected by plant density. <i>Agri Res J</i> 58(5) :840-44.	5.44
1183	Gupta M, Rattanpal HS, Singh G and Kaur T (2021). Chemical weed control in mandarin (<i>Citrus reticulata</i> Blanco) cv. Kinnow under subtropical conditions. <i>Agri Res J</i> 58(4) :678-84.	5.44
1184	Gupta M, Varinder, Rattanpal H S, Singh G and Arora A (2021). Influence of potassium sorbate with wax coatings on post -harvest life of Kinnow mandarin under ambient conditions. <i>Agri Res J</i> 58(6) :1093-99.	5.44
1185	Gupta N, Humphreys E, Eberbach PL, Balwinder-Singh, Sudhir-Yadav and Kukal S S (2021). Effects of tillage and mulch on soil evaporation in a dry seeded rice-wheat cropping system. <i>Soil & Tillage Research</i> 209 : 104976.	13.37
1186	Gupta N, Pal R K and Kour A (2021). Performance of high density planting of kinnow in response to integrated nutrient management in south-western Punjab. <i>Agri Res J</i> 58(2) : 252-259.	5.44
1187	Gupta R and Shilla K (2021). FPO: Harvest the profits of collectivisation. <i>J Community Mobilization and Sustain Dev</i> 16(3) : 1042 –1044.	5.67
1188	Gupta S and Kaur H (2021). Workplace Facilities: A corrected Parameter of Satisfaction of Polyhouse Workers of Ludhiana District. <i>J Community Mobilization and Sustain Dev</i> 17(2) : 609-14.	5.67
1189	Gupta V, Gupta M, Kour S and Sandhu S S(2021). Agromet indices and response of varieties of wheat (<i>Triticum aestivum</i>) to sowing environments and nitrogen levels under irrigated lower hills of North-West plains of Shiwaliks. <i>Ind J Agron</i> 66 : 25-32.	5.55
1190	Gupta N, Gupta M, Akhtar J, Goyal A, Kaur R, Sharma S et al. (2021). Association genetics of the parameters related to nitrogen use efficiency in Brassica juncea L. <i>Plant Molecular Biology</i> 105 : 161-175.	10.335
1191	Hari G, Sharma P, Yadav I, Kaur S, Chhuneja P (2021). Highly conserved tapstol5as-1, a wheat ortholog of ospstol1 has undergone a high selection pressure. <i>J plant biochemistry and biotechnology</i> 30 :297–303.	7.53
1192	Hasam H, Kaur S, Kaur H, Kaur N, Kaur T, Aulakh C S and Bhullar M S (2021). Weed management using tillage, seed rate and bed planting in durum wheat (<i>Triticum durum</i> Desf.) under an organic agriculture system. <i>Archives of Agronomy and Soil Sci</i> , DOI: 10.1080/03650340.2021.1946041.	8.14

1193	Hossain A, Skalický M, Brestič M, Maitra S, Sarkar S, Ahmad Z, Vemuri H, Mondal M, Garai S, Bhatt R, Kumar P, Banerjee P, Saha S, Islam T and Laing A (2021). Selenium biofortification: role, responses, prospects, and mechanisms. <i>Molecules</i> 26 : 881.	10.41
1194	Hunjan M S, Kamboj I, Lore J S, Bhatia G and Pannu P P S (2021). Expression of defense related enzymes in rice near isogenic lines IRBB4 and IRBB7 challenged with <i>Xanthomonas oryzaepv. oryzae</i> at elevated temperature. <i>Ind Phytopathology</i> , DOI: https://doi.org/10.1007/s42360-020-00304	5.92
1195	Jain J, Sohal M K, Lore J S, Jain S, Sidhu N and Upmanyu S (2021). Identification and quantification of slow blasting resistance in basmati/aromatic rice germplasm against neck blast (<i>Pyriculariaoryzae</i> Cavara). <i>Ind J Genet</i> 81(4) : 505-512.	6.55
1196	Jain N, Utreja D, Kaur K and Jain P (2021). Novel derivatives of nicotinic acid as promising anticancer agents. <i>Mini Rev Med Chem</i> 21(7) : 847-82.	9.862
1197	Jain R K and Nanda A K (2021). Permeability status of sand along with pond ash: A Study. <i>Design Engineering</i> . 21(08) : 17315-321.	7.409
1198	Jain S, Singh G, Jindal V and Singh A (2021). Resolving the etiological conundrum of gummy stem, sudden death and leaf blight syndromes of bottle gourd in Indo-gangetic plains of India. <i>Journal of Plant Pathology</i> 103 : 433-441	7.15
1199	Jain V and Sharma S (2021). Protein quality parameters and storage protein profiling of mungbean interspecific lines (<i>Vigna radiata</i> L. Wilczek). <i>Genetika</i> 53(3) :1341-1356.	6.46
1200	Jain V and Sharma S (2021). Mung bean x rice bean and mung bean x urd bean interspecific lines are nutritionally comparable to mung bean cultivars. <i>J Food Comp Anal</i> 104(4) : 104171.	9.72
1201	Jakhu P, Sharma P, Yadav I S, Kaur P, Kaur S, Chhuneja P, Singh K (2021). Cloning, expression analysis and in silico characterization of hsp101: a potential player conferring heat stress in <i>Aegilops speltoides</i> (tausch) gren. <i>Physiology and Molecular Biology of Plants</i> 27 , DOI:10.1007/s12298-021-01005-2.	9.02
1202	Jalota S K, Vashisht B B and Kaur S (2021). Field water budget of crops as influenced by soil texture, climate change and management interventions. <i>Agri Res J</i> 58(3) :373-82.	5.44
1203	Jasmeen, Utreja D, Dhillon N K and Kaur K (2021). Synthesis and evaluation of dihydropyrimidinones and their derivatives against root knot nematode <i>Meloidogyne incognita</i> . <i>Ind J Heterocycl Chem</i> 31(4) : 543-550.	6.27
1204	Jassal A and Sharma S (2021). Strengthening oil quality and stability features by blending canola, sunflower and sesame oil. <i>Agri Res J</i> 58(6) :1077-1085.	5.44
1205	Jassal K, Kaushal S, Rashmi and Rani R (2021). Antifungal potential of guava (<i>Psidium guajava</i>) leaves essential oil, major compounds: betacaryophyllene and caryophyllene oxide. <i>Archives of Phytopathology and Plant Protection</i> 3 : 2034-2050	6.73
1206	Jatana B S, Ram H, Gupta N and Kaur H (2021). Wheat response to foliar application of salicylic acid at different sowing dates. 36:369-388 DOI: 10.1080/15427528.2021.1971131.	7.14
1207	Jha P, Lakaria B L, Vishwakarma A K, Wanjari R H, Mohanty M, Sinha N K, Somasundaram J, Dheri G S, Dwivedi A K, Sharma R Pand Singh M (2021). Modeling the organic carbon dynamics in long-term fertilizer experiments of India using the Rothamsted carbon model. <i>Ecological Modelling</i> 450 :109562.	8.50
1208	Jha S N, Jaiswal P, Kumari L, Kaur J, Ramya H G and Lawnia S (2021). Detection and quantification of patulin in apple juice using fourier transform infrared spectroscopy. <i>Agric Res</i> 10 : 314-23.	5.90
1209	Jhanji S and Dhatt U K (2021). Phytoremediation of indoor air pollutants: Harnessing the potential of plants beyond aesthetics. <i>J Hort Sci</i> 16(2) : 131-143.	5.08
1210	Jhanji S, Shukla A, Dhatt K K and Shukla P (2021). The road to success of floriculture through mapping of Micronutrient status of flower producing zones in India. <i>Ind J Agri Sci</i> 91(5) : 666-672.	6.37



1211	Jindal J, Aggarwal N and Kumar A (2021). Efficacy of thiamethoxam 30 FS seed treatment against shoot fly <i>therigona naqvisteyskal</i> in spring maize. <i>Ind J Ent</i> 83 (10) : 339-344.	5.00
1212	Jindal J, Sharma K P, Shera P S and Cheema H K (2021). Native parasitoids of fall army worm <i>Spodoptera frugiperda</i> (J E Smith) in maize. <i>Ind J Ent</i> , DoI.: 10.5958/IJE.2021.72	5.89
1213	Jindal S K, Dhaliwal M S, Vikal Y, Meena OP (2021). Species diversity of genus capsicum using agromorphological descriptors and simple sequence repeat markers. <i>Indian J Exp Bio</i> 59 :906-915.	6.94
1214	Jindal S K, Garg N, Singh P, Kaur S and Jain S (2021). Evaluation of promising tomato hybrids having resistance to late blight and root knot nematodes in diverse agro climatic zones of Punjab. <i>Agri Res J</i> 58(5) : 768-773.	5.44
1215	Jiwan, Sharma R and Walia SS (2021). Weed composition and nutrient uptake by weeds in sole and intercrops during rabi season. <i>Ind J Ecol</i> 48(1) : 300-303.	5.79
1216	Johar V, Dhillon RS, Ahlawat KS and Singh A (2021). Studies on the effect of different doses of nitrogen on quality parameters of wheat under Eucalyptus based agri-silvi-horticultural system. <i>Ind J Ecology</i> 48(5) : 1313-1322.	5.55
1217	Joshi N, Kocher G S, Kalia A and Banga H S (2021). <i>Bacillus circulans</i> MTCC 7906 aided facile development of bio conjugatenano-silica alkaline protease formulation with superlative dehairing potential. <i>Environmental Pollution</i> 285(1) :117181, DOI: 10.1016/j.envpol.2021.117181.	12.79
1218	Kahlon P, Yadav B K and Sharma S (2021). Assessment of dehydrogenase and phosphatase activities under cotton-wheat and rice-wheat cropping systems in Sangat block of Bathinda district, Punjab. <i>J Ind Soc Soil Sci</i> 69 : 96-104.	5.31
1219	Kalia A, Kaur J, Tondey M, Manchanda P, Bindra P, Alghuthaymi M A, Shami A and Abd-El-salam K A (2021). Differential antimycotic and antioxidant potentials of chemically synthesized zinc-based nano particles derived from different reducing/complexing agents against pathogenic fungi of maize crop. <i>Journal of Fungi</i> 7(3) : 223.	10.62
1220	Kallummal M and Mouzam S M (2021). Indo-Japan Comprehensive Economic Partnership Agreement (IJCPEA): Lessons for India's access to agricultural markets. <i>Agri Econ Res Rev</i> 34(1) .	5.84
1221	Kannu P, Sharma P, Choudhary O P and Sardana V (2021). Regulation of salinity tolerance in Brassica juncea (L.) introgression lines: Osmoprotectants, antioxidative molecules and ionic content. <i>GSC Advanced Research and Reviews</i> 6(3) : 116–131.	8.64
1222	Kanwal V, Sirohi S and Chand P (2021). Farmers' perception on climate extremes and their coping mechanism: evidences from disaster prone regions of India. <i>Indian Journal of Traditional Knowledge</i> 20(2) : 512-519.	7.09
1223	Karedla A K, Choudhary A, Chhuneja P K and Singh J (2021). Effect of thiamethoxam on the survival of brood in <i>Apis mellifera</i> Linnaeus colonies placed in mustard fields. <i>Journal of Apicultural Research</i> , 10.1080/00218839.2021.1958565	7.36
1224	Kataria A, Sharma S and Dar B N (2021). Changes in phenolic compounds, antioxidant potential and antinutritional factors of Teff (<i>Eragrostis tef</i>) during different thermal processing methods. <i>Int J Food Sci Technol</i> 57 : 6893-6902.	9.61
1225	Kataria A, Sharma S, Singh A and Singh B (2021). Effect of hydrothermal and thermal processing on the antioxidative, antinutritional and functional characteristics of <i>Salvia hispanica</i> . <i>J Food Meas Charact</i> 16 : 332-43.	9.01
1226	Kataria S K and Singh G (2021). Efficacy of biorational insecticides against spotted boll-worm, <i>Earias</i> spp. in okra. <i>Ind J Ent</i> , e21061, DoI: 1.5958/IJE 2021.84	5.89
1227	Katyal P, Kaur A and Chandel S (2021). Lignocellulose-rich spent mushroom compost for biosorption of heavy metals from effluent samples. <i>Cellulose Chem Tech</i> 55(3-4) : 433-42.	6.00

1228	Kaur P , Devgan K , Kumar N , Kaur A , Kumar M and Sandhu K (2021). Quality retention and shelf-life prolongation of cucumbers (<i>Cucumissativus</i> L.) under different cool storage systems with passive modified atmosphere bulk packaging. <i>Packag Technol Sci</i> : 1-12, (DOI: 10.1002/pts.2595)	7.19
1229	Kaur A and Chandi R S (2021). Management of fruit borer <i>Helicoverpa armigera</i> (Hubner) on chilli with safer insecticides. <i>Ind J Ent</i> 83(3) : 451-53.	5.89
1230	Kaur A and Katyal P (2021). Microbial interventions for composting of organic and lingo cellulose waste. <i>Appl Biochem Microbio</i> 57(1) : 127.	7.02
1231	Kaur A and Kaur L (2021). Environment, Health and social impact of Talwandi Sabo Power Plant Limited (TSPL) Mansa. <i>J Community Mobilization and Sustain Dev</i> 16(2) : 587-590.	5.67
1232	Kaur A and Sharma V K (2021). Cross infectivity of <i>Helmintho sporium</i> isolates occurring on barley and other graminaceous host. <i>Agri Res J</i> 58 : 75-81.	5.44
1233	Kaur A D and Goyal M (2021). Metabolic adjustments in forage oats (<i>Avena sativa</i> L.) genotypes under different sowing windows. <i>Physiol Mol Biol Plants</i> 27 (12) : 2709-2725, http://dio.org/10.1007/s12298-21-01118-8 .	8.01
1234	Kaur A, Bhatia S and Alam M S (2021). Influence of edible coatings and packaging on quality and shelf-life of carrot stored under ambient conditions. <i>Agri Res J</i> 58(2) : 280-290.	5.44
1235	Kaur A, Chandi R S and Sharma S (2021). Lesenta 80 WG (fipronil 40% + imidacloprid 40% WG) against termite in Chilli. <i>Pesticide Res J</i> 33(1) : 19-24.	5.49
1236	Kaur A, Chhuneja P, Srivastava P, Singh K, Kaur S (2021). Evaluation of <i>Triticum durum</i> – <i>Aegilops tauschii</i> derived primary synthetics as potential sources of heat stress tolerance for wheat improvement. <i>Plant Genetic Resources</i> 19(1) : 74-89.	7.28
1237	Kaur A, Goyal M, Kaur M and Mahal A K (2021). Interactive effect of planting dates and development stages on digestibility, qualitative traits and yield of forage oat (<i>Avena sativa</i> L.) genotypes. <i>Cereal Res Commun</i> 50 :1237-1247.	6.81
1238	Kaur A, Kaur K and Jhanji S (2021). Partitioning of zinc and its associated metabolites in zinc efficient and inefficient rice (<i>Oryza sativa</i> L.) genotypes. <i>J Pl Nut</i> 44 :337-50.	6.75
1239	Kaur A, Kaur N, Singh H, Murria S and Kaur S (2021). Efficacy of plant growth regulators and mineral nutrients on fruit drop and quality attributes of plum cv. Satluj purple. <i>Plant Physiol Rep</i> 26 : 541-47.	5.50
1240	Kaur A, Kaur P and Kumar P (2021). Status of paddy straw management technologies in Punjab. <i>Ind J Ext Edu</i> 57(1) : 78–83.	5.95
1241	Kaur A, Lore J S, and Sandhu J S (2021). Transient assay for validating the efficacy of anti-fungal genes in plant cells rapidly against phyto pathogens. <i>Agri Res J</i> 58 : 487-492.	5.44
1242	Kaur A, Sharma S and Singh N (2021). Biochemical changes in pear fruits during storage at ambient conditions. <i>Adv Hort Sci</i> 35(3) :293-303.	6.54
1243	Kaur A, Sharma V K and Sharma S (2021). Management of spot blotch of barley: An eco-friendly approach. <i>Australasian Plant Pathology</i> , Doi https://doi.org/10.1007/s13313-021-00785-1 .	7.42
1244	Kaur B, Garcha K S, Chahal G K and Dhatt A S (2021). Study on pre-fertilization barriers in the inter specific hybridization between <i>Cucurbita pepo</i> L. and <i>C. moschata</i> Duchesne. <i>Agri Res J</i> 58 : 594-602.	5.44
1245	Kaur B, Kaur N, Singh J, Gill K K, Saha S and Bhan S C (2021). Forecasting mean monthly maximum and minimum air temperature of Jalandhar district of Punjab, India using seasonal ARIMA model. <i>J Agrometeorology</i> 24(1) : 42-49.	6.37
1246	Kaur B, Singh K and Garg L (2021). Constraints in adoption of polyhouse technology among farmers in Jalandhar district of Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 : 966-970.	5.67
1247	Kaur B, Singh S P, Kingra P K and Setia R K (2021). Spatio-temporal variability in climatic parameters in trans-gangetic plains of India. <i>Int J Ecol and Environ Sci</i> 3(4) : 93-99.	5.31



1248	Kaur D and Gupta M (2021). Banks and insurance companies' preference for firm specific attributes: A study of Indian equity market. <i>Ind J Econ Dev</i> 17 : 143-50.	5.15
1249	Kaur D, Kingra HS, Kaur M, Mahal A K and Saini R (2021). Socio-economic characteristics of peasantry of Sub-mountainous Punjab. <i>Ind J Econ Dev</i> 17 (3): 576-83.	5.15
1250	Kaur E, Bhardwaj R D, Kaur S, Grewal S K (2021). Drought stress-induced changes in redox metabolism of barley (<i>Hordeum vulgare</i> L.). <i>Biologia Futura</i> 72 : 347-358.	6.59
1251	Kaur G and Mittal R (2021). Gender mapping in vegetable cultivation in Sangrur and Patiala districts of Punjab. <i>Ind J Ext Edu</i> 57 (4):1-6.	5.30
1252	Kaur G, Joshi N, Suneja Y (2021). Pathogenicity of <i>Metarhizium rileyi</i> (Farlow) Kepler, SA Rehner and Humber isolates against <i>Spodopteralitura</i> (Fabricius) and their extracellular enzymatic activities. <i>Egyptian J Biological Pest Control</i> 31 :59-63	6.763
1253	Kaur G, Goswami T K (2021). Physical and sensory characteristics of low sugar dairy dessert (rasgulla) developed at different level coconut sap syrup. <i>J Food Sci Technol</i> 58 :343–348, https://doi.org/10.1007/s13197-020-04547-7 .	9.12
1254	Kaur G, Kalia A and Sodhi H S (2021). Conformational, antioxidant and antibacterial properties of polysaccharides extracted from edible mushrooms of <i>Pleurotus</i> species. <i>Agri Res J</i> 58 (6): 1071-1076.	5.44
1255	Kaur G, Kapoor R, Sharma P, Srivastava P (2021). Molecular characterization of oats (<i>Avena sativa</i> L.) germplasm with microsatellite markers. <i>Indian J Genetics and Plant Breeding</i> 81 (1): 144-147.	7.34
1256	Kaur G, Kaur L and Kaur A P (2021). Interpersonal relations of old aged people with their families in Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 (1): 33-38.	5.67
1257	Kaur G, Kaur P and Mahal AK (2021). Preserving bioactive quality and colour of novel frozen lemongrass puree tablets. <i>Journal of Food Processing and Preservation</i> 46 (9).	8.61
1258	Kaur G, Pathak M, Singla D, Sharma A, Chhuneja P, Sarao N K (2021). High-density gbs-based genetic linkage map construction and qtl identification associated with yellow mosaic disease resistance in bitter melon (<i>Momordica charantia</i> L.). <i>Frontiers in plant science</i> 12 , https://doi.org/10.3389/fpls.2021.671620 . Impact Factor: 6.627	12.63
1259	Kaur G, Sharma S, Mir S A and Dar B N (2021). Nano composite films: A “greener alternate” for food packaging. <i>Food & Bio processing Technology</i> 14 :1013–1027.	9.35
1260	Kaur G, Singh P and Sharma S (2021). Physical, Morphological and Storage studies of Cinnamon based Nano emulsions developed with Tween 80 and soy lecithin: A comparative study. <i>Journal of Food Measurement and Characterization</i> 15 :2386–2398.	7.47
1261	Kaur G, Singh S P, Setia R K and Kingra P K (2021). Delineation of maize growing areas vis-à-vis climate and technology using statistical and geospatial techniques in Punjab. <i>J Agrometeorology</i> 23 (1): 93-99.	6.47
1262	Kaur G, Vikal Y, Kaur L , Kalia A, Mittal A, Kaur D, Yadav I (2021). Elucidating the morpho-physiological adaptations and molecular responses under long-term waterlogging stress in maize through gene expression analysis. <i>Plant Science</i> 304 , https://doi.org/10.1016/j.plantsci.2021.110823 .	11.36
1263	Kaur H and Gupta N (2021). Influence of proline and ascorbic acid on seed germination behaviour of tomato (<i>Solanum lycopersicum</i> L.) under salt stress. <i>Agri Res J</i> 58 : 1053 -59.	5.44
1264	Kaur H and Kaur P (2021). Comparison of extraction procedures for the determination of meso sulfuron methyl and iodo sulfuron methyl sodium from soil and wheat using Response surface methodology. <i>Microchemical J</i> 168 : 106456.	9.59
1265	Kaur H, Bhardwaj U and Kaur R (2021). <i>Cymbopogon nardus</i> essential oil: A comprehensive review on its chemistry and bioactivity. <i>J Essen Oil Res</i> 33 (3): 205-20.	7.15
1266	Kaur H, Bhardwaj U, Kaur R and Kaur H (2021). Chemical composition and antifungal potential of <i>Citronella</i> (<i>Cymbopogon nardus</i>) essential oil and major compounds. <i>J Essent Oil Bear Plants</i> 24 (3): 571-81.	6.81

1267	Kaur H, Keshani and Kocher G S (2021). Flavour profiling of red wine with respect to different strains of yeast. <i>Ind J Hort</i> 78(3) : 325-329.	6.16
1268	Kaur H, Kingra P K and Singh SP (2021). Long-term variability in evapo transpiration and water productivity of kharif maize in central and sub-mountainous Punjab. <i>Agri Res J</i> 58(2) : 207-215.	5.44
1269	Kaur H, Kumar M and Choudhary A (2021). Artificial “T- perches” as attractant for insectivorous birds against <i>Helicoverpa armigera</i> Hubner. <i>Ind J Ent</i> , DOI: 10.5958/0974-8172.2021.00183.8	5.08
1270	Kaur H, Singh B and Singh A (2021). Comparison of dietary fibers obtained from seven Indian cereal grains. <i>J Cereal Sci</i> 102 : 103331.	8.94
1271	Kaur H, Singla N and Jain R (2021). Role of nutrition counseling and lifestyle modification in managing prediabetes. <i>Food Nutr Bull</i> 42 :584-96.	7.49
1272	Kaur H, Singla N and Mahal AK (2021). Anti fertility effect of cereal based bait containing papaya (<i>Carica papaya</i> L.) seed powder in male lesser bandicoot rat, <i>Bandicota bengalensis</i> and its reversibility. <i>Indian J Exp Biol</i> 59(7) : 448-57	6.78
1273	Kaur I, Singh K, Garg L and Singh H (2021). Adoption of Kitchen gardening by the farmers trained by KVK Jalandhar. <i>J Community Mobilization and Sustain Dev</i> 16 : 307-12.	5.67
1274	Kaur J and Aulakh G S (2021). Impact analysis of frontline demonstrations on summer mungbean production in Ferozepur District of Punjab, India. <i>Ind J Ext Edu</i> 57(2) : 253-257.	5.95
1275	Kaur J and Kaur P (2021). Comparison of climate change in past versus future as simulated by FIO-ESM model under RCP based emission scenarios at different locations in Punjab. <i>Int J Ecology Env Sci</i> 3(2) :16-23.	5.18
1276	Kaur J and Pathania M (2021). Bio efficacy of insecticides for the management of termites in wheat under semi-arid irrigated conditions of south-western Punjab. <i>Pesticide Res J</i> 33(1) : 120-124.	5.49
1277	Kaur J, Aggarwal N and Kular J S (2021). Abundance and diversity of arthropods in transgenic Bt and non-Bt cotton fields under Indian conditions. <i>Phytoparasitica</i> 49 (1) 61-72. http://doi.org/10.1007/s12600-020-00874-9 .	7.81
1278	Kaur J, Kaur J, Dhillion G S, Kaur H, Singh J, Bala R, Srivastava P, Kaur S, Sharma A, Chhuneja P (2021). Characterization and mapping of spot blotch in <i>Triticum durum</i> – <i>Aegilops speltoides</i> introgression lines using snp markers. <i>Frontiers in plant science</i> 12 , doi: 10.3389/fpls.2021.650400.	12.63
1279	Kaur J, Kaur M, Ubhi M K, Kaur M and Grenche J M (2021). Composition optimization of activated carbon-iron oxide nanocomposite for effective removal of Cr(VI) ions. <i>Mater ChemPhys</i> 258 : 124002.	9.41
1280	Kaur J, Kaur P and Kaur S (2021). Comparison of statistical procedures for bias removal in temperature, solar radiation and rainfall data predicted by CSIRO-MK3-6-0 model in Punjab. <i>Agri Res J</i> 58(2) : 200-206.	5.44
1281	Kaur J, Kaur P and Kaur S (2021). Projected changes in temperature and rainfall during 21st century simulated by CSIRO-Mk-3-6-0 model under RCP based scenarios in Punjab. <i>Mausam</i> 72(3) : 649-660.	6.37
1282	Kaur J, Kumar V, Kumar S, Aggarwal P, Sharma K and Bhadariya V (2021). Process Optimization for The Preparation of Tea And Fruit-Oriented Energy Drink: A Nutritional Approach. <i>J Food Proc Preserv</i> 45(4) :15363.	8.61
1283	Kaur J, Pathak M and Pathak D (2021). Inheritance of resistance to yellow vein mosaic virus disease in interspecific crosses of <i>Abelmoschus</i> . <i>Ind J Agri Sci</i> 90(12) :2302-2306.	6.25



1284	Kaur J, Prusty A K, Ravisankar N, Panwar A S, Shamim M, Walia S S, Chatterjee S, Pasha M L, Babu S, Jat M L, Lopez-Ridaura S, Groot JCJ, Toorop R A, Escoto LB, Nopur K and Kashyap P (2021). Farm typology for planning targeted farming systems interventions for smallholders in IndoGangetic Plains of India. <i>Scientific Reports</i> 11 :20978, https://doi.org/10.1038/s41598-021-00372 .	11.00
1285	Kaur J, Ram H and Kumar V (2021). Productivity, growth and profitability of wheat (<i>Triticum aestivum</i> L.) as influenced by tillage, varieties and precision nitrogen management practices in India. <i>Ind J Agri Sci</i> 92 : 118-22.	6.37
1286	Kaur J, Sandhu S S, Sharma S (2021). Yield response of wheat grown under periodic heat stress imposed by using mini heat tents. <i>Journal of Agronomy and Crop Science</i> 207 :285–303.	9.06
1287	Kaur J, Sharma R, Kaur R (2021). Propagation of <i>Terminalia chebula</i> from explants and seeds collected from different agro-ecological regions of north-western states of India. <i>Vegetos</i> , 1-10.	5.27
1288	Kaur J, Sharma R, Sharma M and Chhabra R (2021). Evaluation of physiological and biochemical changes in garlic (<i>Allium sativum</i> L.) bulbs stored under different temperature conditions. <i>Plant Physiology Reports</i> : 1-7	12.90
1289	Kaur J, Singh K, Singh K G, Sharma S P and Talwar D (2021). Effect of drip irrigation, fertigation and mulch on quality of muskmelon. <i>Agri Res J</i> 58 : 1060-64.	5.44
1290	Kaur K and Vashishat N (2021). Nanoemulsified <i>Eucalyptus globulus</i> essential oil against mosquito <i>Aedes aegypti</i> (L.). <i>Ind J Ent</i> , DOI: https://doi.org/10.5958/0974-8172.2021.00083.3	5.89
1291	Kaur K, Dhadd A S and Sharma M (2021). Inheritance of allo plasmic fertility restoration in eggplant (<i>Solanum melongena</i> L.). <i>Genetic Resources and Crop Evolution</i> 68 : 1949-60.	7.07
1292	Kaur K, Goyal K, Arora K and Kaur G (2021). Genotypic variations in nitrate respiration along with potassium nitrate treatment - accountable for water logging tolerance in maize. <i>Biologia</i> 76 : 1651-1660.	6.81
1293	Kaur K, Gupta M, Vikal Y, Singh K, Neelam K (2021). Callose depositions underlie the incompatible reaction in inter generic crosses of rice. <i>Plant Genetic Resources</i> 19 (5): 447-452.	7.28
1294	Kaur K, Kaur M, Ubhi M K and Kaur P (2021). Comparative studies on adsorptive and photocatalytic potential of differently synthesized ferric oxide nanoparticles for malachite green. <i>Water Sci Technol</i> 84 (10-11): 2857-2870.	7.64
1295	Kaur K, Utreja D, Dhillon N K, Pathak R K, Singh K (2021). N-alkyl isatin derivatives: Synthesis, nematocidal evaluation and protein target identifications for their mode of action. <i>Pest Biochem Physiol</i> 171 : 104736.	8.75
1296	Kaur K, Grewal S K, Singh S, Rani U and Bhardwaj R D (2021). Timing and intensity of up regulated defensive enzymes is a key factor determining resistance in chickpea to <i>Ascochyta rabiei</i> . <i>Physiol Mol Plant Pathol</i> 114 : 101645	7.65
1297	Kaur K, Sharma P, Kaur I and Sardana V (2021). Nitrogen impact on morpho-physiological Traits and yield of Indian mustard (<i>Brassica juncea</i>) genotypes. <i>J Agric Sci Tech</i> 11 : 1-14.	6.22
1298	Kaur L and Kaur P (2021). Degradation of imazethapyr in soil: Impact of application rate, soil physicochemical properties and temperature. <i>Int J Environ Sci Technol</i> , https://doi.org/10.1007/s13762-021-03137-0 .	8.54
1299	Kaur L, Kaur A and Brar A S (2021). Water use and productivity of green gram (<i>Vigna radiata</i> L.) impacted by paddy straw mulch and irrigation regimes in north-western India. <i>Agricultural Water Management</i> 258 : 1-8.	10.52
1300	Kaur L, Kaur K and Kaur S (2021). Action Research in Social Science. <i>Ind Res J Ext Edu</i> 21 (1):128-134.	5.67

1301	Kaur L, Utreja D and Dhillon N K (2021). N-alkylation of 2-substituted benzimidazole derivatives and their evaluation as antinemic agents. <i>Russ J Org Chem</i> 57(6) : 961-967.	6.723
1302	Kaur M and Anand A (2021). Perception of Teachers Regarding Gaps in Student Competencies for Industrial and Farmers' Needs. <i>Ind J Ext Edu</i> 57(3) : 65-70.	5.95
1303	Kaur M and Mahal A K (2021). Export of tea from India: Performance and determinants. <i>Ind J Econ Dev</i> 17(3) : 700-03.	5.15
1304	Kaur M and Oberoi H K (2021). Evaluation of fodder productivity, grain yield and economics of dual-purpose wheat and single cut Egyptian clover intercropping system. <i>Agri Res J</i> 58 : 535-538.	5.44
1305	Kaur M and Sharma S (2021). Selenium affects protein accumulation and its distribution in different protein fractions in developing wheat grains. <i>Cereal Res Commun</i> 49 :109–117.	6.81
1306	Kaur M, Tak Y, Bhatia S, Asthir B, Lorenzo JM, Amarowicz R (2021). Crosstalk during the carbon–Nitrogen Cycle That interlinks the Biosynthesis, Mobilization and Accumulation of Seed Storage Reserves. <i>Int. J. Mol. Sci.</i> 22 : 12032, https://doi.org/10.3390/ijms222112032	10.56
1307	Kaur M, Aggarwal P and Kumar V (2021). Effect of chilli varieties and storage conditions on quality attributes of honey chilli sauce: a preservation study. <i>J Food Process Preserv</i> e15734 .	8.61
1308	Kaur M, Kaur M, Singh D, Oliveira A C, Garg V K and Sharma V K (2021). Synthesis of CaFe ₂ O ₄ -NGO Nano composite for Effective Removal of Heavy Metal Ion and Photocatalytic Degradation of Organic Pollutants. <i>Nano</i> 11 :1471.	10.32
1309	Kaur M, Kiran Jeet and Kaur M (2021). Facile synthesis of graphene oxide nanocomposites membranes for effective removal of As (III) from water. <i>Journal of Nanoscience and Nanotechnology</i> 21 : 3596–3610.	7.35
1310	Kaur M, Manchanda P, Kalia A, Ahmed F K, Nepovimova E, Kuca K, ABD-Elsalam KA (2021). Agroinfiltration mediated scalable transient gene expression in genome edited crop plants. <i>International journal of molecular sciences</i> 22 :(19):10882.	12.21
1311	Kaur M, Sandhu P S and Singh M (2021). Economic Contribution of Home Makers in the Family Income through their Unpaid Household Work. <i>J Community Mobilization and Sustain Dev</i> 16 : 913-917.	5.67
1312	Kaur M, Sharma P and Sidhu K (2021). Gender Disparity in Awareness and Perception towards Novel Corona Virus (COVID-19). <i>Ind J Ext Edu</i> 57(3) : 86-89.	5.95
1313	Kaur M, Ubhi M K, Grewal J K and Sharma V K (2021). Boron and phosphorous doped graphene nanosheets and quantum dots: Emerging materials as sensors and catalysts in environmental applications: a review. <i>Environ Chem Lett</i> 19 : 4375-4392.	19.61
1314	Kaur M, Ubhi M K, Grewal J K and Singh D (2021). Insight into the structural, optical, adsorptive and photocatalytic properties of MgFe ₂ O ₄ -bentonite nano composites. <i>J Phys Chem Solids</i> 154 : 110060.	9.99
1315	Kaur N and Khanna A (2021). On vibration of bidirectional tapered triangular plate under the effect of thermal gradient. <i>J Mechanics Materials and Structures</i> 16 :49-62.	7.09
1316	Kaur N, Kaur S, Kaur P and Aggarwal R (2021). Impact of climate change on groundwater levels in Sirhind Canal Tract of Punjab, India. <i>Groundwater for Sustainable Development</i> 15 :100670.	11.21
1317	Kaur N, Randhawa H S and Sarao P S (2021). Bioefficacy of biopesticides against lepidopteran pests and their effect on natural enemies in direct seeded rice. <i>Ind J Ecol</i> 83(3) : 360-364.	5.80
1318	Kaur N, Vashist K K, and Brar A S (2021). Energy and productivity analysis of maize-based crop sequences compared to rice-wheat system under different moisture regimes. <i>Energy</i> 216 :119286, doi.org/10.1016/j.energy.2020.119286 .	11.54



1319	Kaur N, Singh B, Kaur H and Gill R I S (2021). Performance of lemongrass in poplar plantation of different spacing throughout its rotation. <i>Ind J Agroforestry</i> 23 (1): 23-27.	5.19
1320	Kaur P and J Sachdeva (2021). Optimal crop planning for conjunctive use of irrigation water in Punjab: A path towards sustainable development. <i>Int J Ecology Env Sci</i> 3 (1): 312-320.	5.18
1321	Kaur P and Ranguwal S (2021). Constraints in adoption of protected cultivation technology in Punjab. <i>Int J Ecology Env Sci</i> 3 (1): 273-279.	5.18
1322	Kaur P and Sandhu S K (2021). Impact of recent weather variability on rice yield in Ludhiana district of Punjab. <i>Agri Res J</i> 58 (3): 441-445.	5.44
1323	Kaur P K, Kalsi H N and Bhullar M S (2021). Evaluation of leaching potential of penoxsulam and bispyribac sodium in Punjab soils under laboratory conditions. <i>Intl J Environ Analytical Chemistry</i> , DOI:10.1080/03067319.2021.1970148.	7.43
1324	Kaur P, Bains K and Kaur H (2021). Protective effect of Indian Herbs and physical exercise on osteoporosis: A Review. <i>Food Reviews Inter</i> , DOI: 10.1080/87559129.2021.0926483.	10.97
1325	Kaur P, Devgan K, Kumar N, Kaur A, Kumar M and Sandhu K (2021). Quality retention and shelf-life prolongation of cucumbers (<i>Cucumissativus</i> L.) under different cool storage systems with passive modified atmosphere bulk packaging. <i>Packaging Technology and Science</i> 34 (9): 567-578, DOI: 10.1002/pts.2595.	8.55
1326	Kaur P, Gupta S, Kaur K, Kaur N, Kumar R and Bhullar M S (2021). Nano emulsion of <i>Foeniculum vulgare</i> essential oil: A propitious striver against weeds of <i>Triticum aestivum</i> . <i>Industrial Crops & Products</i> 168 :113601.	11.65
1327	Kaur P, Kaur K, Devgan K, Kumar M, Sandhu K and Kaur A (2021). Potential of low-dose aqueous ozone treatment and packaging to extend quality and shelf-life of green pea pods under cold storage. <i>J Food Process and Pres</i> 46 (10): 1-16.	7.41
1328	Kaur P, Kumar P and Gill J S (2021). Restraining paddy straw burning through FLDs on happy seeder in Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 (3): 925–928.	5.30
1329	Kaur P, Sachan S and Sharma A (2021). Weed competitive ability in wheat: a peek through in its functional significance, present status and future prospects. <i>Physiol Mol Biol Plants</i> 27 :2165-2179. https://doi.org/10.1007/s12298-021-01079-y	8.01
1330	Kaur P, Sharma S, Gaba J (2021). Preparation and biological activities of novel cuminal dehyde derivatives. <i>Org Prep Proced Int</i> 53 (3): 240-53.	6.85
1331	Kaur P, Shilpa, Kaur H and Bhullar M S (2021). Equilibrium, kinetic and thermodynamic studies on adsorption of penoxsulam in punjab Soils. <i>Soil Contamination</i> , DOI: 10.1080/15320383.2021.1992608.	7.25
1332	Kaur P, Singh S, Khera S and Bhatt R (2021). Improving livelihoods of the wheat farmers through extension activities of Farm Advisory Service Scheme (FASC), Tarn Taran. <i>Ind J Ext Edu</i> 57 (1): 191-195.	5.95
1333	Kaur P, Taggar M S and Kalia A (2021). Characterization of magnetic nanoparticle-immobilized cellulases for enzymatic saccharification of rice straw. <i>Biomass Conversion and Biorefinery</i> 11 : 955-969.	8.60
1334	Kaur P, Taggar M S, Kalia A and Kocher G S (2021). Optimization of solid- state fermentation conditions for cellulase production by <i>Aspergillus fumigatus</i> . <i>Agri Res J</i> 58 (6): 1100-1107.	5.44
1335	Kaur R and Kaur K (2021). Preservation of sweet pepper purees: effect on chemical, bio-active and microbial quality. <i>J Food Sci Technol</i> 58 : 3655–3660.	9.12
1336	Kaur R and Zhawar VK (2021). Regulation of secondary antioxidants and carbohydrates by gamma-aminobutyric acid under salinity-alkalinity stress in rice (<i>Oryza sativa</i> L.). <i>Biologia Futura</i> 72 (2): 229-239.	6.59

1337	Kaur R, Babbar B K and Mahal A K (2021). Evaluation of methyl anthranilate based repellent formulations and mode of delivery to prevent rodent damage Under storage conditions. <i>Agri Res J</i> 58(5) : 857-66.	5.44
1338	Kaur R, Bhullar M B, Sharma D R, Arora P K and Mahajan B V C (2021). Rind screening caused by biotic and abiotic factors influence kinnow fruit quality. <i>Ind J Ent</i> , 1-4, DOI: https://doi.org/10.55446/IJE.2022.495	5.08
1339	Kaur R, Bhullar M B, Sharma D R, Arora P K and Kaur P (2021). Seasonal incidence of mites on Kinnow in Punjab. <i>Ind J Ent</i> 84(2) : 356-359.	5.89
1340	Kaur R, Kalia A, Lore J S, Kaur A, Yadav I, Sharma P, Sandhu J S (2021). Trichoderma sp. Endochitinase and β -1, 3-glucanase impede Rhizoctonia solani growth independently, and their combined use does not enhance impediment. <i>Plant pathology</i> 70 , https://doi.org/10.1111/ppa.13381 .	8.77
1341	Kaur R, Kaur S, Deol J S, Sharma R, Kaur T, Brar A S and Choudhary O P (2021). Soil Properties and weed dynamics in wheat as affected by rice residue management in the rice–Wheat cropping system in South Asia. <i>Plants</i> 10 : 953 , https://doi.org/10.3390/plants10050953 .	9.94
1342	Kaur R, Kumar S, Kumar M, Alam M S and Wahid A (2021). Optimization of microwave assisted multilayer drying of Bittergourd. <i>Agri Res J</i> 58(6) : 1086-1092.	5.44
1343	Kaur R, Zhawar V K, Kaur G, Asthir B (2021). Gammaamino butyric acid effect in the alleviation of saline–alkaline stress conditions in rice. <i>Cereal Res Commun</i> 49 : 355–363.	6.81
1344	Kaur R, Kaur N, Gill R I S, Sandhu S K and Singh A (2021). Optimization of nutrient requirement of Indian mustard (<i>Brassica juncea</i> L.) cultivars under poplar (<i>Populus deltoides</i>) based agroforestry system. <i>Ind J Agroforestry</i> 23(2) : 80-89.	5.19
1345	Kaur S, Aggarwal P and Sharma S (2021). Evaluation of potato genotypes for French Fry quality. <i>Agri Res J</i> 58(2) : 275-79.	5.44
1346	Kaur S, Gill M S, Gill P P S and Singh N P (2021). Effect of prohexadione calcium and chlormequate chloride on growth, yield and fruit quality of pear under high density planting. <i>Ind J Hort</i> 78 : 216-220.	6.16
1347	Kaur S, Kaur K, Jindal J, Kaur G (2021). Salivary amylase from <i>Chiloptartellus</i> (Swinhoe) - Characterization and mode of inhibition through analysis of double reciprocal, fractional velocity and combination plots. <i>Indian J Exp Biol</i> 59 : 88-96.	6.78
1348	Kaur S, Kaur N, Aggarwal P and Grover K (2021). Bioactive compounds, antioxidant activity and color retention of beetroot (<i>Beta vulgaris</i> L.) powder: Effect of Steam blanching with refrigeration and storage. <i>J Food Proc Preserv</i> 45 (3) :e15247.	8.61
1349	Kaur S, Kumar V and Sangha M K (2021). Behavioural hormologosis in oviposition preference of <i>Bemisia tabaci</i> (Gennadius) in Bt cotton. <i>Int J Tropical Insect Science</i> 42(2) .	6.85
1350	Kaur S, Mann S K and Kaur M (2021). Factors Affecting Adoption of Home Science Practices Disseminated Through Rural Awareness Work Experience (RAWWE). <i>Ind J Ext Edu</i> 57 : 143-146.	5.95
1351	Kaur S, Saini M K, Aulakh S S and Chhina R S (2021). Impact Assessment of Front Line Demonstrations on Oilseed Rape (<i>Brassica napus</i> L.) in Sub-mountainous Region of Punjab. <i>J Community Mobilization and Sustain Dev</i> 16(1) : 1-8.	5.67
1352	Kaur S, Sidhu M K and Dhatt A S (2021). Genetic diversity analysis through cluster constellation in brinjal (<i>Solanum melongena</i> L.). <i>Genetika</i> 53 : 629-40.	6.40
1353	Kaur S, Singh S, Mohanpuria P and Li Z (2021). Successful rearing of <i>Bactrocera dorsalis</i> on a semi-solid artificial diet. <i>Ind J Agri Sci</i> 91(9) : 1342–1346.	6.37
1354	Kaur S, Bhardwaj R D, Kaur J and Kaur S (2021). Induction of defense-related enzymes and pathogenesis-related proteins imparts resistance to barley genotypes against spot blotch disease. <i>J Plant Grow Regul</i> , https://doi.org/10.1007/s00344-021-10333-2	8.67



1355	Kaur T and Bhullar M S (2021). Field evaluation of fluorochloridone for broad-spectrum weed control in carrot (<i>Dacuscarota L.</i>) in north-west India. <i>Intl J Pest Management</i> , DOI: 10.1080/09670874.2021.1875151.	7.09
1356	Kaur V, Kaur R, Bhardwaj U and Kaur H (2021). Antifungal potential of dill (<i>Anethum graveolens L.</i>) seed essential oil, its extracts and components against phytopathogenic maize fungi. <i>J Essent Oil Bear Plants</i> 24 (6): 1333-48.	6.82
1357	Kaur Y, Thind SK, Arora A (2021). Survival of <i>Phytophthora nicotianae</i> in citrus rhizosphere. <i>Journal of Plant Pathology</i> 103 (4): 1307-1313.	7.15
1358	Kaur, L, Kaur A and Brar A S (2021). Water use efficiency of green gram (<i>Vigna radiata L.</i>) impacted by paddy straw mulch and irrigation regimes in north-western India. <i>Agricultural Water Management</i> 258 : 107184.	10.02
1359	Kaur K, Kumar K, Bhatia D, Naliath R, Likhar A, Arora P K and Singh K (2021). Allelic pattern of SSRs with high hybrid detection efficiency and inheritance of leaf petiole wing in inter-specific Citrus crosses. <i>Fruits</i> 76 (1): 30-38.	6.58
1360	Kaur N, Kumar VK and Brar A S (2021). Productivity of maize (<i>Zea mays</i>) under different crop sequences and irrigation regimes. <i>Ind J Agri Sci</i> 91 (6): 828-32.	6.21
1361	Kaur P, Kumar V, Sandhu S S and Singh H (2021). Weather based model for forewarning incidence of whitefly (<i>Bemisia tabaci Gennadius</i>) in cotton (<i>Gossypium hirsutum</i>) in Punjab. <i>J Agrometeorology</i> 23 (4): 476-480.	6.47
1362	Kawatra A, Ghai N and Dhillon B S (2021). Growth and reproductive efficiency of transplanted rice (<i>Oryza sativa L.</i>) in relation to seedling age and growth regulators. <i>Agri Res</i> 10 : 582-591	5.95
1363	Kerketta S, Mohanty T K, Kumaresan A, Bhakat M, Gupta R, Malhotra R, Baithalu R, Mohanty A K, Singh S R K and Rahim A (2021). Moosense pedometer for oestrus detection and ovulation time prediction for artificial insemination in Karan Fries cows. <i>Ind J Ani Res</i> 57 (1): 18-23.	6.14
1364	Khanna N, Jaidka M and Bhullar M S (2021). Quantification of intra and inter row weed competition in maize. <i>Maydica</i> 66 :16	6.57
1365	Khehra S and Kaur P (2021). Awareness and adoption level of improved practices by pear growers of district Tarn Taran. <i>J Applied Hort</i> 23 (3): 327-329.	5.13
1366	Khipla N, Kaur J, Gosal S K, Gill R I S and Walia S S (2021). Integrated nutrient management to improve soil health, nutrient uptake and growth of Poplar (<i>Populus deltoides</i>) seedlings in nursery conditions <i>Ind J Agroforestry</i> 23 (2): 45-52.	5.19
1367	Khokhar A, Sharma V, Singh M J, Yousuf A, Sandhu P S, Kumar V and Bhatt M A (2021). Effect of Potassium and Magnesium Application on Growth, Yield and Nutrient Uptake of Rainfed Maize in the sub-montaneous region of Punjab, India. <i>Journal of Plant Nutrition</i> .	8.28
1368	Khokhar A, Yousuf A, Singh M, Sharma V, Sandhu P S, Chary G R (2021). Impact of Land Configuration and Strip-Intercropping on Runoff, Soil Loss and Crop Yields under Rainfed Conditions in the Shivalik Foothills of North-West, India. <i>Sustainability</i> 13 (11):6282.	9.89
1369	Khosla G, Gill B S, Sirari A, Sharma P and Singh S (2021). Inheritance and molecular mapping of resistance against mungbean yellow mosaic India virus in soybean (<i>Glycine max</i>). <i>Plant Breeding</i> 140 (5): 860-869.	7.83
1370	Khushboo, Kaur Mand KiranJeet (2021). Mechanistic insight into adsorption and photocatalytic potential of magnesium ferrite-bentonite nanocomposite. <i>J Photochemistry & Photobiology, A: Chemistry</i> 425 :113717.	10.29
1371	Kingra P K, Kaur R, Majumder D, Singh S P and Buttar G S (2021). Agricultural water use efficiency to adapt climate change under Indo-gangetic plains of south-east Asia. <i>Ind J Agri Sci</i> 91 (6): 1-7.	6.23

1372	Kondal R, Kalia A, Krejcar O, Kuca K, Sharma S P, Luthra K, Dheri G S ,Vikal Y, Taggar M S, Kamel A (2021). Chitosan-urea nanocomposite for improved fertilizer applications: the effect on the soil enzymatic activities and microflora dynamics in n cycle of potatoes (<i>Solanum tuberosum</i> L.) <i>Polymers</i> 13(17) :2887.	10.97
1373	Kumar A and Kumar P (2021). Factors affecting knowledge level of kinnow growers about cultivation practices of kinnow in Punjab. <i>Agri Res J</i> 58(2) : 334–339.	5.44
1374	Kumar A, Sharma A, Sharma R, Srivastava P and Choudhary A (2021). Exploration of wheat wild relative diversity from Lahaul valley: a cold arid desert of Indian Himalayas. <i>Cereal Res Commun</i> 50 :305-320.	6.81
1375	Kumar A, Sharma R, Sharma A Choudhary P, Srivastava Pand Kaur H (2021). Morpho-physiological evaluation of <i>Elymus semicostatus</i> (Nees ex Steud.) Melderis as potential donor for drought tolerance in Wheat (<i>Triticum aestivum</i> L.). <i>Genetic Resources and Crop Evolution</i> : 1-20	7.07
1376	Kumar B and Ram H (2021). Biofortification of maize fodder with zinc improves forage productivity and nutritive value for livestock. <i>Journal of Animal and Feed Sciences</i> 30 :149–158. https://doi.org/10.22358/jafs/135932/2021	8.50
1377	Kumar D S, Sharma R and Brar A S (2021). Optimising drip irrigation and fertigation schedules for higher crop and water productivity of oilseed rape (<i>Brassica napus</i> L.). <i>Irrigation Science</i> : 1-14. https://doi.org/10.1007/s00271-020-00714-y .	8.94
1378	Kumar D, Singh M, Kushwaha M, Makarana G and Yadav MR (2021). Integrated use of organic and inorganic nutrient sources influences the nutrient content, uptake and nutrient use efficiencies of fodder oats (<i>Avena sativa</i>). <i>Ind J Agron</i> 66(4) : 466-473.	5.55
1379	Kumar M, Dogra R, Narang M K, Singh M and Mehan S (2021). Development and evaluation of direct paddy seeder in puddled field. <i>Sust</i> 13(5) :2745, https://doi.org/10.3390/su13052745 .	8.59
1380	Kumar N and Kumar V (2021). Assessment of genetic diversity in linseed germplasm using morphological traits. <i>Electronic J Plant Breeding</i> 12(1) :66-73.	5.14
1381	Kumar N and Kumar V (2021). GGE biplot and AMMI analysis of advanced breeding lines of linseed. <i>Electronic J Plant Breeding</i> 12(2) : 455-463.	5.14
1382	Kumar N, Sanghera G S, Singh V and Kashyap L (2021). Study of commercial cane sugar contributing traits—their variability, association and implications for selection in advanced clonal stages of sugarcane. <i>Agri Res J</i> 58 (1) : 23-28.	5.44
1383	Kumar P, Brar S K, Pandove G and Aulakh C S (2021). Bioformulation of <i>Azotobacterspp</i> and <i>Streptomyces badius</i> on the productivity, economics and energetics of wheat (<i>Triticum aestivum</i> L.). <i>Energy</i> 232 :120868, https://doi.org/10.1016/j .	12.18
1384	Kumar P, Choudhary M, Jat B S, Kumar B Singh, Kumar V, Singla, D; Rakshit S (2021). Skim sequencing: an advanced NGS technology for crop improvement. <i>Journal of Genetics</i> 100 , https://doi.org/10.1007/s12041-021-01285-3 .	7.51
1385	Kumar R, Chahal P, Mukteshwar R, Meena D K and Kumar S (2021). Role of information and communication technologies (ICTs) in agriculture trade’s information. <i>Ind J Agri Sci</i> 91(7) : 1049-1051.	6.37
1386	Kumar R, Singh N D and Sheena G S (2021). Evaluation of economic viability and constraints in growing pulse based crop rotations at small farms. <i>Ind J Ecol</i> 48(3) : 740-745.	5.76
1387	Kumar R, Verma R K, Boonmee S, Chandrasiri S, Hyde K D Nikhil A, Lad S and Wijayawardene N N (2021). <i>Paradictyocheirosporatectonae</i> , a novel genus in the family Dictyosporiaceae from India. <i>Phytotaxa</i> 509 (3) : 259–271.	7.01
1388	Kumar S, Kaur H and Hunjan M S (2021). Genetic diversity and virulence spectrum of <i>Rhizoctonia solani</i> , the incitant of banded leaf and sheath blight of maize. <i>Journal of Phytopathology</i> , https://doi.org/10.1111/jph.13004	7.10



1389	Kumar S, Kumar D, Sekhon K S, Singh P, Phogat M and Choudhary O P(2021). Soil application of boron impacts its solubility, yield and fibre quality of cotton in calcareous soils of North-western India. <i>J Environ Biol</i> 41 :1534-1543	6.78
1390	Kumar S, Sharma R and Sharma S (2021). Impact of socio-economic factors on farm income under existing farming systems: A study in north-western Himalayas. <i>Ind J Ext Edu</i> 57(2) : 181-185.	5.95
1391	Kumar S, Verma G, and Dhaliwal SS (2021). Zinc phasing and fertilization effects on soil properties and some agro-morphological parameters in maize-wheat cropping system. <i>Commun. Soil Sci Plant Anal.</i> 53(1) :1-10, DOI: 10.1080/00103624.2021.2017449	7.33
1392	Kumar S, Verma G, Dhaliwal S S and Sharma V (2021). Influence of zinc fertilization levels and frequencies on crop productivity, zinc uptake and buildup of soil zinc in maize-wheat system. <i>Journal of Plant Nutrition</i> (https://doi.org/10.1080/01904167.2022.2027970)	7.13
1393	Kumar S, Dogra B and Manes G S (2021). Design and development of paddy straw bale shredder. <i>IJAS</i> 91(1) : 94-98.	6.20
1394	Kumar V and Kaur N (2021). Phenological events and grain yield of maize as influenced by different weather parameters. <i>J Agril Phys</i> 21 : 404-415.	5.10
1395	Kumar V, Aulakh CS and Kaur J (2021). Planting geometry and seed tuber size effects on potato (<i>Solanum tuberosum</i>) productivity. <i>Ind J Agri Sci</i> 91(10) :1524-1527.	6.37
1396	Kumar V, Aulakh C S, Kooner R and Kaur J (2021). Nutrition and weather effects on population dynamics of insect-pests in potato (<i>Solanum tuberosum</i>). <i>Indian Journal of Agricultural Sciences/Ind J Agri Sci</i> 91(11) : 1690-4.	6.37
1397	Kumari A, Goyal M and Kumar R (2021). Morpho-physiological and biochemical attributes influence intra genotypic preference of shoot fly { <i>Atherogona soccata</i> (rodani)} among sorghum genotypes. <i>Protoplasma</i> 258 :87-102.	8.63
1398	Kumari A, Goyal M and Kumar R (2021). Nutritional evaluation of sorghum genotypes with varying resistance to shoot fly, <i>Atherigona soccata</i> (Rondani) infestation. <i>Range Mgmt. & Agroforestry</i> 42(1) : 110-117.	6.28
1399	Kumari A, Goyal M, Mittal A D and Kumar R (2021). Defensive capabilities of contrasting sorghum genotypes against <i>Atherigona soccata</i> (Rondani) Infestation <i>Protoplasma</i> , https://doi.org/10.1007/s00709-021-01703-4 .	9.36
1400	Kumari R, Bedi S, Dhatt A S, and Sethi V P (2021). Effect of Proportion of NO ₃ - and NH ₄ + in Nutrient Solution and Growing Seasons on Yield and Quality in Coriander. <i>J. Agr. Sci. Tech</i> 23(4) : 891-902.	6.9
1401	Kumari S, Chhuneja P K, Singh J and Choudhary A (2021). Contribution of <i>Apis mellifera</i> L. in seed yield and quality of rapeseed canola. <i>Ind J Ent</i> 83 (4): 650-654.	5.08
1402	Kumawat K C, Sharma P, Nagpal S, Gupta R K, Sirari A, Nair R M , Bindumadhava H and Singh S (2021). Dual Microbial Inoculation, a Game Changer? – Bacterial Biostimulants With Multifunctional Growth Promoting Traits to Mitigate Salinity Stress in Spring Mungbean <i>Front Microbiol</i> 11 : 600576.	11.64
1403	Kushwah A, Bhatia D, Rani U, Yadav I S, Singh I, Bharadwaj C and Singh S (2021). Molecular mapping of quantitative trait loci for ascochyta blight and botrytis grey mould resistance in an inter-specific cross in chickpea (<i>Cicer arietinum</i> L.) using genotyping by sequencing. <i>Breeding Science.</i> 71 : 229-239.	7.87
1404	Kushwah A, Bhatia D, Singh G, Singh I, Bindra S, Vij S and Singh S (2021). Phenotypic evaluation of genetic variability and selection of yield contributing traits in chickpea recombinant inbred line population under high temperature stress. <i>Physiol Mol Biol Plants</i> 27 : 747-767.	8.01

1405	Kushwah A, Bhatia D, Singh I, Thudi M, Singh G, Bindra S, Vij S, Gill B S, Bharadwaj C, Singh S and Varshney R K (2021). Identification of stable heat tolerance QTLs using inter-specific recombinant inbred line population derived from GPF 2 and ILWC 292. <i>PLoS ONE</i> 16 : e0254957. https://doi.org/10.1371/journal.pone.0254957 .	8.74
1406	Laishram P, Kaur P, Oinam K, Laitonjam N and Ph R (2021). Economic impact of crop diversification in north-east India: Evidence from household-level survey. <i>Ind J Ext Edu</i> 57(4) : 104-109.	5.95
1407	Laishram P, Oinam K S and Vatta K (2021). Effects of income sources on inequality among agricultural households in north-east India. <i>Ind J Agril Econ</i> 76(4) : 658-671.	5.30
1408	Lal A, Kaur K, and Kaur G (2021). Status of phenolic metabolism and glutathione detoxification pathway in waterlogged maize as affected by KNO ₃ treatment. <i>Russ J Plant Physiol</i> 68 (6) : 1247–1256.	7.20
1409	Lohan S K, Narang M K, Singh M, Singh D, Sidhu H S, Singh S, Dixit A (2021) Design and development of remote-control system for two-wheel paddy transplanter. <i>J Field Robotics</i> 3 :177-187.	6.39
1410	Lohan S K, Narang M K, Singh M, Khadatkar A and Karkee M (2021). Actuating force required for operating various controls of walk-behind type paddy transplanter leading to development of remotely operated system. <i>Journal of Agricultural Safety and Health</i> 27 (2).	6.88
1411	Longmei N, Gill G K, Zaidi P H, Kumar R, Nair S K, Hindu V, Vinayan M T, Vikal Y (2021). Genome wide association mapping for heat tolerance in sub-tropical maize. <i>BMC genomics</i> 22 : 154.	10.55
1412	Loomba S, Utreja D, Kaur K, Kaur J, Sharma S, Dhillon N Kand Pathak R K (2021). Synthesis and evaluation of isatin Schiff bases against plant pathogens validated through Aspartyl protease and Acetylcholine binding proteins docked studies. <i>Lett Org Chem</i> 18 : 1000-1011.	6.78
1413	Lore J S, Jain J, Hunjan M S, Kamboj I, Zaidi N W and Singh U S (2021). Efficiency of axenically grown <i>Rhizoctonia solani</i> inoculum types in evaluating sheath blight development on rice genotypes. <i>Journal of Phytopathology</i> , https://doi.org/10.1111/jph.13006 .	7.10
1414	Lore J S, Jain J, Hunjan M S, Singh P and Kumar S (2021). Quantification of yield losses with relation to sheath blight development at different growth stages in mega rice varieties of South Asia. <i>Journal of Phytopathology</i> , https://doi.org/10.1111/jph.13005	7.10
1415	Lore J S, Hunjan M S, Jain J, Kumar S, Singh P, Mangat G S, Zaidi N W, Singh US (2021). Temporal and spatial progression of sheath blight in mega rice varieties of South Asia. <i>Australasian Plant Pathology</i> 50 : 609-619, https://doi.org/10.1007/s13313-021-00812-1	7.42
1416	Lotika and Saini H K (2021). A comparative study of marketing practices of knitwear export units in Punjab and Tamil Nadu. <i>Ind J Econ Dev</i> 17(2) :401-09.	5.15
1417	Ludhar N K, Sirari A, Bains T S, Sharma A, Patel S A H, Sharma P, Rani U and Cheema H K (2021). Deployment of yellow mosaic disease resistance in mungbean (<i>Vigna radiate</i> (L.) Wilczek) through interspecific hybridization. <i>Legume Res</i> 44(2) : 152-157.	6.23
1418	M S (2021). Microwave-assisted pre-milling treatments of chickpea (<i>CicerArietinum</i>) for higher recovery. <i>Emirates Journal of Food and Agriculture</i> 33(11) : 965-971.	7.04
1419	Maaken E, Bhardwaj R D, Kaur S and Kaur S (2021). Drought stress induced changes in redox metabolism of barley (<i>Hordeum vulgare</i> L.) <i>Biologia Futura</i> , https://doi.org/10.1007/s42977-021-00084-2	6.59
1420	Maan P K, Garcha S, Sharma S and Walia GS (2021). Nodule occupancy behaviour of bacteriocinogenic <i>Rhizobium</i> spp. in mungbean (<i>Vigna radiata</i>). <i>Legume Res</i> 44(9) : 1097-1103.	6.59
1421	Maan S, Gill M I S and Arora N K (2021). Determination of gamma rays induced mutagenic sensitivity of guava (<i>Psidiumguajava</i> L.) cv. 'Lalit' and 'Shweta'. <i>Agri Res J</i> 58 :474-81.	5.44



1422	Mahdi J M, Singh R P, Hussein T A N, Singh S and Nsofor E C (2021). Efficient thermal management of the photovoltaic/phase change material system with innovative exterior metal-foam layer. <i>Solar Energy</i> : 216 :411-427.	10.60
1423	Mahesh Chand Singh, Abrar Yousuf and Vishnu Prasad (2021). Morphometric and principal component analysis–based prioritization of reservoir catchments using geospatial techniques for land and water conservation aspects in North-West India. <i>Arabian Journal of Geosciences</i> 14 :598	7.82
1424	Majumder A, Setia R, Kingra P K, Sembhi H, Singh S P and Pateriya B (2021). Estimation of land surface temperature using different retrieval methods to study the spatio-temporal variations of surface urban heat and cold islands in Indian Punjab. <i>Environment, Development and Sustainability</i> , https://doi.org/10.1007/s10668-021-01321-3	8.14
1425	Malik A, Tikhamarine Y, Al-Ansari N, Shahid S, Sekhon H S, Pal R K, Rai P, Pandey K, Singh P and Sammen S S (2021). Daily pan-evaporation estimation in different agro-climatic zones using novel hybrid support vector regression optimized by salp swarm algorithm in conjunction with gamma test. <i>Engineering Applications of Computational Fluid Mechanics</i> 15(1) : 1075-1094, https://doi.org/10.1080/19942060.2021.1942990 .	14.39
1426	Mandal A, Sidhu M S, Rost J M, Pfeifer T, Singh K P (2021). Attosecond delay lines: design, characterization and applications. <i>The European Physical Journal Special Topics</i> 230 (23): 4195-4213.	8.891
1427	Mandla D, Singla N, Brar S K and Singla L D (2021). Diversity, prevalence and risk assessment of nematode parasites in <i>Tatera indica</i> found in Punjab State. <i>Ind J Anim Res</i> , DOI: 10.18805/IJAR.B-4369	6.44
1428	Manjunatha L, Rani U, Basavaraja T, Jagadeeswaran R and Kumar Y (2021). Morphological and Molecular Diversity of <i>Botrytis cinerea</i> Infecting Chickpea in India. <i>Legume Res</i> , DOI:10.18805/LR-4547	6.59
1429	Martolia D, Gupta R and Kaur H (2021). Ergonomic analysis of working posture of gardeners engaged in selected gardening activities. <i>Ind J Ext Edu</i> 57(3) : 211-214.	5.95
1430	Megha M, Gill P P S, Jawandha S K and Gill M S (2021). Effect of chitosan coating incorporated with pomegranate peel extract on pear fruit softening, quality, and cell wall degrading enzymes during cold storage. <i>Journal of Food Processing and Preservation</i> , https://doi.org/10.1111/jfpp.15984 .	8.19
1431	Menard G, Sandhu N, Anderson D, Catolos M, Hassall K L, Eastmond P J, Kumar A, Kurup S (2021). Laboratory phenomics predicts field performance and identifies superior indica haplotypes for early seedling vigour in dry direct-seeded rice. <i>Genomics</i> 113 : 4227-4236.	10.35
1432	Mirzakhani-fachi H, Singh M, Bector V, Gupta O P and Singh R (2021). Design and development of a variable rate applicator for real time application of fertilizer. <i>Sustainability</i> 13 : 8694, https://doi.org/10.3390/su13168694 .	8.59
1433	Mishra P K, Singh M, Mandal B, Singh D, Bector V and Patel B (2021). Development and evaluation of tractor operated cotton header. <i>Agri Mech Asia Africa LatAm</i> 52(3) : 35-44.	6.15
1434	Mishra P K, Singh M, Mandal B, Singh D, Bector V and Patel B (2021). Computer aided design and development of a tractor operated cotton header. <i>Agri Mech Asia Africa LatAm</i> 52(3) : 24-34.	6.29
1435	Mittal I and Jhanji S (2021). Evaluation of sodium nitroprusside (NO donor) as pulsing solution in improving post-harvest quality of gladiolus spikes. <i>Indian J Exp Biol</i> 59(7) : 467-475.	6.78
1436	Mittal I, Jhanji S and Dhatt K K (2021). Efficacy of sodium nitroprusside, a nitric oxide donor, on vase life and postharvest attributes of gladiolus spikes. <i>Acta Physiologiae Plantarum</i> 43 :108.	7.61
1437	Mittal R and Randhawa V (2021). Perceived Deception in Upward Organizational Communication: An Examination of Information Manipulation Theory. <i>Ind J Ext Edu</i> 57(2) : 105-114.	5.90

1438	Mohanan A and Sharma A (2021). Momordica balsamina, a new natural host of begomovirus and its first report in India. <i>Ind Phytopathology</i> 74 : 859-61.	5.95
1439	Mohanpuria P, Govindaswamy M, Sidhu G S, Singh S, Kaur S and Chhuneja P (2021). Ingestion of bacteria expressing dsRNA to maggots produces severe mortality and deformities in fruit fly <i>Bactrocera dorsalis</i> (Hendel) (Diptera: Tephritidae). <i>Egypt J Biological Pest Control</i> 31 (1), http://doi.org/ 10.1186/s41938-020-00345-7	6.38
1440	Monga S and Sidana B K (2021). Growth performance of major indian cereals: state level analysis. <i>Agri Res J</i> 58 (1): 130-138.	5.44
1441	Mshora A, Gill P P S, Jawandha S K, Sinha A and Kaur N (2021). Physico-chemical and enzymatic changes in cold stored 'dusehri' mango fruits in response to beeswax and aloe vera gel coatings. <i>J Food Nutr Res</i> 9 : 1-9.	7.10
1442	Murria M and Kumar R (2021). Structural, optical and acoustical characterization of polyvinyl alcohol dispersed cadmium selenide nanocomposites. <i>J Macro Mol Sci part B</i> . https://doi.org/10.1080/00222348.2021.1922159 .	6.91
1443	Murria M, Kumar R and Mehta C (2021). Capacitance-voltage profiling of aluminium junctioned PVA/CdSe nanocomposite schottky diode. <i>Materials Today Proc</i> 28 :1145-1449.	6.58
1444	Nagpal S, Sharma P and Sirari A (2021). Induction of antioxidant response with compatible consortium of Mesorhizobium sp. and Pseudomonas sp. against Fusarium oxysporum sp. ciceris in chickpea. <i>Bangladesh J Bot</i> 50 (2): 359-364.	6.21
1445	Nagpal S, Sharma P, Sirari A, Kumawat K C, Wati L, Gupta S C and Mandahal KS (2021). Chickpea (<i>Cicerarietinum</i> L.) as model legume for decoding the co-existence of Pseudomonasfluorescens and Mesorhizobium sp. as bio-fertilizer under diverse agro-climatic zones. <i>Microbiol Res</i> 247 :126720.	11.4
1446	Nair I J, Sharma S and Shera P S (2021). Impact of sticky traps of different colours and shapes against sucking pests of tomato under protected conditions: a randomized controlled trial. <i>Int J Tropical Insect Science</i> 41 : 2739-2746.	6.85
1447	Naresh R K, Bhatt R, Chandra M S, Laing A M, Gaber A, Sayed S, and Hossain A (2021). Soil organic carbon and system environmental footprint in sugarcane-based cropping systems are improved by precision land leveling. <i>Agronomy</i> 11 (10):1964, DOI:10.3390/agronomy11101964.	9.42
1448	Oberoi H K, Singh J, Tiwana U S and Goyal M (2021). Interactive effect of different sowing dates and irrigation regimes on morpho-physiological response, fodder yield and quality and antinutrient HCN of multi-cut hybrid sorghum. <i>Maydica</i> , DOI: 2254-7433-1-SM	6.57
1449	Oinam K S, Laishram P and Vatta K (2021). The impact of public expenditure on agricultural growth: Empirical evidence from Punjab, India. <i>Agri Econ Res Rev</i> 34 (Conference Number), 157-164.	5.84
1450	Pal R P, Mani V, Mir S H, Sharma A and Sarkar S (2021). Comparative effect of zinc supplementation by hydroxy and inorganic sources on nutrient utilisation, mineral balance, growth performance and growth biomarkers in pre-ruminant calves. <i>Archives of Animal Nutrition</i> 75 (6): 435-449.	8.89
1451	Pal R, Singh K, Singh O and Singh V (2021). Effect of plant growth regulators (pgrs) on germination, yield and quality of sugarcane in sub-tropical India. <i>Agri Res J</i> 58 (4): 657-661.	5.40
1452	Pal R, Singh O, Sanghera G S and Gupta R K (2021). Influence of INM on sugarcane productivity and soil fertility under Indo-Gangetic plain. <i>Ind J Agri Sci</i> 91 (5):703-707.	6.21
1453	Pal V, Singh G and Dhaliwal S S (2021). A new approach in agronomic biofortification for improving zinc and iron content in chickpea (<i>Cicer arietinum</i> L.) grain with simultaneous foliar application of zinc sulphate, ferrous sulphate and urea. <i>Journal of Soil Science and Plant Nutrition</i> 21 (2) : 883-896.	9.61
1454	Palial G and Thakur S (2021). Correlation and principal component analysis for morpho-physiological characteristics in Salix clones. <i>Ind J Agroforestry</i> 23 (1): 88-93.	5.19



1455	Pandey P, Grover K, Dhillon T S, Kaur A and Javed M (2021). Evaluation of polyphenols enriched dairy products developed by incorporating black carrot (<i>Daucus carota</i> L.) concentrate. <i>Heliyon</i> 7 : e06880.	10.857
1456	Parmar P, Kaur K, Kaur G (2021). Combined action of salicylic acid and thiourea alleviated heat stress in maize by stimulating varied antioxidant response in tissues. <i>Russ J.Plant-Physiol</i> 68 : 463- 473.	7.20
1457	Parmar R P, Singh S K and Singh M (2021). Bioefficacy study of agricultural spraying system for Unmanned Aerial Vehicle to manage pests in cotton, rice and moong. <i>Ind J Agri Sci</i> 91(9) : 1373–7.	6.21
1458	Parmeshwar P, Gupta A K, Bains N and Kaur K (2021). Variability in enzymatic and non enzymatic antioxidants in wheat (<i>Triticum aestivum</i> L.) genotypes. <i>Plant Physiol Rep</i> , 10.1007/s40502-021-00584-2	5.50
1459	Patel B, Singh M, Mishra P K, Manes G S and Patel M K (2021). Efficacy of the prototype electrostatic nozzle for cotton crops. <i>African Ent</i> 29(2) : 471-478.	6.65
1460	Pathania M, Arora J K and Arora P K (2021). Incidence and severity of insect-pests and diseases of Kinnow mandarin. <i>Ind J Hort</i> 78(3) : 280-286.	6.15
1461	Pathania M, Kaur J and Singh B (2021). Efficacy of neem based formulations against wheat aphids under semi-arid irrigated conditions in south-west Punjab. <i>Ind J Ent</i> , https://doi.org/10.55446/IJE.2021.134 .	5.08
1462	Pathania M, Kaur J and Singh B (2021). Home-made neem formulation paper. <i>Ind J Ent</i> , DOI: 10.5958/IJE.2021.13	5.08
1463	Pathania M, Pal R K, Kumar S, Singh S and Singh P (2021). Seasonal incidence of whitefly (<i>Bemisia tabaci</i> Gennadius) and jassid (<i>Amrasca bigutulla bigutulla</i> Ishida) on transgenic cotton in south-western Punjab. <i>Ind J Agromet</i> 22 :545-550.	6.47
1464	Pathania S and Sandhu J S (2021). Effect of 2, 4-D on embryogenic callus induction and evaluation of g418 on growth inhibition in rice calli. <i>Agri Res J</i> 58 :18-22.	5.44
1465	Pathania S and Singh S (2021). Evaluation and prediction of salinity tolerance behaviour of citrus rootstocks. <i>Scientia Horticulturae</i> 289 : 110422.	8.77
1466	Peshin R, Hansra B S, Singh K, Nanda R, Sharma R, Yangsdon S and Kumar R (2021). Long-term impact of Bt cotton: Empirical evidence from north India. <i>J Cleaner Production</i> 312 : 27575.	13.25
1467	Phogat B S, Kumar S, Kumari J, Kumar N (2021). Characterization of wheat germplasm conserved in the Indian National Genebank and establishment of a composite core collection. <i>Crop Science</i> 61(1) : 604-620.	8.76
1468	Pratiksha and Sharma P (2021). Knowledge of farming families regarding air pollution and its mitigation. <i>J Community Mobilization and Sustain Dev</i> 16(1) : 177-184.	5.67
1469	Pratiksha and Sharma P (2021). Zone wise knowledge disparities about water pollution and its mitigation strategies among farming families of Punjab, India. <i>J Community Mobilization and Sustain Dev</i> 16(3) : 792-798.	5.67
1470	Priyanka V, Kumar R, Dhaliwal I and Kaushik P (2021). Germplasm Conservation: Instrumental in Agricultural Biodiversity — A Review. <i>Sustainability</i> 13 : 6743, DOI: 10.3390/su1312/6743.	9.251
1471	Proch A, Malik DS, Sandhu K, Singh Y and Gill G S (2021). Effect of sodium bisulphate in litter and low protein diet supplemented with proteolytic enzyme on ammonia concentration, growth parameters and litter quality of broiler during summer season. <i>Ind JPoultry Sci</i> 56(2) :141-147.	5.85
1472	Puri H and Jindal V (2021). Target of Rapamycin (TOR) gene is vital for whitefly survival and reproduction. <i>J Biosci</i> 46 : 60, DOI: 10.1007/s12038-021-00168-0.	7.65
1473	Rai A and Sidhu K (2021). Perception of farm families towards farming as an occupation. <i>Ind J Ext Edu</i> 57(3) .	5.95

1474	Rajput P, Thakur A, Singh H, Singh J, Kaur S, Koulagi R and Pathak D (2021). Screening of peach rootstock hybrids for resistance to root-knot nematode. <i>Ind J Hort</i> 78(2) : 134-141.	6.16
1475	Ram H, Gupta N, Singh G, Kaur H, Kaur J and Srivastava P (2021). Agronomic performance of Unnat PBW 343 (Marker assisted backcross bread-wheat) at different sowing dates in Central Punjab, India. <i>Ind J Agri Sci</i> 91 : 1313-17.	6.21
1476	Ramandeep and Kaur M (2021). Impacts of waterlogging and the management practices adopted by the farmers in waterlogged areas of Punjab. <i>J Community Mobilization and Sustain Dev</i> 16 : 319-324.	5.30
1477	Ramteke P R, Vashisht B B, Sharma S and Jalota S K (2021). Assessing and ranking influence of rates of Rice (<i>Oryza sativa</i> L.) straw incorporation and N fertilizers on soil physicochemical properties and Wheat (<i>Triticum aestivum</i> L.) yield in Rice-Wheat system. <i>Journal of Soil Science and Plant Nutrition</i> 22 : 515-526.	9.87
1478	Ramya S, Pandove G, Kalia A, Kaur S, Oberoi H, Yadav B K (2021). Appraisal of Seed Priming with Liquid Microbial Inoculants on Growth and Yield Attributes of Forage Cowpea. <i>Legume Res</i> 9 : 1109-1117.	6.23
1479	Ramya S and Pandove G (2021). Integrated nutrient management in cowpea with the application of microbial inoculants. <i>Legume Res</i> 3 : 243-251.	6.23
1480	Ramya S, Pandove G, Oberoi H K, Kaur S and Kalia A (2021). Improvement in the quality attributes of forage cowpea by use of liquid microbial inoculants. <i>Ind J Anim Res</i> 56(8) : 959-965.	6.44
1481	Ramya S, Pandove G and Kalia A (2021). Optimized Bioprocess for the Formulation of Liquid Microbial Inoculants for Forage Cowpea and Insight of Plant-microbe Interaction by SEM. <i>Legume Res</i> , DOI: 10.18805/LR-4741	6.53
1482	Rana B, Parihar C M, Nayak H S, Patra K, Singh V K, Krishnan P, Pandey R, Rathi N, Meena B R, Kumar A, Gupta N, Sidhu H S and Jat M L (2021). Optimization of N dose in rice under conservation agriculture with sub-surface drip fertigation. <i>Ind J Agri Sci</i> 91 : 509-514.	6.21
1483	Randhawa H S, Kaur A and Damanpreet (2021). Bioefficacy of new insecticides against sucking pests of brinjal (<i>Solanum melongena</i> L.). <i>Ind J Plant Prot</i> 49(2) : 112-120.	5.00
1484	Randhawa M K, Dhaliwal S S, Sharma V, Toor A S, Sharma S, Kaur M and Verma G (2021). Nutrient use efficiency as a strong indicator of nutritional security and builders of soil nutrient status through integrated nutrient management technology in a rice-wheat system in north-western India. <i>Sustainability</i> 13(8) : 4551 https://doi.org/10.3390/su13084551 .	8.16
1485	Rani H and Bhardwaj R D (2021). Quality attributes for barley malt: "The backbone of beer". <i>J Food Science</i> 86 : 3322-3340.	8.48
1486	Rani M, Jindal S K and Meena O P (2021). Exploitation of heterosis among phenotypically diverse Capsicum parents for important fruit traits. <i>Brazilian Archives of Biology and Technology</i> 64 : 1-16.	6.8
1487	Rani M, Jindal S K, Vikal Y and Meena O P (2021). Genetic male sterility breeding in heat tolerant bell pepper: Introgression of ms10 gene from hot pepper through marker assisted backcrossing. <i>Scientia Horticulturae</i> 285 : 110172, https://doi.org/10.1016/j.scienta.2021.110172	9.46
1488	Rani M, Kaur G, Kaur K and Arora N K (2021). Effect of organic manures and biofertilizers on growth, fruit quality and leaf nutrient status of guava. <i>Agri Res J</i> 58 : 835-39.	5.44
1489	Rani N and Singh D (2021). Remediation of Phytotoxic effect of chromium by different amendments in berseem-spinach rotation. <i>J Eco-Friendly Agri</i> 16(2) : 109-115.	5.23
1490	Raouf A, Alam M S and Kaur P (2021). Comparative study on Efficacy of sanitizing potential of aqueous ozone and chlorine on keeping quality and shelf-life of minimally processed onion (<i>Allium Cepa</i> L.) <i>Ozone: Science & Engineering</i> , DOI: 10.1080/01919512.2021.1904204.	8.08



1491	Raouf A, Alam M S, Singh S, Kumar S (2021). Aqueous ozone sanitization of whole peeled onion: Process optimization and evaluation of keeping quality during refrigerated storage. <i>J. Food Sci&Technol</i> , https://doi. Org/10.2016/J.lwt.2021.112183 .	8.00
1492	Rashmi, Kaushal S and Gill KBS (2021). Nutritional status of Banana (<i>Musaa cuminata</i>) peels of variety-Grand Naine. <i>Agri Res J</i> 58(3) : 513-20.	5.44
1493	Ratanoo R, Walia S S, Saini K S and Dheri G S (2021). Effect of biofertilizers, graded levels of chemical fertilizers and FYM on soil properties and yield of Gobhi sarson (<i>Brassica napus L.</i>). <i>The Pharma Innovation J</i> 10(7) : 10-17.	5.23
1494	Rathore P, Kumar H, Singh P, Pathak D, Kumar V, Singh S and Pandher S (2021). Btcotton Variety PAU Bt 3. <i>Ind J Genet Plant Breed</i> 81 (3) : 4	6.55
1495	Reddy P. Sanjana, Satyavathi C. Tara, Khandelwal Vikas, Patil H T, Gupta P C, Sharma L D, Mungra K D, Singh Sumer P, Narasimhulu R, Bhadarge H H, Iyanar K, Tripathi M K, Yadav Devvart, Bhardwaj Ruchika, Talwar A M, Tiwari V K, Kachole U G, Sravanti K, Priya M Shanthi, Athoni B K, Anuradha N, Govindaraj Mahalingam, Nepolean T and Tonapi Vilas A (2021). Performance and stability of pearl millet varieties for grain yield and micronutrients in arid and semi-arid regions of India. <i>Frontiers of Plant Sci</i> 12 :1-16, Doi:3369/fpls2021.670201.	10.40
1496	Rehal J, Aggarwal P and Dhaliwal I (2021). Process development of gluten-free snack utilising finger millets. <i>Intl J CurrMicrobiol App Sci</i> 10 : 1231-38.	5.38
1497	Reshtia S M, Singh D and Sharma A (2021). Preferences and problems in utilization of communication channels for agricultural information. <i>J Community Mobilization and Sustain Dev</i> 16 : 601-09.	5.30
1498	Riar A K, Chhuneja P, Keller B, Singh K (2021). Mechanism of leaf rust resistance in wheat wild relatives, <i>Triticum monococcum L.</i> and <i>T. boeoticum L.</i> <i>Plant Genetic Resources</i> 19(4) : 320-327.	7.28
1499	Riar J K, Bhanot R and Hundal S S (2021). Assessment of heavy metals in samples of soil, water, vegetables, and vital organs of rat (<i>Bandicota bengalensis</i>) collected from Adjoining Areas of Polluted Water Body. <i>Water Air Soil Pollut.</i> DOI: 10.1007/s11270-021-05221-0.	7.90
1500	Ritika, Joshi N and Sangha K S (2019). Effect of adjuvants on <i>Lecanicilliumlecanii</i> against nymphs of <i>Lipaphiserysimi</i> (Kalt). <i>Ind J Entm</i> 81(3) : 597-602.	5.89
1501	Ritika, Joshi N and Sharma S (2021). Chitinase enzyme activity and pathogenicity of <i>Lecanicilliumlecanii</i> (Zimmerman Zare and Gams) against mustard aphid <i>Lipaphiserysimi</i> (Kalt.). <i>Ind J Ent</i> , e21063 DoI.: 10.5958/IJE.2021.88	5.89
1502	Routray S, Kumari S, Borah B, Shelat H and Khanna V (2021). A review on rhizobia and PGPRs interactions in legumes. <i>The Pharma Innovation J</i> 10(7) : 1448.	5.23
1503	Sahni P, Bobbade H, Sharma S and Singh B (2021). Effect of different types and concentrations of hydrocolloids on pasting, hydration and surface active properties of pigeon pea flour. <i>Carpathian J Food Sci Technol</i> 12 : 202-11.	6.13
1504	Sahni T, Sharma S, Verma D, Sharma P and Kaur S (2021). Antioxidant and antibacterial evaluation of 2, 6-dimethoxy-4-((phenylamino) methyl) Phenol and 2, 6-Dimethoxy-4-((4'-nitrophenylimino) methyl) Phenol. <i>Biological Forum—An Intl J</i> 14(1) :1-7.	5.11
1505	Sahoo D, Mohanty G B and Trabelsi K, Adachi I., Kumar R. et. al. (The Belle collaboration) (2021). Search for lepton-number- and baryon-number-violating tau decays at Belle. <i>Phy. Rev. D</i> 102 :11110.	11.296
1506	Sahoo J, Dass D, Bhat A, Gouda M A, H S and Anurag (2021). Land suitability assessment for improved land use planning in selected watersheds of Haryana. <i>J Environ Bio</i> 42(2) : 285–294.	5.57

1507	Saini A, Kaur P, Singh K and Bhullar M S (2021). Influence of soil properties, temperature and pH on adsorption desorption of imazamox in Indian aridisols. <i>Archives of Agronomy and Soil Sci</i> , 10.1080/03650340.2021.1925652.	8.14
1508	Saini M K, Kaur R and Randhawa H S (2021). Field screening of rice varieties for resistance to major insects-pests. <i>Ind J Ent</i> 83(2) : 159-162.	5.08
1509	Sakhuja M, Zhawar VK and Pannu PPS (2021). Regulation of antioxidant enzymes by abscisic acid and salicylic acid under biotic stress caused by <i>Fusarium fujikuroi</i> in rice. <i>Ind Phytopathology</i> 74 : 823–830.	5.95
1510	Salaria S, Bindra S, Kumar A, Singh S, Singh I, Singh P, Kaur J, Kaur L, Gill B S and Singh S (2021). Identification of suitable traits in derivatives derived from <i>Cicer arietinum</i> x c. <i>Pinnatifidum</i> cross for improving chickpea. <i>Agri Res J</i> 58 : 983-988.	5.44
1511	Saloni, Bhullar M B and Kaur P (2021). Seasonal incidence of phytophagous and predatory mites on <i>Capsicum</i> under nethouse. <i>Ind J Ent</i> , e20298 DoI No.: 10.55446/IJE.2021.266	5.89
1512	Sandhu N, Sethi M, Kumar A, Dang D, Singh J, Chhuneja P (2021). Biochemical and genetic approaches improving nitrogen use efficiency in cereal crops: a review. <i>Frontiers in plant science</i> 12 .	12.63
1513	Sandhu K K and Singla N (2021). Observations of growth index and morphological characters of the Indian gerbil, <i>Tatera indica</i> (Hardwicke) as an attempt to record intra-specific variations. <i>Agri Res J</i> 58(6) : 1116-23.	5.44
1514	Sandhu N, Kaur A, Sethi S, Kaur S, Singh V P, Sharma A, Bentley A R, Barsby T and Chhuneja P (2021). Genetic dissection uncovers genome-wide marker-trait associations for plant growth, yield, and yield-related traits under varying nitrogen levels in nested synthetic wheat introgression libraries. <i>Frontiers in Plant Science</i> , 12 :738710, doi: 10.3389/fpls.2021.738710.	10.40
1515	Sandhu N, Pruthi G, Prakash Raigar, Singh M P, Phagna K K, Sethi M S Pooja A, Saini D K (2021). Meta-qtI analysis in rice and cross-genome talk of the genomic regions controlling nitrogen use efficiency in cereal crops revealing phylogenetic relationship. <i>Frontiers in genetics</i> 12 , https://doi.org/10.3389/fgene.2021.807210 .	10.77
1516	Sandhu N, Yadav S, Catolos M, Cruz M T S, Kumar, A (2021). Developing climate-resilient, direct-seeded, adapted multiple-stress-tolerant rice applying genomics-assisted breeding. <i>Frontiers in plant science</i> 12 , https://doi.org/10.3389/fpls.2021.637488 .	12.63
1517	Sandhu O S and Makkar G S (2021) Realising higher lentil productivity through farmer participatory action in sub-mountainous zone of Punjab. <i>Agri Res J</i> 58(6) : 1124-1132.	5.44
1518	Sandhu P K, Dhillon B S and H Singh (2021). Rice yield variability in Punjab – an overview of five decades. <i>Paddy and Water Environment</i> 19(4) :673-681.	7.26
1519	Sandhu P S, Walia S S and Kaur A (2021). Yield Quality Parameters of rice- wheat system in response to integrated nutrient management over 31 Years. <i>Agri Res J</i> 58(5) : 794- 800.	5.44
1520	Sandhu R K and Sarao P S (2021). Evaluation of antixenosis resistance in wild rice accessions against brown plant hopper, <i>Nilaparvata lugens</i> (Stal). <i>Int J Tropical Insect Science</i> 41 : 65–73	6.85
1521	Sandhu S K, Sunayana, Pal L, Rialch I and Singh M (2021). Unravelling genetic variability for moisture stress tolerance in indian mustard and identification of high breeding value donor lines. <i>J Env Biol</i> 42 : 1478-1487.	6.78
1522	Sandhu S K, Tak P S and Pannu P P S (2021). Forewarning of stripe rust (<i>Puccinia striiformis</i>) of wheat in central zone of Punjab. <i>J Agrometeorology</i> 23(4) :435-441.	6.47
1523	Sanghera GS, Sanghera P and Bhatt R (2021). Approaches for Amelioration of Selenium Deficiencies/toxicities in Crop Plants. <i>Biological Forum–An Int J</i> 13(4) : 449-461.	5.11



1524	Sarkar S, Mohini M, Sharma A, Tariq H and Pal R P (2021). Effect of supplementing leucaena leucocephala leaves alone or in conjunction with malic acid on nutrient utilization, performance traits, and enteric methane emission in crossbred calves under tropical conditions. <i>Tropical Animal Health and Production</i> 53 :1-10.	7.89
1525	Satpute S, Singh M C and Garg S (2021). Assessment of irrigation water requirements for different crops in central Punjab, India. <i>J Agrometeorology</i> 23(4) : 481-484.	6.47
1526	Saxena R, Kanwal V, Khan M, Verma S, and Gururaj B (2021). Gains from improved technology adoption in disadvantaged regions: Evidences from Bundelkhand Region. <i>Ind J Agri Sci</i> 92(6) :695-699.	6.23
1527	Sekhon H S, Setia R, Singh S P, Kingra P K, Ansari J (2021). Spatio-temporal analysis of the relationship between climate variables and water logging using satellite remote sensing. <i>Arabian Journal of Geosciences</i> 14 : 1306, https://doi.org/10.1007/s12517-021-07653-8	7.33
1528	Seni S, Kaur S, Malik P, Yadav I S, Sirohi P, Chauhan H, Kaur A, Chhuneja P (2021). Transcriptome based identification and validation of heat stress transcription factors in wheat progenitor species <i>Aegilops speltoides</i> . <i>Scientific reports</i> 11 , https://doi.org/10.1038/s41598-021-01596-6 .	11.00
1529	Sethi S, Yadav D N, Snigdha S, and Gupta A (2021). Optimization of process parameters for extraction of protein isolates from Khesari dhal (<i>Lathyrus sativus</i> L.) <i>LWT - Food Science and Technology</i> 137 : 1-23.	12.056
1530	Shahida Nisar, Benbi D K and Toor A S (2021). Energy budgeting and carbon footprints of three tillage systems in maize-wheat sequence of north-western Indo-Gangetic Plains. <i>Energy</i> 229 : 120661	12.08
1531	Sharma A and Brar A S (2021). Investigations on in-situ paddy straw management technology implemented under different mechanical treatments for wheat establishment. <i>Paddy and Water Environment</i> 19 : 649–660.	7.26
1532	Sharma A B, Singh B, Vikal Y, Singh A and Kaur S (2021). Profiling of monosporidial populations of <i>Tilletiabarclayana</i> causing kernel smut of rice. <i>Ind Phytopathology</i> , https://doi.org/10.1007/s42360-021-00367-7 .	5.95
1533	Sharma A, Ankita, Shamshad M, Kaur S, Singh A, Srivastava P, Mavi GS, Sandhu B, Dhaliwal NS and Sohu VS (2021). Salt stress genotypic response: relative tolerance of wheat cultivars to salinity. <i>Agri Res J</i> 58(6) : 974-982.	5.44
1534	Sharma A, Sharma S, Khan I, Kaur S and Kaur S I (2021). Comparative study on detection efficacy of universal potyvirus primers. <i>Vegetos</i> https://doi.org/10.1007/s42535-021-00254-6	5.27
1535	Sharma A, Sheikh I, Kaur S, Vyas P, Dhaliwal H S (2021). Introgression of recombinant 1rs wr. 1bl translocation and rust resistance genes in bread wheat cv. Hd2967 through marker-assisted selection. <i>Plant molecular biology reporter</i> 39(4) :1-9.	7.82
1536	Sharma A, Srivastava P, Mavi G S, Kaur S, Kaur J, Bala R, Singh T P, Sohu V S, Chhuneja P, Bains N S (2021). Resurrection of wheat cultivar pbw 343 using marker-assisted gene pyramiding for rust resistance. <i>Frontiers in plant science</i> 12 , https://doi.org/10.3389/fpls.2021.570408 .	12.63
1537	Sharma A B, Singh A, Singh T P (2021). Effect of black point on seed germination parameters in popular wheat cultivars of Northern India. <i>Ind Phytopathology</i> 74 : 271–275.	5.95
1538	Sharma B, Gill K K and Sandhu S S (2021). Comparative analysis of weather forecast from different weather websites for Ludhiana, Punjab. <i>Agri Res J</i> 58(5) : 903-912.	5.44
1539	Sharma K and Chandel R (2021). Multiple attributed parametric review on mechanical picking of cotton (<i>Gossypium Hirsutum</i> L.) Crop in Relevance to Developing Countries. <i>Agri Mech Asia Africa LatAm</i> 52(2) : 7-13.	6.29

1540	Sharma K K and Sandhu P S (2021). Efficacy of fungicides and botanicals against alternaria blight of taramira (<i>Eruca sativa</i> Mill.) in sub-mountainous Punjab. <i>Agri Res J</i> 58(1) :150-153.	5.44
1541	Sharma K, Dhaliwal NS and Bishnoi C (2021). Adoption status of improved crop production practices in bt-cotton in Sri Muktsar Sahib, Punjab. <i>Ind J Ext Edu</i> 57(2) : 63-68.	5.95
1542	Sharma K, Kumar V, Kumar S, Dave J, Babbar N, Kaur J, Sharma B R (2021). Process optimization for drying of Bauhinia variegata flowers: Effect of different pre-treatments on quality attributes. <i>J Food Process Preserv</i> 46 : e16229.	8.61
1543	Sharma M, Dhaliwal I, Rana K, Delta A K, Kaushik P (2021). Phytochemistry, pharmacology, and toxicology of datura species—A Review. <i>Antioxidants</i> 10 : 1291, https://doi.org/10.3390/antiox10081291 .	11.01
1544	Sharma N, Devi S, Kaur P and Sondhia S (2021). Behaviour of bispyribac sodium in soil and its impact on biochemical constituents of rice. <i>Int J Environ Anal Chem</i> , https://doi.org/10.1080/03067319.2021.1931852 .	7.43
1545	Sharma N, Kaur G and Khatkar S K (2021). Optimization of emulsification conditions for designing ultrasound assisted curcumin loaded nanoemulsion: Characterization, antioxidant assay and release kinetics. <i>LWT-Food Science & Technology</i> 141 , doi.org/10.1016/j.lwt.2021.110962 .	10.004
1546	Sharma N, Sahoo S K, Mandal K and Kumar R (2021). Dissipation kinetics of metribuzin in sugarcane and soil under sub-tropical conditions of Punjab in India. <i>Sugar Tech</i> 23 :1359-1365.	7.01
1547	Sharma P and Aparna (2021). Preferences and Perceived Effectiveness of Information Sources for Livestock Production. <i>Ind J Ext Edu</i> 57(3) :81-85.	5.95
1548	Sharma P, Madane D, Bhakar S, Sharma S D (2021). Monthly streamflow forecasting using artificial intelligence approach: a case study in a semiarid region of India. <i>Arabian Journal of Geosciences</i> 14 :2440.	7.83
1549	Sharma P, Sharma S R, Dhall R K, Mittal T C and Kumar S (2021). Variation in quality and acceptability of minimally processed garlic in response to γ -irradiation and packaging during refrigerated storage. <i>RadiatPhysChem</i> , https://doi.org/10.1016/j.radphyschem.2020.109193 .	7.98
1550	Sharma Pand Aparna (2021). Preferences and perceived effectiveness of information sources for livestock production. <i>Ind J Ext Edu</i> 57(3) : 81-85.	5.95
1551	Sharma R and Sharma S (2021). Anti-nutrient & bioactive profile, in vitro nutrient digestibility, techno-functionality, molecular and structural interactions of foxtail millet (<i>Setaria italica</i> L.) as influenced by biological processing techniques. <i>Food Chem</i> 368 : 130815.	15.23
1552	Sharma R K and Sharma K K (2021). Relative incidence of aphid (<i>Lipaphiserysimi</i>) and Alternaria blight on mustard in sub-mountainous region of Punjab. <i>J Environ Bio</i> 42 : 694-699.	5.57
1553	Sharma R, Burang G, Kumar S, Sharma Y P, Kumar V (2021). Optimization of apricot (<i>Prunus armeniaca</i> L.) blended Aloe vera (<i>Aloe barbadensis</i> M.) based low-calorie beverage functionally enriched with aonla juice (<i>Phyllanthus emblica</i> L.). <i>J Food Sci Technol</i> 59(5) :2013-24.	8.70
1554	Sharma R, Dar B N, Sharma S and Singh B (2021). In vitro digestibility, cooking quality, bio-functional composition, and sensory properties of pasta incorporated with potato and pigeon pea flour. <i>Int J Gastr Food Sci</i> 23 : 100300.	9.19
1555	Sharma R, Kumar M and Alam M S (2021). Image processing techniques to estimate weight and morphological parameters for selected wheat refractions. <i>Scientific Reports</i> 11 :20953, https://doi.org/10.1038/s41598-021-00081-4 .	10.00



1556	Sharma R K and Suri K S (2021). Seasonal activity of rice brown planthopper, Nilaparvatalugens (Stal.) (Homoptera: Delphacidae) in sub-mountainous region of Punjab. <i>Agri Res J</i> 58(1) : 82-87.	5.44
1557	Sharma S and Dhaliwal S S (2021). Conservation agriculture-based practices enhanced micronutrients transformation in earthworm cast soil under rice-wheat cropping system. <i>Ecological Engineering</i> 163 :106195.	10.04
1558	Sharma S and Sahni P (2021). Dynamics of germination behaviour, protein secondary structure, techno-functional properties, antinutrients, antioxidant capacity and mineral elements in germinating Dhaincha. <i>Food Technol Biotechnol</i> 59 : 230-50.	8.33
1559	Sharma S and Sahni P (2021). Germination behaviour, technofunctional characteristics, antinutrients, antioxidant activity and mineral profile of lucerne as influenced by germination regimes. <i>J Food Measure</i> 15 : 1796-1809.	9.01
1560	Sharma S and Singh J (2021). Split application of potassium improves yield and potassium uptake of rice crop under deficient soils. <i>J Soil Water Conserv</i> 20(2) : 213-220.	5.20
1561	Sharma S and Utreja D (2021). Synthesis and antiviral activity of diverse heterocyclic scaffolds. <i>Chem Biol Drug Design</i> 1-51.	8.55
1562	Sharma S G, Walia A, Chauhan A& Shirkot C K(2021). Statistical optimization of alkaline protease from <i>Bacillus amyloliquefaciens</i> SP1. <i>Indian J ExpBiol</i> 58 :1-12.	6.78
1563	Sharma S R, Mittal T C, Alam M S, BhardwajA and Sharda R (2021). Drying behaviour of curry leaves under different drying techniques. <i>Agri Res J</i> 58(5) :881-887.	5.44
1564	Sharma S R, SinhaA, Kaur P and Mittal T C (2021). Recent techniques for the management of postharvest losses and quality preservation of fruits and vegetables: A Review. <i>Agri Res J</i> 58(6) : 941-957.	5.44
1565	Sharma S, and Dhaliwal S S (2021). Conservation agriculture based practices enhanced micronutrients transformation in earthworm cast soil under rice-wheat cropping system. <i>Ecological Engineering</i> 163 : 106195.	9.51
1566	Sharma S, Gill M S, Thakur A, Choudhary O P, Singh M and Singh N (2021). Evergreen fruit crops improve carbon pools, enzymes and nutrient availability in soil over deciduous ones under sub-tropical conditions. <i>Comm. Soil Science and Plant Analysis</i> 52(16) : 1864-78	6.69
1567	Sharma S, Sharma N, Singh A and Singh B (2021). Stability of iron and vitamin A in pasta enriched with variable plant sources during processing and storage. <i>J Food Process Preserv</i> 45 : e15422.	8.61
1568	Sharma S, Sharma R and Singh B (2021). Influence of bioprocessing treatments on phytochemical and functional properties, in vitro digestibility, protein secondary structure and morphological characteristics of Indian barnyard millet flour. <i>Int J Food Sci Technol</i> 57 : 4744-53.	9.61
1569	Sharma S, Singh P, Choudhary O P, and Neemisha (2021). Nitrogen and rice straw incorporation impact nitrogen use efficiency, soil nitrogen pools and enzyme activity in rice-wheat system in north-western India. <i>Field Crops Research</i> 266 : 108131.	10.31
1570	Sharma T and Shera P S (2021). Biological anomalies in the sugarcane leafhopper, <i>Pyrilla perpusilla</i> (Walker) due to parasitism by <i>Fulgoraacia melanoleuca</i> (Fletcher) (Lepidoptera :Epipyropidae). <i>Egypt J Biological Pest Control</i> 31 : 137.	6.38
1571	Sharma Y and Singh H (2021). Effects of Par on Plant Spacing in Relation to Yield Efficiency in Peach. <i>Bangladesh J Botany</i> 50(3) : 701-707.	6.34
1572	Sharma Y, Sidana B K, Kaur S and Kumar S (2021). Role of public policy in sustaining groundwater: Impact of 'The Punjab Preservation of Sub Soil Water Act, 2009'. <i>Agri Econ Res Rev</i> 34 (347-2022-568).	5.84
1573	Sharma A, Dheri G S and Saini S P (2021). Long-term nutrient management affects nitrogen dynamics and crop yield in rice (<i>Oryza sativa</i>)-wheat (<i>Triticum aestivum</i>) system. <i>Ind J Agri Sci</i> 91 :1174–1179.	6.37

1574	Sharma D K, Alam M S, Saini M K and Bhatia S (2021). Evaluation of some botanicals, thermal treatment and packing materials against pulse beetle <i>callosobruchuschinensis</i> . In chickpea. <i>Ind J Ent</i> , DOI.: 10.5958/IJE.2021.141	5.08
1575	Sheikh Md. M, Riar T S, Walia S S and Garg L (2021). A comparative study of productivity and economic profitability of integrated farming systems in Punjab, India and northern part of Bangladesh. <i>Ind J Ext Edu</i> 57(1) : 136-141.	5.95
1576	Shera P S, Karmakar P, Sharma S, Kaur R and Sangha K S (2021). Bt cotton producing Cry1Ac and Cry2Ab does not harm the parasitoid <i>Aenasius arizonensis</i> (Girault): a host-mediated tritrophic assay. <i>Phytoparasitica</i> , https://doi.org/10.1007/s12600-021-00908-w	7.14
1577	Shilpa, Mahajan B V C, Singh NP, Bhullar K S and Kaur S (2021). Effect of evaporative cooling on peel browning and quality of litchi (<i>Litchi chinensis</i> L.) <i>Ind J Agri Sci</i> 91(3) : 445-49.	6.21
1578	Sidana B K and Kumar S (2021). Climate adaptation strategies: optimizing farm-level water use and profitability in Punjab. <i>Agri Econ Res Rev</i> 34(1) : 91-102.	5.84
1579	Sidhu A S, Kang J S and Kaur J (2021). Nitrogen and residue management effects on productivity and profitability of happy seeder wheat in Indian Punjab. <i>Agri Res J</i> 58(03) : 434-40.	5.44
1580	Sidhu A S, Kang J S and Kaur J (2021). Soil physico-chemical environment, root density and weed growth under different residue and nitrogen management practices in happy seeder sown wheat. <i>Ind J Agri Sci</i> 91(06) : 814-18.	6.25
1581	Sidhu B S, Sharda R and Singh S (2021). An assessment of water footprint for irrigated rice in Punjab. <i>J Agrometeorology</i> 23(1) :21-29.	6.47
1582	Sidhu B S, Sharda R and Singh S (2021). Water Footprint of Crop Production: A Review. <i>Ind J Ecol Soc</i> 48(2) :358-66.	5.79
1583	Sidhu M K and Kaur J (2021). Inter-specific hybridization between sponge gourd (<i>Luffa cylindrica</i> L.) and 'Satputia' (<i>Luffa hermaphrodita</i> Singh & Bhandari) for pre-introgression of cluster bearing, high yield, and gynocism. <i>J Genetics</i> 100 : 73.	6.99
1584	Sidhu S K and Kler T K (2021). Assessment of heavy metal contamination in excreta of Baya Weaver Bird (<i>Ploceus philippinus</i>) from three districts of different zones of Punjab. <i>Bull Environ Contam Toxicol</i> , https://doi.org/10.1007/s00128-021-03181-z	7.66
1585	Sidhu S K, Sekhon G S, Aulakh R K and Kler T K (2021). Prioritizing sustenance of village ponds for avian conservation: A case study from Punjab, India. <i>Pak J Zool</i> 53(2) : 1-8.	6.00
1586	Singh J, Sirari A, Singh H, Kumar A, Jaidka M, Mandahal K S, Kumar S and Singh S (2021). Identifying and validating SSR markers linked with rust resistance in lentil (<i>Lens culinaris</i>). <i>Plant Breeding</i> 3 : 477-485.	7.60
1587	Singh A K, Kewalramani N, Mani V, Sharma A, Kumari P and Pal R P (2021). Effects of boric acid supplementation on bone health in crossbred calves under tropical condition. <i>J Trace Elements in Medicine and Biology</i> 63 : 126647.	10.00
1588	Singh A, Bobade H, Sharma S, Singh B and Gupta A (2021). Enhancement of digestibility of nutrients (in vitro), antioxidant potential and functional attributes of wheat flour through grain germination. <i>Plant Food Hum Nutr</i> 76 : 118-24.	10.12
1589	Singh A, Singh G, Rattanpal H S and Gupta M (2021). Diversity assessment of mandarin (<i>Citrus reticulata</i> Blanco) genotypes under sub-tropical conditions. <i>Agri Res J</i> 58(6) : 1006-13.	5.44
1590	Singh A, Singh ND and Sohal S K (2021). Current Perspective on Optimizing Economics of Bee-keeping in Punjab. <i>Ind J Ecol</i> 48(3) : 834-839.	5.76
1591	Singh A, Sohal S K and Singh N D (2021). Cosmopolitan honey bee (<i>Apis mellifera</i>) as quick and efficient marker of pesticide pollution in environment through RP- HPLC. <i>Environmental Sciences and Pollution Control</i> .	11.60



1592	Singh B and Singh P (2021). Influence of abiotic factor on the relative abundance and damage of major insect pests of wheat under different sowing times in north-western plains of India. <i>Agri Res J</i> 58(5) : 801-807.	5.44
1593	Singh B, Gill R I S, Kaur N and Dhillon G P S (2021). Standardization of irrigation, nutrient and pruning requirement of <i>Jatropha</i> (<i>Jatropha curcas</i> L.) for enhancing its productivity. <i>Ind Forester</i> 147(2) : 160-167.	5.1
1594	Singh B, Kaur S, Litoria P K and Das S (2021). Development of web enabled water resource information system using open source software for Patiala and SAS Nagar districts of Punjab, India. <i>Water Practice and Technology</i> 16(3) : 980-990.	6.78
1595	Singh B, Singh S and Chaudhary S (2021). Physico-chemical properties and fractions of organic carbon and nitrogen in the soil under twenty-year-old tree species. <i>Ind J Agroforestry</i> 23(2) : 17-24.	5.19
1596	Singh B, Kaur N, Gill R I S and Gosal S K (2021). Effect of biofertilizers and chemical fertilizers on growth of clonal eucalyptus plantations. <i>Agri Res J</i> 58(4) : 632-635.	5.44
1597	Singh D and Kaur P (2021). Happy Seeder Technologies in Punjab State of India: Lessons Learned from Farmers. <i>Ind J Econ Dev</i> 17 : 910-916.	5.15
1598	Singh D, Kaur P and Singh D (2021). A Standardized Scale to Measure the Attitude of Farmers Towards Zero-Till Drill. <i>Ind J Ext Edu</i> 57(2) : 11-18.	5.95
1599	Singh E, Kaur M and Sharma S (2021). Structural tuning of CTAB@MgFe ₂ O ₄ nanocomposite as peroxidase mimic for H ₂ O ₂ and glucose sensing. <i>Mater Chem Phys</i> 271 :124851.	9.41
1600	Singh G, Batra N, Salaria A, WanFO A and Singh J (2021). Groundwater quality assessment in Kapurthala district of central plain zone of Punjab using hydrochemical characteristics. <i>J Soil Water Conserv</i> 20(1) : 43-51.	5.20
1601	Singh G, Buttar D S and Aulakh S K (2021). Prevalence of Fusarium wilt incidence (<i>Fusarium oxysporium</i> f.sp. <i>melonis</i>) on Muskmelon under Punjab conditions. <i>Agri Res J</i> 58(5) : 913-916.	5.44
1602	Singh G, Mavi M S, Choudhary O P, Gupta N and Singh Y(2021). Rice straw biochar application to soil irrigated with saline water in a cotton-wheat system improves crop performance and soil functionality in north-west India. <i>J Env Management</i> 295 :113277.	11.65
1603	Singh G, Singh I, Sharma P, Gupta M and Singh S (2021). Devising selection criteria based on variability and association studies in segregating populations derived from an inter-specific cross between <i>Cajanus scarabaeoides</i> × <i>C. cajan</i> . <i>Legume Res</i> 44(6) : 615-620.	6.23
1604	Singh G, Singh K, Sodhi G P S and Sekhon B S (2021). Economic analysis of parawilt management in Bt-cotton (<i>Gossypium hirsutum</i> L.) in Mansa district of South-western Punjab, India. <i>Ind J Ext Edu</i> 58(1) : 93-96.	5.95
1605	Singh G, Singh P and Sharda R (2021). Effect of irrigation levels and mulching on growth and flower production in african marigold (<i>Tagetes erecta</i> L.). <i>Agri Res J</i> 58(4) : 693-697.	5.44
1606	Singh G, Singh P and Sodhi GPS (2021). Assessment and analysis of agricultural technology adoption in cotton (<i>Gossypiumhirsutum</i> L.) cultivation in south-western Punjab. <i>Agri Res J</i> 58(2) : 324-333.	5.44
1607	Singh G, Singh P, Sodhi GPS and Tiwari D (2021). Energy auditing and data envelopment analysis (DEA) based optimization for increased energy use efficiency in wheat (<i>Triticumaestivum</i> L.) in north-western India. <i>Sustainable Energy Technologies and Assessment</i> 47 : 101453.	14.00
1608	Singh G, Singh P, Tiwari D and Singh K (2021). Role of social media in enhancing agricultural growth. <i>Ind J Ext Edu</i> 57(2) :69-72.	5.95
1609	Singh G, Singh R and Singla A (2021). Seasonal abundance of Blister beetle, <i>Mylabrispustulata thunberg</i> on pigeonpea and mungbean. <i>Mausam</i> 72(3) : 645-648.	6.64

1610	Singh G, Virk H K, Aggarwal N and Gupta R K (2021). Growth, symbiotic traits, productivity and nutrient uptake as influenced by dose and time of nitrogen application and Rhizobium inoculation in mungbean [<i>Vigna radiata</i> (L.) Wilczek]. <i>Journal of Plant Nutrition</i> 44(13) : 1982-1992.	8.28
1611	Singh H and Khar A (2021). Perspectives of onion hybrid breeding in India: An overview. <i>Ind J Agri Sci</i> 91 : 1426-32.	6.21
1612	Singh H, Kaur P, Bal S K and Choudary B U (2021). Effect of elevated temperature on green gram [<i>Vigna radiata</i> (L.) Wilczek] performance under temperature gradient tunnel (TGT) environment in Punjab. <i>J Agrometeorology</i> 23(1) : 3-13.	6.47
1613	Singh H, Khar A and Verma P (2021). Induced mutagenesis for genetic improvement of <i>Allium</i> genetic resources: A comprehensive review. <i>Genetic Resources and Crop Evolution</i> 68 : 2669-90, https://doi.org/10.1007/s10722-021-01210-8	7.52
1614	Singh H, Kingra P K, Pal R K and Singh S P (2021). Altering microclimate of wheat (<i>Triticum aestivum</i> L.) by adjusting sowing dates, irrigation and nitrogen application in semi-arid and arid agroclimatic conditions of Punjab. <i>J Agrometeorology</i> 23(3) : 272-278.	6.47
1615	Singh H, Kingra P K, Pal R K and Singh S P (2021). Effect of weather parameters on wheat (<i>Triticum aestivum</i> L.) grown under different sowing environments in central and south-western Punjab. <i>Agri Res J</i> 58(6) : 1042-1052.	5.44
1616	Singh H, Kingra P K, Pal R K and Singh S P (2021). Improving heat use efficiency of wheat (<i>Triticum aestivum</i> L.) in semi-arid and arid agroclimatic conditions of Punjab. <i>Mausam</i> 72(3) : 673-680.	6.37
1617	Singh H, Kingra P K, Pal R K and Singh SP (2021). Growth response and water production functions of wheat (<i>Triticum aestivum</i> L.) under abiotic stresses in central and south-western Punjab. <i>Mausam</i> 72(4) : 887-896.	6.37
1618	Singh H, Mishra S K, Singh K, Singh K, Pal R K, Gill K K and Kingra P K (2021). Simulating the impact of climate change on sugarcane production in Punjab. <i>J Agrometeorology</i> 23(3) : 292-298.	6.47
1619	Singh H, Sharma S K and Bhat M A (2021). Performance of wheat under different tillage methods and potassium levels under irrigated and rainfed conditions of Northern-India. <i>J Crop Weed</i> . 17(1) : 99-109.	5.46
1620	Singh H, Verma P, Lal S K and Khar A (2021). Optimization of EMS mutagen dose for short day Indian onion. <i>Ind J Hort</i> 78 : 35-40.	6.16
1621	Singh I, Singh S, Sandhu J S, Taggar G K, Singh R and Singh I P (2021). AL 1747 (IC0632084; INGR19076), a Pigeonpea (<i>Cajanus cajan</i>) Germplasm Moderately Resistant to Pod Borer. Indeterminate Growth Habit. Early Maturing (130-140 days). <i>Ind J Plant Genetic Resources</i> 34 : 136-137.	5.54
1622	Singh J and Garg L (2021). Farmer's Opinion about Crop Diversification in Punjab. <i>Ind J Ext Edu</i> 57(2) : 208-211.	5.95
1623	Singh J and Kaur P (2021). Crop Weather Calendars for cultivation of Sunflower crop in Punjab. <i>Agri Res J</i> 58(1) : 68-74.	5.44
1624	Singh J and Kaur P (2021). Formulation of "weekly and monthly thumb rule models" for prediction of potential productivity of sunflower in Punjab. <i>J Agrometeorology</i> 23(2) : 176-182.	6.47
1625	Singh J and Singh R (2021). Roosting preference and relation of abiotic factors on population of <i>Pteropus giganteus</i> (Chiroptera: Pteropodidae) in Ludhiana. <i>Agri Res J</i> 58(6) : 1108-15.	5.44
1626	Singh J and Singh V (2021). Prediction of spring maize yields using leaf color chart, chlorophyll meter, and GreenSeeker optical sensor. <i>Experimental Agriculture</i> , 57 : 45-56.	7.40



1627	Singh J, Chahal T S, Gill P P S and Grewal S K (2021). Changes in phenolics and antioxidant capacities in fruit tissues of mandarin cultivars Kinnow and W. Murcott with relation to fruit development <i>Journal Food Processing and Preservation</i> , https://doi.org/10.1111/jfpp.16040 .	8.19
1628	Singh J, Chahal T S, Gill P P S, Grewal S K (2021). Effect of fruit development stages on antioxidant properties and bioactive compounds in peel, pulp and juice of grapefruit varieties. <i>J Food Process Preserv</i> , DOI: 10.1111/jfpp.16040	7.41
1629	Singh J, Dhaliwal S S and Mavi M S (2021). Zinc fractions and nutrition of maize (<i>Zea mays</i> L.) as affected by Olsen-P levels in soil. <i>Nutrient Cycling in Agroecosystems</i> 120 : 271–274.	9.27
1630	Singh J, Dhaliwal R K, Vikal Y (2021). Genetic diversity studies in Indian germplasm of pea (<i>Pisum sativum</i> L.) using morphological and microsatellite markers. <i>Genetika</i> 53(2) :473-491.	6.75
1631	Singh J, Kaur A, Sharma V K and Kalia A (2021). Variable host pathogen interactions in resistant and susceptible barley (<i>Hordeum vulgare</i>) genotypes to <i>Ustilago hordei</i> . <i>Ind J Ecol</i> 48(5) : 1449-1452.	5.79
1632	Singh J, Riar T S and Garg L (2021). Prospects of Integrated Farming System in Punjab. <i>J Community Mobilization and Sustain Dev</i> 16(3) : 884-886.	5.65
1633	Singh J, Sharma S, Kaur A, Vikal Y, Cheema A K, Bains B K, Kaur N, Gill G K, Malhotra P K, Kumar A, Sharma P, Muthusamy V, Kaur A, Chawala J S, Hossain F (2021). Marker assisted pyramiding of lycopene- ξ -cyclase, β -carotene hydroxylase 1 and opaque 2 genes for development of biofortified maize hybrids. <i>Scientific Reports</i> 11 : 12642.	10.00
1634	Singh J, Sharma V K, Kaur A and Sharma S (2021). Differential biochemical response in resistant and susceptible barley (<i>Hordeum vulgare</i>) cultivars upon covered smut (<i>Ustilago hordei</i>) infection. <i>Ind Phytopathology</i> 74 : 173-179.	5.95
1635	Singh J, Singh B and Sharma S (2021). Comparison of soil carbon and nitrogen pools among poplar and eucalyptus based agroforestry systems in Punjab, India. <i>Carbon Management</i> 12 (6) : 693-708.	9.18
1636	Singh J, Singh R, Dhaliwal H S, Sidhu G S, Thakur A, Chhuneja P (2021). Morpho-genetic diversity in zygotic populations derived from Rough lemon (<i>Citrus jambhiri</i> Lush.) and their tolerance against <i>Phytophthora</i> . <i>Fruits</i> 76(5) :236-47.	6.58
1637	Singh J, Sirari A, Singh H, Kumar A and Jaidka M (2021). Identifying and validating S S R marker linked with rust resistance in lentil (<i>Lens culinaris</i> L.). <i>Plant Breeding</i> 140(3) : 477-485.	7.66
1638	Singh K G and Singh A (2021). Growth and yield of tomato in soilless media under naturally ventilated polyhouse. <i>Ind J Hort</i> 78(3) :297-303.	6.16
1639	Singh K, Brar AS, and Mishra SK (2021). Improvement in productivity and profitability of sugarcane through drip fertigation in north Indian conditions. <i>Sugar Tech</i> , 23 : 536-545.	7.02
1640	Singh K, Gera R, Sharma R, Maithani D, Chandra D, Bhat M A, Kumar R and Bhatt P (2021). Mechanism and application of <i>Sesbania</i> rootnodulating bacteria: an alternative for chemical fertilizers and sustainable development. <i>Archives of Microbiology</i> 203 : 1259–1270, https://doi.org/10.1007/s00203-020-02137-x .	8.67
1641	Singh K, Prakash A, Singh M, Sharda S and Gupta H (2021). Relative performance of satellite based navigation systems for improving tractor productivity. <i>Agri Res J</i> 58(5) : 874-880.	5.44
1642	Singh K, Rathore P, Brar A S and Mishra S K (2021). Drip fertigation improves seed cotton yield, water productivity and profitability of cotton raised under high density planting system in semi-arid environment. <i>Emirates Journal of Food and Agriculture</i> 33 : 781-793.	7.01
1643	Singh M and Singh A (2021). Inclusion of women in dairy enterprise. <i>Ind J Ext Edu</i> 57(3) : 192-195.	5.96

1644	Singh M C, Pal V, Singh S and Satpute S (2021). Wheat yield prediction in relation to climatic parameters using statistical model for Ludhiana district of central Punjab. <i>J Agrometeorology</i> 23(1) :122-26.	6.47
1645	Singh M C, Singh J P and Singh K G (2021). Mathematical modeling of greenhouse microclimate under vertically trained soilless cropped conditions. <i>Agri Res</i> 10(3) :1-11.	5.95
1646	Singh M C, Singh J P, Singh K G, Gupta O P and Kumar G (2021). Computation of vapour pressure deficit and crop transpiration via development of a web based computer module. <i>J Agrometeorology</i> 23(4) : 381-88.	6.55
1647	Singh M C, Yousuf A and Prasad V (2021). Morphometric and principal component analysis-based prioritization of reservoir catchments using geospatial techniques for land and water conservation aspects in North-West India. <i>Arabian Journal of Geosciences</i> 14 :598. https://doi.org/10.1007/s12517-021-06822-z	7.83
1648	Singh M, Kaur M, Sangha M K and Ubhi M K (2021). Comparative evaluation of manganese oxide and its graphene oxide nanocomposites as polyphenol oxidase mimics. <i>Mater Today Commun</i> 27 : 102237.	9.38
1649	Singh M, Sharma P and Brar AS (2021). Growth and forage yield potential of cowpea (<i>Vigna unguiculata</i> (L.) Walp) as exploited by sowing dates and plant population. <i>Agri Res J</i> 58(6) : 1029-1035.	5.44
1650	Singh M, Singh K B (2021). Effect of Tillage for Rice Residue Management on Physical Properties of Soil. <i>Communications in Soil Science and Plant Analysis</i> 52 (18), 2098-2109.	7.58
1651	Singh M, Tiwana B S, Sharma B, Singh S K, Dixit A K, Goyal R and Singh Y (2021). Microcontrollerbased low-cost safety alarm for straw management system attached to combine harvester. <i>Agri Res J</i> 58(4) : 698-705.	5.44
1652	Singh M, Walia G S and Javed M (2021). A general class of modified ratio type estimators of population mean. <i>J Ind Soc Agri Stat</i> 75(3) : 211-215.	5.51
1653	Singh MJ, Sharma V and Bhatt R (2021). Bio-efficacy of Polymer Coated Urea on Nitrogen Use Efficiency and Yield of Maize (<i>Zea mays</i> L.). <i>J Ind Soc Soil Sci</i> 68(4) : 462-468.	5.31
1654	Singh P and Benbi DK (2021). Physical and chemical stabilization of soil organic matter in cropland ecosystems under rice-wheat, maize-wheat and cotton-wheat cropping systems in north-western India. <i>Carbon Management</i> 12 (6) : 603-21.	9.18
1655	Singh P, Benbi D K and Verma G (2021). Nutrient management impacts on nutrient use efficiency and energy, carbon, and net ecosystem economic budget of a rice-wheat cropping system in north western India. <i>J Soil Sci Plant Nutr</i> 21 : 559-577.	8.16
1656	Singh P, Goyal M, Bhasker B and Guleria A (2021). Sustainable food security index: planning tool for district level agricultural development in Uttar Pradesh. <i>Agri Econ Res Rev</i> 34(1) :51-67.	5.84
1657	Singh P, Kaur P, Khehra S, Singh Sand Bhatt R (2020). Interventions of Farm Advisory Service Center in improving farm livelihoods of Tarn Taran district of Punjab. <i>Agri Res J</i> 57(4) : 627-632.	5.44
1658	Singh P, Singh G, Sodhi G P S and Benbi D K (2021). Accounting carbon footprints and applying Data Envelopment Analysis to optimize input-induced greenhouse gas emissions under rice-wheat cropping system in north-western India. <i>Journal of Soil Science and Plant Nutrition</i> 21 : 3030-3050.	9.87
1659	Singh P, Singh G, Sodhi G P S and Sharma S (2021). Energy optimization in wheat establishment following rice residue management with Happy Seeder technology for reduced carbon footprints in north-western India. <i>Energy</i> 230 :120680.	12.06
1660	Singh P and Saini SP (2021). Micronutrients availability in soil-plant system as influenced by long-term integrated nutrient under rice-wheat cropping. <i>Journal of Plant Nutrition</i> , DOI:10.1081/01904167.2021.1943680.	7.10



1661	Singh R, Kaur S and Aggarwal P (2021). A cost effective technology for isolation of potato starch and its utilization in formulation of ready to cook, non cereal, and non glutinous soup mix. <i>J Food Meas</i> : 1-14, DOI: https://doi.org/10.1007/s11694-021-00887-w	9.01
1662	Singh R, Kaur S and Aggarwal P (2021). Exploration of potato starches from non-commercial cultivars in ready to cook instant non cereal, non glutinous pudding mix. <i>LWT</i> 150 :111966.	12.06
1663	Singh R, Taggar G K, Singla A and Chhuneja P K (2021). Computation of economic threshold and economic injury level of <i>Helicoverpaarmigera</i> (Hübner) in chickpea. <i>J Ent Res</i> 45(4) : 696-701.	5.89
1664	Singh Rand Singh G (2021). Influence of herbicides on symbiotic parameters, growth, yield and nutrient uptake in mungbean [<i>Vigna radiata</i> (L.) Wilczek]. <i>Archives of Agronomy and Soil Science</i> 67(3) : 410-425.	8.24
1665	Singh S and Sharma D K (2021). Deterioration of Grain Quality of Wheat by Rice Weevil, <i>Sitophilus oryzae</i> (L.) during Storage. <i>Ind J Agri Res</i> , DOI.10.18805/IJARE.A-5695.	5.20
1666	Singh S and Sharma DK (2021). Screening of wheat varieties against lesser grain borer, <i>Rhyzoperthadominica</i> . <i>Ind J Ent</i> 83(4) : 602-605.	5.89
1667	Singh S, Brar A S and Dhillon B S (2021). Effect of variable sowing and harvesting schedule on growth and yield of chicory (<i>Cichoriumintybus</i> L.). <i>Agri Res J</i> 58(2) : 189-194.	5.44
1668	Singh S, Deol J S, Singh O and Sharma R (2021). Effect of mepiquat chloride and nitrogen fertilizer on growth, yield, quality and lodging in basmati rice (<i>Oryzasativa</i> L.) cultivars in Punjab. <i>Agri Res J</i> 58(6) : 1020-28.	5.44
1669	Singh S, Gill R S, Hans V S and Singh M (2021). A novel active-mode indirect solar dryer for agricultural products: Experimental evaluation and economic feasibility. <i>Energy</i> 222 : 119956.	12.08
1670	Singh S, Jighly A, Sehgal D, Burgueño J, Joukhadar R, Singh S K, Sharma A, Vikram P, Sansaloni C P, Govindan V, Bhavani S, Randhawa M, Solis Moya E, Singh S, Pardo N, Arif M A R, Aghari K A, Basandrai D, Shokat S, Chaudhary H K, Saeed NA, Basandrai A K, Ledesma-Ramírez L, Sohu VS, Intiaz M, Ali SM, Wenzl P, Singh GP and Bains NS (2021). Direct introgression of untapped diversity into elite wheat lines. <i>Nature Foods</i> , https://doi.org/10.1038/s43016-021-00380-z	20.00
1671	Singh S, Kumar S, Pathania M and Singh P (2021). Population dynamics of thrips <i>Thripstabaci</i> in Bt cotton. <i>Ind J Ent</i> 83(4) : 589-591.	5.08
1672	Singh S, Kumar V and Utreja D (2021). Pyrrolo[2,1-f][1,2,4]triazine: A promising fused heterocycle to target kinases in cancer therapy. <i>Med Chem Res</i> 1-25.	7.78
1673	Singh S, Sekhon M and Kumar S (2021). Staggered public procurement of good grains in Punjab: New policy regime. <i>Ind J Agri Sci</i> 91(10) : 1510-1514.	6.37
1674	Singh S, Sekhon M, Kumar S and Bhardwaj S (2021). Implications of organized retailing in horticultural crops in Punjab. <i>Ind J Agri Sci</i> 91(8) : 1151-1154.	6.37
1675	Singh S, Shashank PR, Singh V and Kaur R (2021). Occurrence of indigenously restricted fruit borer, <i>Citripestiseutraperha</i> on mango in Punjab, and its damage potential. <i>Ind J Plant Prot</i> 49(1) : 9-13.	5.07
1676	Singh S, Singh N P, Mahajan B V C and Sidhu GS (2021). Response of strawberry fruits to low temperature and ambient storage conditions. <i>Ind J Hort</i> 78 : 111-117.	6.59
1677	Singh T, Kaur M and Singh G (2021). Extent of adoption of happy seeder technology among the farmers of Punjab, India. <i>Ind J Ext Edu</i> 57 : 75-79.	5.95
1678	Singh T, Singh ND and Sohal SK (2021). Farmers' Perception Regarding Water Conservation in Punjab. <i>Ind J Econ Dev</i> 17(2) : 273-281.	5.86
1679	Singh T, Verma A and Singh M (2021). Development and implementation of an IOT based instrumentation system for computing performance of a tractor-implement system. <i>Journal of Terramechanics</i> 97 : 105-118.	8.04

1680	Singh V K, Gautam P, Nanda G, Dhaliwal S S, Pramanick B, Meena S S, Alsanie, W F, Gaber A, Sayed S and Hossain A (2021). Soil Test Based Fertilizer Application Improves Productivity, Profitability and Nutrient Use Efficiency of Rice (<i>Oryza sativa</i> L.) under Direct Seeded Condition. <i>Agronomy</i> 11 : 1756.	9.43
1681	Singh V P, Kunal, Gosal S K, Choudhary R, Singh R and Adholeya A (2021). Arbuscular mycorrhizal fungi and proximal sensing for improving nutrient use efficiencies in wheat (<i>Triticum aestivum</i> L.). <i>Journal of Plant Nutrition</i> , DOI:10.1080/01904167.2021.2014872.	7.71
1682	Singh V P, Kunal, Gosal S K, Choudhary R, Singh R and Adholeya A (2021). Improving nitrogen use efficiency using precision nitrogen management in wheat (<i>Triticum aestivum</i> L.). <i>Journal of Plant Nutrition and Soil Science</i> 184 : 371-377.	9.57
1683	Singh V, Chahal T S and Gill P P S (2021). Seasonal variations in nutrient elements in leaves and fruits of four grapefruit varieties. <i>Agri Res J</i> 58 : 685-92.	5.44
1684	Singh V, Chahal TS , Grewal S K and Gill P S (2021). Effect of fruit development stages on antioxidant properties and bioactive compounds in peel, pulp and juice of grapefruit varieties. <i>J Food Meas Charac</i> 15 : 2531-2539.	7.65
1685	Singh V, Kaur N, Kunal, Singh M B, Kumar J, Thapar A and Ober E (2021). Nitrate leaching from applied fertilizer is reduced by precision nitrogen management in baby corn cropping systems. <i>Nutrient Cycling in Agroecosystems</i> 120 : 379-391.	8.45
1686	Singh V, Kunal, Kaur R, Singh M, Singh M, Singh H and Singh B (2021). Prediction of grain yield and nitrogen uptake by basmati rice through in-season proximal sensing with a canopy reflectance sensor. <i>Precision Agriculture</i> , doi.org/10.1007/s11119-021-09857-0.	11.39
1687	Singh V, Sharma G and Sood A K (2021). Vertical distribution and abundance of aleyrodids of agricultural importance in Himachal Pradesh. <i>Ind J Ent</i> 83 , DOI: 10.5958/0974-8172.2020.00258.8	5.08
1688	Singh J, Mavi M S and Saini S P (2021). Target yield based integrated nutrient management in rice (<i>Oryza sativa</i>) and wheat (<i>Triticum aestivum</i>) cropping system. <i>Ind J Agri Sci</i> 91 : 1528-31.	6.37
1689	Singh N, Singh N P, Kumari V, Jindal V and Meena S (2021). Morphological and molecular characterization of forensically important blowfly, <i>Chrysomya megacephala</i> . <i>Ind J Ent</i> , DOI. 10.5958/0974-8172.2021.00082.1	5.89
1690	Singla R and Rampal V K (2021). Constraints faced by farmers in adoption of polyhouse technology. <i>Ind J Ext Edu</i> 57(3) : 22-27.	5.95
1691	Sinha A , Gill P P S, Jawandha S K, Kaur P , Grewal S K (2021). Chitosan-enriched salicylic acid coatings preserves antioxidant properties and alleviates internal browning of pear fruit under cold storage and supermarket conditions. <i>Postharvest Biology and Technology</i> 182 : 111721 https://doi.org/10.1016/j.postharvbio.2021.111721 .	12.75
1692	Sirunyan A M and Dhingra N (2021). First measurement of large area jet transverse momentum spectra in heavy-ion collisions. <i>J High Energy Phy</i> 05 : Article No. 284.	11.81
1693	Sirunyan A M and Dhingra N (2021). Measurements of Higgs boson production cross sections and couplings in the diphoton decay channel at $\sqrt{s}=13$ TeV. <i>J High Energy Phy</i> 07 : Article No. 27.	11.81
1694	Sirunyan A M and Dhingra N (2021). Study of Drell-Yan dimuon production in proton-lead collisions at $\sqrt{s_{NN}}=8.16$ TeV. <i>J High Energy Phy</i> 05 : Article No. 182.	11.81
1695	Sirunyan A M, Tumasyan A, Adam W, Andrejkovic J W, Kalsi A K et al. [CMS Collaboration], (2021). Search for lepton-flavor violating decays of the Higgs boson in the $\mu\tau$ and $e\tau$ final states in proton-proton collisions at $\sqrt{s}=13$ TeV. <i>Phys. Rev. D</i> 104 :032013.	11.296
1696	Sirunyan A M,..., Dhingra N et al. (CMS Collaboration) (2021). Measurements of production cross sections of the Higgs boson in the four-lepton final state in proton-proton collisions at $\sqrt{s}=13$ TeV. <i>European Physical Journal C</i> : 81, Article No. 488.	10.59



1697	Sirunyan A M,., Dhingra N. et al. (CMS Collaboration) (2021). Constraints on anomalous Higgs boson couplings to vector bosons and fermions in its production and decay using the four-lepton final state. <i>Physical Review D</i> 104 :052004.	11.40
1698	Sirunyan A M, Tumasyan A, Adam W, Andrejkovic J W, Kalsi A K et al. [CMS Collaboration] (2021). Search for resonant and nonresonant new phenomena in high-mass dilepton final states at $\sqrt{s} = 13$ TeV. <i>Journal of High Energy Physics</i> 07 :208.	12.38
1699	Sivia S S, Sunayana and Siwach S S (2021). Microsatellite based genotyping and assessment of genetic divergence in upland cotton (<i>Gossypium hirsutum</i>). <i>Ind J Genetics Plant Breed</i> 81(2) : 327-330.	6.47
1700	Sohu V S, Bains N S, Mavi G S, Sharma A, Bhagat I and Srivastava P (2021). Notification and germplasm registration – Bread wheat variety PBW 1 Zn. <i>Ind J Genet</i> 81(4) :605.	6.55
1701	Solanki C, Gupta S K, Alam M S (2021). Microwave-assisted dehulling of pigeon pea (<i>Cajanus Cajan</i>). <i>Agri Mech Asia Africa LatAm</i> 52(1) : 2969-2977.	6.17
1702	Sood A, Singh A, Mahajan R, Midha V, Kaur K, Singh D, Bansal N and Dharni K (2021). Clinical Predictors of response to Faecal Microbiota Transplantation in patients with active ulcerative colitis, <i>Journal of Crohn's and Colitis</i> 15 , :238–243. (Clarivate Impact Factor: 8.658, equivalent NAAS Rating:14.658)	14.66
1703	Sood P and Singla N (2021). Imidacloprid as Reproductive Toxicant in Laboratory Animals: A Review. <i>Pest Res J</i> 33(2) : 3-11.	5.84
1704	Sran T S and Jindal S K (2021). Genetic diversity analysis of chilli genotypes based on qualitative morphological traits. <i>Agri Res J</i> 58 : 603-10.	5.44
1705	Sran T S, Jindal S K and Chawla N (2021). Genotype by environment interaction for quality traits in chilli pepper (<i>Capsicum annum L</i>). <i>Genetika</i> 53 : 23-49.	6.4
1706	Sravani A, Sharma S and Kalia A (2021). Effect of selenium enriched wheat substrate on the nutritional and antioxidant properties of <i>Pleurotus</i> spp. <i>Acta Alimentaria</i> , DOI:10.1556/066.2021.00005.	6.46
1707	Steadham J, Schulden T, Kalia B, Koo D H, Gill B S, Bowden R, Yadav I S, Chhuneja P, Erwin J, Tiwari V (2021). An approach for high-resolution genetic mapping of distant wild relatives of bread wheat: example of fine mapping of <i>Ir57</i> and <i>yr40</i> genes. <i>Theoretical and applied genetics</i> 134(6) :1-16.	11.57
1708	Suma M, Singh N and Buttar D S (2021). Identification of potential native chitinase-producing <i>Trichoderma</i> spp. and its efficacy against damping-off in onion. <i>European Journal of Plant Pathology</i> 161 :289-300. https://doi.org/10.1007/s10658-021-02321-9 .	7.58
1709	Surasani V K R, Varadaraju R C and Singh A (2021). Biochemical, microbial, and textural quality changes in rohu protein isolates supplemented pangas mince sausages packed in LDPE and cellulose casing during frozen storage. <i>J Food Process Preserv</i> 45(9) : 157-67.	7.41
1710	Suryadevara R S H and Kumar V (2021). Efficacy of plant products against leafhopper, <i>Amrascabiguttulabiguttula</i> (Ishida) in Bt cotton. <i>Ind J Ent</i> 83 , e20262 DoI No.: 10.5958/0974-8172.2021.00121.8	5.89
1711	Suthar T, Gupta N, Pathak D, Sharma S and Rathore P (2021). Morphoanatomical characterization of interspecific derivatives of <i>Gossypium hirsutum L.</i> × <i>G. armourianum</i> Kerney cross for whitefly tolerance. <i>Phytoparasitica</i> , https://doi.org/10.1007/s12600-021-00963-3	7.14
1712	Taggar G K, Singh R, Chhuneja P K, Randhawa H S, Singh S, Kumar R and Kaur J (2021). Insecticidal potential of homemade neem extract against pod sucking bug, <i>Clavigrallagibbosa</i> in pigeonpea. <i>Int J Trop Insect Sci</i> 42(2) :1913-24.	6.5
1713	Tak P S, Pannu PPS and Kaur J K (2021). Effect of foliar application of fungicides, neem extract and butter milk on yellow rust, plant growth and yield parameters of wheat. <i>Agri Res J</i> 58(2) : 232-239.	5.44

1714	Tak Y, Kaur M, Amarowicz R, Bhatia S and Chirag G (2021). Pulse derived Bioactive Peptides as Novel Nutraceuticals: A Review. <i>International Journal of Peptide Research and Therapeutics</i> , https://doi.org/10.1007/s10989-021-10234-8	7.50
1715	Talwar D, Singh K, Dhatt A S and Choudhary O P (2021). Effect of soil salinity on growth, yield and quality of brinjal (<i>Solanum melongena</i> L.). <i>Agri Res J</i> 58 : 662-77.	5.44
1716	Thakur S, Yadav I S, Jindal M, Sharma P K, Dhillon G S, Boora R S, Arora N K, Gill M I S, Chhuneja P, Mittal A (2021). Development of genome-wide functional markers using draft genome assembly of guava (<i>Psidium guajava</i> l.) Cv. Allahabad safeda to expedite molecular breeding. <i>Frontiers in plant science</i> 12 , https://doi.org/10.3389/fpls.2021.708332 .	12.63
1717	Thakur S, Asthir B, Kaur G, Kalia A and Sharma A (2021). Zinc oxide and titanium dioxide nanoparticles influence heat stress tolerance mediated by antioxidant defense system in wheat. <i>Cereal Res Commun</i> 50 :385-396.	6.81
1718	Thakur S, Kumar R, Vikal Y, Vyas P, Sheikh I, Dhaliwal HS (2021). Molecular mapping of popping volume QTL in popcorn (<i>Zea mays</i> L.). <i>J Plant Biochemistry and Biotechnology</i> 30 : 496–503.	7.53
1719	Thakur S, Yadav I S, Jindal M, Sharma P K, Dhillon G S, Boora R S, Arora N K, Gill M I S, Chhuneja P, Mittal A (2021). Development of genome-wide functional markers using draft genome assembly of guava (<i>Psidium guajava</i> L.) cv. Allahabad safeda to expedite molecular breeding. <i>Frontiers in Plant Science</i> 12 , doi.org/10.3389/fpls.2021.708332 .	10.40
1720	Tondey M, Kalia A, Singh A, Dheri G S, Taggar M S, Nepovimova E, Krejcar O and Kuca K (2021). Seed Priming and Coating by Nano-Scale Zinc Oxide Particles Improved Vegetative Growth, Yield and Quality of Fodder Maize (<i>Zea mays</i>). <i>Agron</i> 11 (4): 729.	8.60
1721	Toor B S, Kaur A, Sahota P P and Kaur J (2021). Antioxidant potential, antinutrients, mineral composition and FTIR spectra of legumes fermented with <i>Rhizopus oligosporus</i> . <i>Food Technol Biotechnol</i> 59 : 530-542.	9.92
1722	Tripathi D, Mani V, Pal R P and Yadav R K (2021). Vanadium content in common feedstuffs used in tropical livestock system. <i>Ani Nutr Feed Tech</i> 21 (1): 213-219.	6.00
1723	Tumasyan A and Dhingra N (2021). Search for new particles in events with energetic jets and large missing transverse momentum in proton-proton collisions at $\sqrt{s} = 13$ TeV. <i>J High Energy Phys</i> 11 : Article No. 153.	11.81
1724	Tumasyan A and Dhingra N (2021). Study of Z boson plus jets events using variables sensitive to double-parton scattering in pp collisions at 13 TeV. <i>J High Energy Phys</i> 10 : Article No. 176.	11.81
1725	Tumasyan A, Dhingra N. et al. (CMS Collaboration) (2021). Measurements of the electroweak diboson production cross sections in proton-proton collisions at $\sqrt{s}=5.02$ TeV using leptonic decays. <i>Physical Review Letters</i> 127 : 191801.	15.16
1726	Tuteja C, Shanthanagouda A H, Hundal S S and Dhaliwal S S (2021). Antioxidative role of dietary ascorbic acid against arsenic induced haematological, biochemical and histomorphological alterations in <i>Cyprinus carpio</i> . <i>Comp Biochem Physiol C</i> 24 : 108973.	8.20
1727	Varinder S, Chahal T S, Kaur S, Gill P P S (2021). Effect of fruit development stages on antioxidant properties and bioactive compounds in peel, pulp and juice of grapefruit varieties. <i>J Food Meas Charact</i> 15 :2531-2539.	9.01
1728	Vashisht, B B, Jalota S K, Ramteke P, Kaur R and Jayeshwal D K (2021). Impact of rice (<i>O. sativa</i> L.) straw incorporation induced changes in soil physical and chemical properties on yield, water and nitrogen–balance and –use efficiency of wheat (<i>T. aestivum</i> L.) in rice–wheat cropping system: <i>Field and simulation studies</i> . <i>Agricultural Systems</i> 194 : 1032798, https://doi.org/10.1016/j.agsy.2021.103279 .	12.77
1729	Vasmatkar P, Kaur K and Pannu P P S (2021). Field based assessment of yield related traits and flowering response in <i>Zea mays</i> towards Southern corn leaf blight. <i>Ind Phytopathology</i> 74 : 969–979.	5.95



1730	Verma R K, Prasher I B, Sushma, Gautam A K, Rajeshkumar K C, Kumar A, Castañeda-Ruiz RF (2021). Neosporidesmiumhimachalense sp. nov.fromIndia and Neosporidesmina gen. nov.to accommodate N. micheliae. <i>Mycotaxon</i> 136 : 587–595.	6.54
1731	Verma R K, Prasher I B, Sushma, Rajeshkumar K C, Gautam A K and Castañeda-Ruiz RF (2021). Brykendrickiacatenata gen. & sp. nov.from India. <i>Mycotaxon</i> 136 : 131-140.	6.54
1732	Vikram P, Sehgal D, Sharma A, Bhavani S, Gupta P and Randhawa M (2021). Genome wide association analysis of Mexican bread wheat landraces for resistance to yellow and stem rust. <i>PLoS ONE</i> 16 (1): e0246015, https://doi.org/ 10.1371/journal.pone.0246015 .	8.74
1733	Viswanathan R, Selvakumar R, Govindaraj P, Chhabra M L, Parameswari B, Singh D, Singh S P, Mehra R, Bharti Y P, Minnatullah Md, Kishore PV, Ravichandran V and Sharma A (2021) Identification of resistance to red rot in interspecific and intergeneric hybrid clones of sugarcane. <i>Int Sugar J</i> 123(1476) : 840-848.	6.14
1734	Viswanathan R, Singh S P, Selvakumar R, Singh D, Bharti YP, Chhabra M L, Parameswari B, Sharma A, Minnatullah Md (2021). Varietal break down to red rot in the sugarcane variety Co 0238 mimics Vertifolia effect: Characterizing new Colletotrichum falcatum pathotype CF13. <i>Sugar Tech</i> , https://doi.org/10.1007/s12355-021-01070-7	7.20
1735	Wadhwa M, Singh H, Kumar B and Bakshi M P S (2021). In vitro evaluation of short duration cassava varieties as livestock feed. <i>Ind J Ani Sci</i> 91 : 402-08.	6.28
1736	Wahid A, Kumar S, Alam M S, Kumar M and Kaur R (2021). Effect of multilayer mechanical drying on the drying kinetics of white button mushroom <i>Agaricusbisporus</i> . <i>In J Chem Studies</i> 9(1) : 3618-3624.	5.31
1737	Wahid A, Kumar S, Alam Md S, Kumar M and Kaur R (2021). Effects ofmultilayer mechanical drying on the drying kinetics of white button mushroom <i>Agaricusbisporus</i> . <i>Int J ChemStud</i> 9(1) : 3618-3624.	6.5
1738	Walia S S and Patidar A (2021). Effect of organic, integrated and chemical sources of nutrient on growth and productivity of maize (<i>Zea mays</i>). <i>Ind J Agron</i> 66(4) : 419-424.	5.55
1739	Xie X, Quintana M R, Sandhu N, Subedi S R, Zou Y, Rutkoski J E and Henry A (2021). Establishment method affects rice root plasticity in response to drought and its relationship with grain yield stability. <i>Journal of experimental botany</i> 72 .	13.3
1740	Yadav B K and Singh P (2021). Assessment of fertility status of PAU seed production farm Sekhpura in District Bathinda, Punjab. <i>Agri Res J</i> 58(4) : 716-723.	5.44
1741	Yadav B.K. and Kumar D (2021). Assessment of ground water quality for irrigation and drinking purposes in Bathinda and Mansa districts of Southwest Punjab, India. <i>J Env Biol</i> 42 : 388-395.	6.78
1742	Yadav R K, Purakayastha T J, Ahmed N, Das R, Chakrabarty B, Biswas S, SharmaV K, Singh P, Talukdar D, Mourya K K, Walia S S, Singh R, Shukla V K, Yadava M S, Ravisankar N, Yadav, Devi B (2021). Long-term effect of fertilization and manuring on soil aggregate carbon mineralization. <i>Ind J Agri Sci</i> 91(2) .	6.37
1743	Yadav S, Sandhu N, Dixit S, Singh V K, Catolos M, Mazumder R R, Rahman M A, Kumar A (2021). Genomics-assisted breeding for successful development of multiple-stress-tolerant, climate-smart rice for southern and south eastern asia. <i>The plant genome</i> 14(1) : e20074.	10.22
1744	Yakubu C M, Sharma R and Sharma S (2021). Fermentation of locust bean (<i>Parkia biglobosa</i>): modulation in the anti-nutrient composition, bioactive profile, in vitro nutrient digestibility, functional and morphological characteristics. <i>Int J Food Sci Technol</i> 57 : 753-62.	9.61
1745	Yaqoob M, Aggarwal P, Baba W N, Ahluwalia P, Rasool N and Raghad A (2021). Enhanced functional properties and shelf stability of cookies by fortification of kinnow derived phytochemicals and residues. <i>J Food Meas Charact</i> 15(3) :2369-2376.	9.01

1746	Yousuf A and Bhardwaj A (2021). Development and application of travel time based gridded runoff and sediment yield model. <i>Int J EnvSciTec</i> 19 : 9801–9816.doi:10.1007/s13762-021-03661-z	8.53
1747	Zada A and Mohapatra L (2021). Willingness to buy Agricultural Insurance by progressive farmers in Punjab State of India. <i>J Community Mobilization and Sustain Dev</i> 16 : 199-208.	5.67
1748	Zada A, Mohapatra L and Anand A (2021). Stakeholders' Opinion regarding Design of Agricultural Insurance in Punjab. <i>Ind J Ext Edu</i> 57 : 38-46.	5.95
1749	Zalpouri R, Kaur P, Kaur A and Sidhu G K (2021). Comparative analysis of optimized physiochemical parameters of dried potato flakes obtained by refractive and convective drying techniques. <i>J Food Process Preserv</i> 45 (1) : 15-77.	7.41
1750	Zhang R, Wang D, Yang Z, Seki K, Singh M, Wang LV (2021). Changes in rainfall partitioning and its effect on soil water replenishment after the conversion of croplands into apple orchards on the Loess Agriculture. <i>Ecosystems & Environment</i> 312 : 107342.	12.58

Sr.No.	2022	NAAS Score
1751	Abrol Y, Singh M J, Benipal A K and Sharma N (2022) Soil erosion and sediment yield assessment using RUSLE and GIS based approach in a forest watershed in Kandi region of Punjab. <i>J Soil Water Conserv</i> 21(4): 354-60 https://doi.org/10.5958/2455-7145.2022.00045.5	5.20
1752	Abrol P and Gupta R M (2022) Promoting the nutri - sensitive agriculture through extension and advisory services. <i>J Comm Mobiliz Sustain Dev</i> 1 (Seminar Special Issue): 416-21.	5.30
1753	Adhikary T, Gill P P S, Jawandha S K and Kaur N (2022) Postharvest quality response of pears with beeswax coatings during long term cold storage. <i>J Horti Sci Biotechnol</i> 97(6):785-798. https://doi.org/10.1080/14620316.2022.2074321	7.64
1754	Adhikary T, Gill P P S, Jawandha S K and Sinha A (2022) Chitosan coating modulates cell wall degrading enzymes and preserved postharvest quality in coldstored pear. <i>J Food Measur Charact</i> 16, 1395–1403. https://doi.org/10.1007/s11694-022-01291-8 .	8.43
1755	Aggarwal P, Kaur S and Kaur N (2022) Intermediate moisture kinnow bar from low grade kinnow mandarins: Phytonutritional profile, morphological characterization, and storage stability. <i>Food Biosci</i> 49:101837.	11.32
1756	Aggarwal P, Singh R, Kaur S and Kaur N (2022). Sugarcane juice kheer: a sweet meal for lactose intolerant people. <i>Agric Res J</i> 59: 771-76.	5.44
1757	Aggarwal R, Satpute S and Kaur S (2022) Solar photovoltaic pump sets as a substitute for conventional pump sets. <i>Curr Sci</i> 122(3):337-43.	7.10
1758	Aggarwal S K, Malik P, Neelam K, Kumar K, Kaur R, Lore J S and Singh K (2022) Genome-wide association mapping for identification of sheath blight resistance loci from wild rice <i>Oryza rufipogon</i> . <i>Euphytica</i> 218(144): 1-20.	8.19
1759	Alam M S and Saini M K (2022) Optimal mechanical exclusion devices for management of Khapra beetle in stored wheat. <i>Indian J Entomol</i> https://doi.org/10.55446/IJE.2022.6611750,1-6 .	5.08
1760	Ali M, Dixit A K, Manes G S, Modi R U, Singh A and Mahal A K (2022) Evaluation of an integral dust separation system based wheat straw combine for improvement in animal feed quality. <i>Anim Nutr Feed Technol</i> 22: 641-52.	6.23
1761	Ali M, Dixit A K, Manes G S, Singh M and Verma A (2022) Optimization of operational parameters for dust separation system of wheat straw combine using sieve setup. <i>Indian J Agril Sci</i> 92(3): 344-47.	6.37
1762	Amandeep and Kapoor R (2022) Exploitation and utilization of exotic germplasm accessions through variability and association studies in oat (<i>Avena sativa</i> L.). <i>Range Mgmt Agro For</i> 43(2): 231-36.	6.37



1763	Anjali, Jindal V and Malhotra M (2022) Molecular and morphological identification of some predominant spiders of Punjab, India. Species richness and diversity of spiders in the semi arid habitat in northern India. <i>J Exp Zool India</i> 25: 301-07.	5.25
1764	Anjali, Jindal V and Prakash S (2022) DNA barcoding of some pre-dominant spiders of semi-arid habitat of Agra, Uttar Pradesh India. <i>J Exp Zool India</i> 25: 1581-85.	5.25
1765	Aparna and Makkar G S (2022) Production performance and egg quality traits of Kadaknath and an improved breed Chabro under intensive housing system. <i>Ind J Ext Edu</i> 57(2): 129-35.	5.95
1766	Aparna, Kansal S K, Singh J and Hundal J S (2022) Animal feeding technologies viz a viz information seeking behaviour of field veterinarians in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(4): 1327-34.	5.67
1767	Arefin S, Islam A, Rahman M, Alim A, Sharnouby M E, Soliman M F K, Hassan M M, Bhatt R and Hossain A (2022) Productivity and quality of sugarcane are influenced by integrated nutrient management. <i>Phyton-Int J Exptl Bot</i> 91(2): 439-69.	7.04
1768	Arora H, Jindal S K and Chawla N (2022) Combining ability analysis for yield and quality traits in exotic lines of tomato (<i>Solanum lycopersicum</i> L.). <i>Agri Res J</i> 59: 394-99.	5.44
1769	Arora H, Jindal S K, Sharma A, Gill R and Chawla N (2022) Development and evaluation of hybrids resistant to late blight and leaf curl virus diseases in tomato. <i>Genetika</i> 54: 801-16.	6.76
1770	Arora J K, Gupta S, Singh R, Chopra S and Choudhary S (2022) Fluxapyroxad 333 FS: A novel systemic fungicide for effective management of black scurf of potato. <i>Pharma Innov J</i> 11(8): 1253-56.	5.23
1771	Arora J K, Kaur S, Yadav I, Kaur S, Garg M and Chhuneja P (2022) Investigation of differential expression of alpha-gliadin genes with variable immunogenic epitopes in hexa- and tetraploid wheat cultivars suggests some have lower immunogenicity. <i>Plant Mol Biol Rep</i> 41(4): 134-44.	7.82
1772	Arora S, Bhatt R, Sharma V and Hadda M S (2022) Indigenous practices for soil and water conservation for sustainable hill agriculture and improving livelihood security. <i>Environ Manag</i> DOI: 10.1007/s00267-022-01602-1.	9.27
1773	Arora V, Pandove G, Oberoi H, Brar S K and Kalia A (2022) Amelioration in the quality traits of forage pearl millet (<i>Pennisetum glaucum</i> L) by application of liquid microbial inoculants. <i>Ind J Anim Sci</i> 92(5): 599-603	6.32
1774	Aslam R, Alam M S, Kaur J, Panayampadan A S, Dar O I, Kothakota A and Pandiselvam R (2022) Understanding the effects of ultrasound processing on texture and rheological properties of food. <i>J Text Stud</i> 53(6): 775-99.	9.22
1775	Atri A, Banyal D K, Bhardwaj N R and Roy A K (2022) Exploring the integrated use of fungicides, bio-control agent and biopesticide for management of foliar diseases (anthracnose, grey leaf spot and zonate leaf spot) of Sorghum. <i>Int J Pest Manag.</i> https://doi.org/10.1080/09670874.2022.2039799	7.09
1776	Attri V, Dhiman R and Kumar R (2022) Effect of seed size and sowing depth on seedling biomass production of soapnut (<i>Sapindus mukorossi</i> Gaertn) at different time intervals under different organic manures doses. <i>Environ Ecol</i> 40(3): 1127-36	5.25
1777	Attri V, Kaler N, Dhiman R, Kumar R and Pant K S (2022) Effect of seed size and sowing depth on the growth parameters of soapnut (<i>Sapindus mukorossi</i> Gaertn) at different time intervals under treatment with different organic manures doses. <i>Environ Ecol</i> 40(2C): 927-42.	5.25
1778	Aulakh C S, Sandhu A S, Singh M and Thakur M (2022) Planting geometry affects potato (<i>Solanum tuberosum</i> L.) productivity and economics in north-west India. <i>Agri Res J</i> 59(5): 876-80.	5.44
1779	Aulakh C S, Sidhu A S, Bhullar M S and Singh S (2022) Non-chemical integrated weed management in organic wheat (<i>Triticum aestivum</i> L.) in north-west India. <i>Agri Res J</i> 59(3): 423-28.	5.44

1780	Aulakh C S, Sidhu A S, Nara U, Singh S and Singh S (2022) Evaluation of bread wheat (<i>Triticum aestivum</i>) genotypes under organic farming in north-west India. <i>Indian J Agric Sci</i> 92(9): 1139-42.	6.37
1781	Aulakh C S, Sidhu A S, Singh S and Singh D (2022) Organic and natural farming in north-west India: Farmers' perspective. <i>Agric Res J</i> 59(6): 1078-85.	5.44
1782	Aulakh C S., Sharma S, Thakur M and Kaur P (2022) A review of the influences of organic farming on soil quality, crop productivity and produce quality. <i>J Plant Nutr</i> https://doi.org/10.1080/01904167.2022.2027976 .	7.71
1783	Babanjeet, Singh K, Talwar D and Jindal S K (2022) Effect of potassium nitrate on yield and quality of chilli. <i>Agril Res J</i> 59: 1034-41.	5.44
1784	Babbar B K, Singla N, Kaur H, Verma M, Rani K, Bala B and Jain S (2022) Bio-ecology, behaviour and management of blue bull, <i>Boselaphus tragocamelus</i> . <i>Int J Pest Manag</i> https://doi.org/10.1080/09670874.2022.2104402	7.91
1785	Babbar B K, Singla N, Kaur N and Kalra S (2022) Development of integrated rodent management module in pea crop. <i>Agric Res J PAU</i> 59(4): 699-705. DOI No. 10.5958/2395-146X.2022.00100.4	5.44
1786	Bal S K, Bisht D, Kaur S and Singh G (2022) Cultivation of Indigenous Vegetables in Containers Through Roof Based Gardening. <i>J Comm Mobil Sustain Dev</i> 17(1): 333-40.	5.67
1787	Bala A, Bala M, Srivastava P and Khare V (2022). Ploidy study of chrysanthemum genotypes through pollen mother cell method. <i>Indian J Agril Sci</i> 92(3): 424-28.	6.37
1788	Bala R, Kaur J, Tak P S, Chahal S K and Pannu PPS (2022). A model for <i>Tilletia indica</i> - (Karnal bunt) <i>Triticum aestivum</i> system under changing environmental conditions. <i>Indian Phytopathol</i> https://doi.org/10.1007/s42360-022-00520-w	5.95
1789	Balkrishna A, Gautam A K, Avasthi S, Niranjana M, Verma R K, Arya V, Kumar A, Karunarathna S C, Suwannarach N (2022) A Comprehensive Account of the Rust Genus <i>Skierka</i> (<i>Skierkaceae</i>). <i>J Fungi</i> 8: 1243. https://doi.org/10.3390/jof8121243	11.82
1790	Banga S, Kumar V, Kumar S, Sharma R, Kaur R and Grover K (2022). Process optimization for the development of fruit-based diet drink: A low-calorie approach. <i>J Food Process Preserv</i> 46: 16674.	8.19
1791	Basandrai A K, Kumar V and Basandrai D (2022) Estimation of gca and sca for resistance to brown stripe downy mildew (<i>Sclerophthora rayssiei pv zeae</i>) in maize. <i>Agril Res J</i> 59: 556-58.	5.44
1792	Basandrai A K, Kumar V, Basandrai D, Guleria S K, Singh A and Kalia V (2022) Genetics of field resistance to <i>Sclerophthora rayssiae pv Zeae</i> causing brown stripe downy mildew in maize. <i>Agril Res J</i> 59: 559-62.	5.44
1793	Bawa K, Brar J K, Singh A, Gupta A, Kaur H and Bains K (2022) Wheatgrass powder enriched functional pasta: Techno-functional, phytochemical, textural, sensory and structural characterization. <i>J Text Stud</i> 54: 517-30.	9.94
1794	Bawa K, Singh A, Brar J K, Surasani V K R and Pandiselvam R (2022) Influence of wheatgrass juice on techno-functional properties and bioactive characteristics of pasta. <i>J Food Qual</i> https://doi.org/10.1155/2022/3891983	9.20
1795	Belludi R, Sandhu P S, Sharma P and Sekhon A S (2022). Diversity analysis of aflatoxigenic isolates of <i>Aspergillus</i> sp From major groundnut growing states of India. <i>Indian Phytopath</i> 75(3): 681-90.	5.95
1796	Benerjee A and Rampal V K (2022) Knowledge level of DAESI and Non DAESI dealers for paddy and wheat cultivation in Punjab. <i>Indian J Ext Educ</i> 58(3):42-45.	5.95
1797	Beniwal D, Dhall R K, Yadav S and Sharma P (2022) An overview of rust (<i>Uromyces viciae-fabae</i>) and powdery mildew (<i>Erysiphe polygoni</i> DC) of pea (<i>Pisum sativum</i> L). <i>Genetika</i> 54: 499-512.	6.76
1798	Bhadwal S and Sharma S (2022) Selenium alleviates carbohydrate metabolism and nutrient composition in arsenic stressed rice plants. <i>Rice Sci</i> 29(4): 385-96.	9.33



1799	Bhadwal S and Sharma S (2022) Selenium alleviates physiological traits, nutrient uptake and nitrogen metabolism in rice under arsenate stress. <i>Environ Sci Poll Res</i> https://doi.org/10.1007/s11356-022-20762-5	10.22
1800	Bhagat V, Dwivedi S and Gohain N (2022) A study of economics of leguminous crops (sesamum and chickpea) in the rainfed areas of Jammu region. <i>Agril Mechanization Asia Afr Latin Amer</i> 53:8889-99.	6.14
1801	Bhandari M, Sharma R and Sharma S (2022) Macromolecular-structural interactions and phytochemical constituents of therapeutic herbs in pasta altered the functional properties, cooking profile and in vitro starch and protein digestibility. <i>Int J Food Sci Technol</i> 58: 367-77.	9.61
1802	Bhangu P K S, Kaur M and Gohain N (2022) Comparative economic analysis of indigenous and clonal eucalyptus in Punjab. <i>Agril Mechanization Asia Afr Latin Amer</i> 53:10521-30.	6.14
1803	Bharadwaj C, Jorben J, Rao A, Roorkiwal M, Patil B S, Jayalakshmi, Khayum A S, Saxena D R, Yasin M, Jahagirdar J E, Sontakke P L, Pithia M S, Chudasama M K, Swarup I, Singh R K, Nitesh S D, Chitikineni A, Singh S, Singh I, Pratap A, Dixit G P, Srivastava A K and Varshney R K (2022) Development of high yielding fusarium wilt resistant cultivar by pyramiding of genes through Marker-Assisted Backcrossing in chickpea (<i>Cicer arietinum</i> L). <i>Front Genet</i> 13:924287. https://doi.org/10.3389/fgene.2022.924287	10.60
1804	Bhardwaj N R, Atri A, Banyal D K, Dhal A and Roy A K (2022) Multi-location evaluation of fungicides for managing blast (<i>Magnaporthe grisea</i>) disease of forage pearl millet in India. <i>Crop Prot</i> 159: 106019. https://doi.org/10.1016/j.cropro.2022.106019	8.57
1805	Bharti K, Joshi N, Khosla S and Kaur R (2022) Compatibility of entomopathogenic fungus <i>Metarhizium rileyi</i> with biorationals. <i>Indian J Ent</i> https://doi.org/10.55446/IJE.2022.801	5.89
1806	Bhatt R and Singh P (2022) Farmer's participatory evaluation of different management practices adopted in direct-seeded rice vis-à-vis puddled transplanted rice in Kapurthala, Punjab. <i>Indian J Ext Educ</i> 58(2): 42-46.	5.95
1807	Bhatt R, Kumar R, Kashyap L, Alataway A, Dewidar A Z and Mattar M A (2022) Growth, yield, quality and insect-pests in sugarcane (<i>Saccharum officinarum</i>) as affected by differential regimes of irrigation and potash under stressed conditions. <i>Agronomy</i> 12: 1942. https://doi.org/10.3390/agronomy12081942 .	9.42
1808	Bhatt R, Majumder D, Tiwari A K, Singh S R, Prasad S and Palanisamy G (2022) Climate-smart technologies for improving sugarcane sustainability in India-A Review. <i>Sugar Tech</i> 25(2): 1-14. DOI: 10.1007/s12355-022-01198-0.	7.87
1809	Bhatt R, Singh J and Kashyap L (2022) Effect of irrigation and potash levels on growth, yield and quality of spring sugarcane (<i>Saccharum officinarum</i>). <i>Indian J Agril Sci</i> 92(5): 663-66.	6.30
1810	Bhatt R, Verma K K, Kumar R and Sanghera G S (2022) Foliar application of potassium salt of active phosphorus (PSAP) mitigates insect pests and improve yield along with sugarcane quality in response to agroclimatic conditions of Punjab. <i>Sugar Tech</i> https://doi.org/10.1007/s12355-022-01222-3 .	7.59
1811	Bhinder G, Sharma S, Kaur H, Akhatar J, Mittal M and Sandhu S (2022). Genomic regions associated with seed meal quality traits in <i>Brassica napus</i> germplasm. <i>Front Plant Sci</i> 13:882766. doi:10.3389/fpls.2022.882766	11.75
1812	Biswas S, Bhullar M B, Karmakar K and Kaur P (2022) Seven new records and distribution of phytoseiid (Acari: Mesostigmata) mite fauna associated with agrihorticultural crops in Northern India. <i>Int J Trop Insect Sci</i> https://doi.org/10.1007/s42690-022-00770-1	6.85
1813	Bobade H, Singh A, Sharma S, Gupta A and Singh B (2022) Effect of extrusion processing on techno-functional, textural and bioactive properties of whole grain corn flour-based breakfast cereals sweetened with honey. <i>J Text Stud</i> 53: 672-83.	9.94
1814	Bobade H, Singh A, Sharma S, Gupta A and Singh B (2022) Whole grain cereal flours and honey-based extruded breakfast cereals: Effect of extrusion processing on functional characteristics, antioxidant properties and hydroxymethylfurfural generation. <i>J Food Process Preserv</i> 46: e17166.	8.61

1815	Bons H K and Pal R K (2022) Survival of loquat under the subtropical conditions of Punjab. <i>J Agrometeorol</i> 24(3): 321-24.	6.55
1816	BonsHarsimrat K and Singh K (2022) Impact of mineral nutrients on powdery mildew and quality attributes in umranber (<i>Ziziphus mauritiana</i>). <i>Indian J Agril Sci</i> 92(11): 1316-20.	6.37
1817	BopcheUsaka, Kingra P K, Setia R and Singh S P (2022). Spatio-temporal analysis of meteorological drought in Punjab under past, present and future climate change scenarios. <i>Arab J Geosci</i> https://doi.org/10.1007/s12517-022-10025-5	7.83
1818	Braich A K, Kaur G, Singh A and Dar B N (2022) Amla essential oil-based nano-coatings of Amla fruit: Analysis of morphological, physiochemical, enzymatic parameters, and shelf-life extension. <i>J Food Process Preserv</i> 46(6): 16498.	8.19
1819	Brar A S, Deol J S, Mohanpuria R, Kaur S, Kaur T and Singh K B (2022) Integration effect of drip irrigation and mulching on weeds and spring maize productivity. <i>Indian J Weed Sci</i> 54: 240-44.	5.84
1820	Brar A S, Kaur K, Sindhu V K, Sharma R and Mithlesh (2022) Phenology, productivity and energy utilization of wheat as influenced by hydro-thermal regimes in central Punjab. <i>Agril Res J</i> 59: 221-27.	5.44
1821	Brar A S, Kaur K, Sindhu V K, Tsolakis N and Srail J S (2022) Sustainable Water Use through Multiple Cropping Systems and Precision Irrigation. <i>J Cleaner Prod</i> 333: 130117.	15.30
1822	Brar H S and Singh P (2022) Pre-and post-sowing irrigation scheduling impacts on crop phenology and water productivity of cotton (<i>Gossypium hirsutum</i> L.) in sub-tropical north-western India. <i>Agril Water Manag</i> 274: 107982, https://doi.org/10.1016/j.agwat.2022.107982	12.61
1823	Brar L K, Sharma P, Chugh P, Prabhjyot-Kaur, Sharma R and Banga S S (2022) Effect of elevated temperature on phenology, growth, yield components and seed yield of Brassica juncea grown in temperature gradient tunnels (TGT). <i>J Agromet</i> 24(4): 359-66.	6.55
1824	Buttar H S, Dhillon N K, Kaur S and Anupam (2022) Integrated Application of Amendments and Chemicals for the Management of Root-Knot Nematode (<i>Meloidogyne incognita</i>) on Cucumber. <i>Indian J Agril Sci</i> 92(11): 1331-35.	6.37
1825	Buttar H S, Singh A and Sirari A (2022) Physiological studies on fusarium equiseti and fusarium chlamyosporum, the cause of pod rot disease in mungbean [<i>Vigna radiata</i> (L.)Wilczek] in India. <i>Indian J Ecol</i> 49(5): 1782-85.	5.79
1826	Chahal A S, Kaur R, Shera P S, Sharma S, Thakur A, Mangat H K and Mohanasundaram A (2022) Diversity of natural enemies associated with lac insect <i>Kerria lacca</i> (Kerr) in Punjab. <i>Indian J Ent</i> https://doi.org/10.55446/IJE.2022.583	5.89
1827	Chahal G K, Kaur A and Ghai N (2022) Mitigation of salt stress with Azospirillum and Azotobacter inoculation in maize (<i>Zea mays</i> L.). <i>Cereal Res Commun</i> 50: 915-27.	6.85
1828	Chandel S, Hadda M S and Mahal A K (2022) Curve numbers as affected by soil conservation treatments in small watersheds in lower Himalayas of north-west India. <i>J Soil Water Conserv</i> 21(1): 21-33.	9.18
1829	Chandi A K, Kaur A and Chandi R S (2022) Effect of insecticides on food consumption and utilization behaviour of different populations of <i>Spodoptera litura</i> . <i>Pest Res J</i> 34(2): 115-21.	5.49
1830	Chandi A K, Kaur A and Chandi R S (2022) Influence of temperature variation on emamectin benzoate toxicity in different <i>Leucinodes orbonalis</i> Guenee population of Punjab. <i>Indian J Ecol</i> 49(1): 208-11.	5.79
1831	Chandi R S and Kumar V (2022) Status of <i>Bemisia tabaci</i> (Gennadius) in context of its biology and ecology in cotton agroecosystem. <i>Indian J Ecol</i> 49(2): 527-33.	5.79
1832	Chandi R S, Kaur A and Aggarwal N (2022) Management of red pumpkin beetle, <i>Aulacophora foveicollis</i> (Lucas) with traditional method of dusting with dung ash in cucurbits. <i>Indian J Tradit Knowl</i> 21(1): 208-14.	6.76



1833	Chandi RS, Kaur A, Sharma RK, Kumar R and Chhuneja P (2022) Efficacy of PAU Homemade Neem (<i>Azadirachta indica</i>) extract against <i>Bemisia tabacoin</i> brinjal. <i>Agric Res J</i> 59(4): 690-98.	5.49
1834	Chandra M S, Naresh R K, Bhatt V R, Kadam P V, Kumar R, Yadav S and Kumar R (2022) Optimizing tillage cum crop establishment methods and nutrient management strategies on crop productivity, nutrient use efficiency and grain quality of rice (<i>Oryza sativa</i> L) in typic ustochrept soils. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(3): 6813-35	6.14
1835	Charaya A, Chawla N, Dhatt A, Sharma M, Sharma S and Kaur I (2022). Evaluation of biochemical composition of hulled and hullless genotypes of pumpkin seeds grown in sub-tropical India. <i>Heliyon</i> DOI: https://doi.org/10.1016/j.heliyon.2023.e12995	9.78
1836	Chaudhary D, Mehta A K, Sharma A, Singh S and Aman (2022) Ergonomic evaluation of developed manual fruit harvesting device. <i>Asian J Dairy Food Res</i> https://doi.org/10.18805/ajdfr.DR-1922 .	5.75
1837	Chaudhary S, Jha U C, Paul P J, Prasad P V V, Sharma K D, Kumar S, Gupta D S, Sharma P, Singh S, Siddique K H M and Nayyar H (2022) Assessing the heat sensitivity of Urdbean (<i>Vigna mungo</i> L. Hepper) genotypes involving physiological, reproductive and yield traits under field and controlled environment. <i>Front Plant Sci</i> 13:1042999. https://doi.org/10.3389/fpls.2022.1042999	12.63
1838	Chaudhary V, Katyal P, Panwar H, Kaur J, Aluko R E, Puniya A K and Poonia A K (2022) Antioxidative, anti-inflammatory and anticancer properties of the red biopigment extract from <i>Monascus purpureus</i> (MTCC 369). <i>J Food Biochem</i> https://doi.org/10.1111/jfbc.14249 .	9.65
1839	Chaudhary V, Katyal P, Panwar H, Puniya A K and Poonia A K (2022) Evaluating antimicrobial and anti-oxidative potential of red biopigment from <i>Monascus purpureus</i> . <i>Environ Conserv J</i> DOI: https://doi.org/10.36953/ECJ.2022 .	5.66
1840	Chavan P, Sharma P, Sharma S R, Mittal T C and Jaiswal A K (2022) Application of high-Intensity ultrasound to improve food processing efficiency: A Review. <i>Foods</i> https://doi.org/10.3390/foods11010122 .	10.35
1841	Cherotich C and Kaur M (2022) Determinants of Awareness of Good Agricultural Practices (GAP) Among Vegetable Growers in Punjab, India. <i>Int J Curr Microbiol Appl Sci</i> 10(11): 218-25	5.38
1842	Chhabra D and Gupta M (2022) Calendar anomalies in commodity markets for natural resources: Evidence from India. <i>Resour Policy</i> 79: 1-17.	14.222
1843	Chhabra R, Kaur N and Bala A (2022). Biochemical and anatomical characteristics of basmati and non-basmati rice (<i>Oryza sativa</i> L.) for resistance to foot rot. <i>Bangladesh J Bot</i> 51(1): 29-36.	6.31
1844	Chhabra R, Sharma R, Hunjan M S, Sharma V K, Thakur S and Chauhan S (2022) Physio-biochemical and histological alterations in response to sheath blight disease of rice. <i>J Phytopathol</i> https://doi.org/10.1111/jph.13141	7.83
1845	Choudhary A K, Singh N and Singh D (2022) Management of foot rot of citrus (<i>Citrus jambhiri</i> spp.) using biocontrol agents. <i>Indian J Agril Sci</i> 92(9): 1148-52.	6.37
1846	Choudhary K, Alam M S, Kaur G and Gupta S K (2022) Optimization of fibre and protein rich extruded soybean-rice based ready to eat snacks. <i>Int J Environ Clim Change</i> 12(2): 61-73.	5.13
1847	Choudhary T F, Gupta M and Mavi H K (2022) Modelling the relationship between climate change and rice yield: Evidence from Indian agriculture. <i>Indian J Econ Dev</i> 18:495-500.	5.15
1848	Dahiphale P, Singh M and Yousuf A (2022) Morphometric Indices based Prioritization of Watersheds in lower Shivaliks of North-West India using Remote Sensing and GIS. <i>Indian J Soil Conserv</i> 50:1-11.	5.59
1849	Damanpreet, Chandi R S and Aggarwal N (2022) Field life tables and key mortality factors of <i>Helicoverpa armigera</i> infesting tomato (<i>Solanum lycopersicon</i>). <i>Indian J Agril Sci</i> 92(6): 684-88.	6.8

1850	Dar M H and Vashishat N (2022) Preventing Rose-Ringed Parakeet (<i>Psittacula krameri</i> Scopoli) depredations to sunflower using ecofriendly management. <i>Agril Res J PAU</i> 59(1): 104-09.	5.44
1851	Das D T, Sharma P, Tevatiya S, Chauhan C, Kumari S, Yadav P, Singla D, Srivastava V, Rani J and Hasija Y (2022) Bidirectional microbiome-gut-brain-axis communication influences metabolic switch-associated responses in the mosquito <i>Anopheles culicifacies</i> . <i>Cells</i> 11(1798):1-24.	13.67
1852	Davit H, Kaushal S and Hunjan M S (2022) Chemical composition and antibacterial potential of <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight Arn leaves essential oil against phytopathogenic bacteria of rice and potato. <i>J Essent Oil Bear Plants</i> 25(3): 468-81.	7.699
1853	Deka S, Bhairavi K S, Singh S, Jose S K and Kakoti R K (2022) Diversity of spiders (Arachnida: Araneae) recorded in Khasi Mandarin Ecosystem of Northeastern India. <i>Indian J Agril Res</i> 56(4): 474-79.	5.20
1854	Deol J K, Sharma S, Rani R, Kalia A, Chhuneja P and Sarao N K (2022) Inheritance analysis and identification of SSR markers associated with fusarium wilt resistance in melon. <i>J Horti Sci Biotechnol</i> 97:1-11.	7.90
1855	Deosi K K and Suri K S (2022) Status of insecticide resistance in rice brown planthopper (<i>Nilaparvata lugens</i>) in Punjab. <i>Indian J Agril Sci</i> 92(2): 203-07.	6.80
1856	Devi R, Chauhan S and Dhillon T S (2022) Genome editing for vegetable crop improvement: challenges and future prospects. <i>Front Genet</i> 13:1-16 1037091. doi: 10.3389/fgene.2022.1037091.	10.60
1857	Devi R, Singh P, Mamta, Jeet K and Kumar V (2022) Temperature-dependent dielectric properties of adulterated honey - a quality assessment measure for fraud detection. <i>Indian J Pure Appl Phys</i> 60: 209-17	6.92
1858	Dey D and Mavi M S (2022). Co-application of biochar with non-pyrolyzed organic material accelerates carbon accrual and nutrient availability in soil. <i>Environ Technol Innov</i> 25:102128.	11.26
1859	Dhaliwal J, Kahlon M S and Kukal S S (2022) Deep tillage and irrigation impact on soil water balance and water productivity of maize-wheat cropping system in north-west India. <i>Arch Agron Soil Sci</i> https://doi.org/10.1080/03650340.2020.1827235	8.24
1860	Dhaliwal L K, Kaur J and Singh J (2022) Weather variability during wheat growing season in central plain region of Punjab. <i>Int J Plant Soil Sci</i> 34(6): 34-48.	5.07
1861	Dhaliwal S K, Gill R K, Sharma A, Kaur A, Bhatia D and Kaur S (2022) A large-effect QTL introgressed from ricebean imparts resistance to Mungbean yellow mosaic India virus in blackgram (<i>Vigna mungo</i> L.) Hepper). <i>Theor Appl Genet</i> https://doi.org/10.1007/s00122-022-04234-5	11.70
1862	Dhaliwal S S, Sharma V and Shukla A K (2022) Impact of micronutrients in mitigation of abiotic stresses in soils and plants-A progressive step towards crop security and nutritional quality. <i>Adv Agron</i> 173: 1-78.	12.92
1863	Dhaliwal S S, Sharma V, Kaur J, Shukla A K, Hossain A, Abdel-Hafez S H, Gaber A, Sayed S and Singh V K (2022) The Pedospheric Variation of DTPA-Extractable Zn, Fe, Mn, Cu and Other Physicochemical Characteristics in Major Soil Orders in Existing Land Use Systems of Punjab, India. <i>Sustainability</i> 14: 29.	9.25
1864	Dhaliwal S S, Sharma V, Shukla A K, Kaur M, Verma V, Sandhu P S, Alsuhaibani A M, Gaber A and Hossain A (2022) Biofortification of oil quality, yield, and nutrient uptake in Indian mustard (<i>Brassica juncea</i> L.) by foliar application of boron and nitrogen. <i>Front Plant Sci</i> 13:976391. doi: 10.3389/fpls. 2022. 976391	11.75
1865	Dhaliwal S S, Sharma V, Shukla A K, Shivay Y S, Hossain A, Verma V, Kaur M, Singh J, Bhatti S S, Verma G, Singh J and Singh P (2022) Agronomic biofortification of forage crops with Zn and Cu for enhancing nutritive potential- A systematic review. <i>J Sci Food Agri</i> https://doi.org/10.1002/jsfa.12353	9.64



1866	Dhaliwal S S, Sharma V, Shukla A K, Singh J, Verma V, Kaur M, Singh P and Rehal J (2022) Assessment of optimum mineral zinc fertilizer rate for quantitative and qualitative production of sugarcane in north-western India. <i>J Trace Elements Minerals</i> DOI: https://doi.org/10.1016/j.jtemin.2022.100021	9.50
1867	Dhaliwal S S, Sharma V, Shukla A K, Verma V, Kaur M, Shivay Y S, Nisar S, Gaber A, Brestic M, Barek V and Skalicky M (2022) Biofortification-A frontier novel approach to enrich micronutrients in field crops to encounter the nutritional security. <i>Molecules</i> 27:1340.	10.41
1868	Dhaliwal S S, Sharma V, Shukla AK, Kaur J, Verma V, Kaur M, Singh P, Kaur L, Verma G, Singh Jagdish, Gaber A and Hossain A (2022) Biofortification of Soybean (<i>Glycine max</i> L.) through FeSO ₄ ·7H ₂ O to enhance yield, iron nutrition and economic outcomes in sandy loam soils of India. <i>Agriculture</i> 12: 586. https://doi.org/10.3390/agriculture12050586	9.40
1869	Dhaliwal S S, Sharma V, Verma V, Singh H, Singh P and Kaur K (2022) Biofortification of linseed (<i>Linum usitatissimum</i> L.) through mineral and chelated forms of Zn on yield, Zn accumulation, quality parameters, efficiency indices and economic under low Zn soils of North-Western India. <i>J Plant Nutr</i> 46: 356-69.	8.28
1870	Dhall R K, Hegde S N and Malhotra P K (2022). Standardized protocol for in situ and in vitro maintenance of newly developed parthenocarpic gynoecious cucumber inbred. <i>Braz Arch Biol Technol</i> 65: e22200792, https://doi.org/10.1590/1678-4324-2022200792	6.80
1871	Dhami D S, Kaur S, Sharma A, Dhillion N K and Jain S (2022) Relative consequences of interaction among <i>Meloidogyne incognita</i> , <i>Fusarium oxysporum</i> and tomato leaf curl Palampur-virus on disease severity and growth of muskmelon. <i>Indian Phytopathol</i> 75: 767-79.	5.95
1872	Dhami M, Sharma S and Kang T (2022) Spiritual intelligence analysis of youth: A cultural perspective. <i>J Comm Mobiliz Sustain Dev</i> 17(1):1-4.	5.30
1873	Dhanda S, Kaur S, Chaudhary A and Bhullar M S (2022) Confirmation of metsulfuron-resistant <i>Rumex dentatus</i> in Punjab and Haryana and its management. <i>Agril Res J</i> 59(3): 429-37.	5.44
1874	Dhanda S, Kaur S, Chaudhary A, Jugulam M, Hunjan M S, Sangha M K and Bhullar M S (2022) Characterization and management of metsulfuron-resistant <i>Rumex dentatus</i> biotypes in Northwest India. <i>Agron J</i> 114: 366-78.	8.24
1875	Dhatt K K and Singh S (2022) Morphological variability of dahlia (<i>Dahlia variabilis</i> L.) genotypes under subtropical conditions of Punjab. <i>Agric Res J</i> 59(5): 926-30.	5.44
1876	Dhatt K K, Jhanji S, Kaur G and Dhatt U K (2022) Evaluation of genetic diversity in pansy accessions (<i>Viola</i> spp) using growth and flowering traits. <i>Annals Plant Soil Res</i> 24(2):313-18.	5.22
1877	Dhatt K K and Thakur T (2022) Effect of herbicides in managing weeds and on <i>Gladiolus hybridus</i> Hort growth and flowering. <i>Indian J Weed Sci</i> 54(1):77-80	5.84
1878	Dhawan G, Dheri G S and Gill A A S (2022) Long-term use of balanced fertilization decreases nitrogen losses in a maize-wheat system on Inceptisol of north India. <i>Arch Agron Soil Sci</i> 68: 395-412	8.24
1879	Dheri G S, Lal R and Moonilal N (2022) Soil carbon stocks and water stable aggregates under annual and perennial biofuel crops in central Ohio. <i>Agri Ecosyst Environ</i> 324: 107715. doi: https://doi.org/10.1016/j.agee.2021.107715 .	11.57
1880	Dhillon B S and Ram H (2022) Growth indices, photosynthetic parameters and productivity of barley (<i>Hordeum vulgare</i>) as influenced by sowing dates and cutting management. <i>Indian J Agron</i> 67(4): 374-79.	5.55
1881	Dhillon B S and Ram H (2022). Improving nitrogen use efficiency and productivity through sowing environment and cutting stage in dualpurpose barley (<i>Hordeum vulgare</i> L). <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00277-y	7.24
1882	Dhillon G K and Kaur N (2022) Impact of growth stages of rice crop on population dynamics and reproductive status of <i>Tatera indica</i> (Hardwicke). <i>Agric Res J PAU</i> 59(3): 468-75.	5.44
1883	Dhillon G K, Kour A and Gupta N (2022) Low-cost Drying Technology for Preservation of Peach (<i>Prunus Persica</i>) Using RSM. <i>Int J Fruit Sci</i> 22(1):525-38.	7.31

1884	Dhillon N K, Toor B S, Kaur A and Kaur J (2022). Characterization and evaluation of yellow pea flour for use in 'Missi Roti' a traditional Indian flat bread in comparison with Desi chick-pea flour. <i>Pharma Innov J</i> 11: 58-64.	5.23
1885	Dhillon P K, Aggarwal N and Zhawar V K (2022) Antioxidant activity of tuber apical and basal ends of potato during cold storage. <i>Int J Veg Sci</i> 28(3): 280-96. https://doi.org/10.1080/19315260.2021.1958402	7.35
1886	Dhiman R, Thakur C L, Kumar D, Pal D K and Attri V. (2022). Seedling parameters of <i>Quercus leucotrichophora</i> under natural conditions along altitudinal gradient at different locations of North West Himalayas. <i>Pharma Innov J</i> 11(6): 2073-76	5.23
1887	Dhkal M, Sharma A and Sharma S (2022) Identification of resistance sources and monogenic dominant nature of resistance to tomato leaf curl Palampur virus in melons. <i>Phytoparasitica</i> https://doi.org/10.1007/s12600-022-00988-2	7.44
1888	Dhkal M, Sharma A and Sharma S P (2022) Bio stimulants an important non chemical alternative to pesticides for management of virus disease in Muskmelon. <i>Egypt J Biolog Pest Control</i> DOI.org/10.1186/s41938-022-00560-4	6.76
1889	Digra A, Kaushal A, Loshali D C, Kaur S and Bhavsar D (2022) Temporal land use/Land cover change analysis in Kotla sub-watershed of Rupnagar district (Punjab) using remote sensing and GIS. <i>J Indian Soc Remote Sens</i> 50:1371-91.	7.56
1890	Dikhsa, Riar T S, Walia S S and Garg L (2022) A Comparative Study of Economic Profitability of Various Integrated Farming Systems in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(4): 1235	5.65
1891	Dulazi A A, Kukal S S, Sharma S and Dhaliwal J (2022) Soil organic carbon and its labile pools as modulated by soil microbes under different land use practices in Typic Ustochrepts. <i>Trop Ecol</i> 64(2):1-11. http://dx.doi.org/10.1007/s42965-022-00257-7	6.85
1892	Ekta, Utreja D and Singh K (2022) Synthesis of Sulfonamide based Chemosensor for sensing of toxic Hg ²⁺ ions in Soil extract. <i>J Photochem Photobiol A Chem</i> 426: 113784.	10.38
1893	Gaba J, Sharma S and Kaur P (2022) Preparation and biological evaluation of thymol functionalized 2-pyrazoline and dihydropyrimidinone hybrids. <i>Org Prep Proced Int</i> 54(4): 312-23.	7.63
1894	Gaba J, Sharma S, Kaur H and Kaur P (2022) Thymol and its Derivatives for Management of Phytopathogenic fungi of Maize. <i>Curr Bioact Compd</i> 18(7): 61-69.	6.96
1895	Gaba Y and Vashishat N (2022) Pesticide residue analysis in excreta of spotted owl <i>Athene brama</i> and barn owl <i>Tyto alba</i> . <i>Indian J Entomol</i> DOI.No: 10.55446/IJE.2022.498.	5.08
1896	Gandhi H, Toor B S, Kaur A and Kaur J (2022). Effect of processing treatments on physicochemical, functional and thermal characteristics of lentils (<i>Lens culinaris</i>). <i>J Food Meas Charact</i> 16: 4603-14.	8.43
1897	Garg D, Dar R A and Phutela U G (2022) Characterization of novel euryhalinemicroalgal cultures from Punjab, India for bioactive compounds. <i>Arch Micro</i> 204(7): 370.	7.88
1898	Garg N, Choudhary O P, Thaman S, Sharma V, Singh H, Vashistha M, Sekhon K S, Sharda R and Dhaliwal M S (2022) Effects of irrigation water quality and NPK-fertigation levels on plant growth, yield and tuber size of potatoes in a sandy loam alluvial soil of semi-arid region of Indian Punjab. <i>Agril Water Manag</i> 266: 107604. https://doi.org/10.1016/j.agwat.2022.107604	10.52
1899	Garg N, Pandove G, Kalia A, Pandey V and Mahala P (2022) Differential effects of plant growth-promoting rhizobacteria used as soil application vis-à-vis root dip of seedlings on the performance of onion (<i>Allium cepa</i> L.) in three distinct agro-climatic zones of Indian Punjab. <i>Commun Soil Sci Plant Anal</i> https://doi.org/10.1080/00103624.2022.2072507	6.77
1900	Garg R K, Garg R K and Sharma S (2022) Growth, biomass and nutrient uptake in <i>Casuarina junghuhniana</i> Miq. as influenced by applications of inorganic and biofertilizers. <i>Range Mgmt Agrofor</i> 43(2): 269-75.	6.58



1901	Garg R K, Sra M S, Nicodemus A, Singh A and Singh G (2022). Evaluation of interspecific hybrid clones of <i>Casuarina</i> for adaptability and growth in arid and semi-arid regions of North-West India. <i>J Environ Biol</i> 43: 317-25.	6.78
1902	Garg R, Singla N, Gupta M and Jain R (2022) Sensory attributes and antioxidant potential of value-added products of grapefruit (<i>Citrus paradisi</i>). <i>Asian J Dairy Food Res</i> DOI: 10.18805/ajdfr. DR-1881.	5.75
1903	Garg V, Kaur M, Sangha M K and Javed M (2022) Ternary CTAB@Co3O4@GO nanocomposite as promising superoxide dismutase mimic. <i>Bull Mater Sci</i> 45: 145. DOI.org/10.1007/s12034-022-02709-1	7.78
1904	Gaur K, Jhanji S and Dhatt K K (2022) Effects of benzyl adenine (BA) and gibberellic acid (GA3) on physiological and biochemical attributes of gladiolus (<i>Gladiolus grandiflorus</i> L.) spikes. <i>Bangladesh J Bot</i> 51(2): 297-304.	6.31
1905	Gautam A K, Avasthi S, Verma R K, Sushma, Niranjana M, Devadatha B, Jayawardena R S, Suwannahach N and Karunarathna S C (2022) A global overview of diversity and phylogeny of the rust genus <i>Uromyces</i> . <i>J Fungi</i> 8: 633. https://doi.org/10.3390/jof8060633	11.82
1906	Gharu H S, Sangha M K, Gupta S, Pathak D, Nara U and Walia G S (2022) Biochemical evaluation of micro-greens and seeds of Punjab Celery 1 (<i>Apium graveolens</i> L.). <i>Agric Res J</i> 59(4): 738-45.	5.44
1907	Ghongade D S, Sangha K S, Dhall R K and Bhullar M B (2022) Field evaluation of <i>Blaptostethus pallescens</i> Poppius (Hemiptera: Anthocoridae) in controlling <i>Tetranychus urticae</i> Koch on parthenocarpic cucumber under protected environments. <i>Int J Acarol</i> https://doi.org/10.1080/01647954.2022.2041091	7.24
1908	Ghosh S, Benbi D K and Choudhary O P (2022) Cropping system effects on organic carbon pools in four IndoGangetic alluvial soils of different antecedent carbon levels. <i>J Soil Sci Plant Nutr</i> https://doi.org/10.1007/s42729-022-00794-z .	9.87
1909	Gill D M, Praba G K, Singh U P, Garg T Karnatam, KS Kaur, A Vikal, Y (2022) Biochemical and molecular characterization of sub-tropical maize germplasm for tocopherols. <i>Journal of Food Composition and Analysis</i> 114.(104842):1-10	10.52
1910	Gill J K, Sangha K S, Shera P S and Sharma S (2022) Insecticidal toxicity to <i>Trichogramma chilonis</i> Ishii (Hymenoptera: Trichogrammatidae) and subsequent effects on parasitic efficiency and adult emergence rate of descendant generation. <i>Int J Trop Insect Sci</i> 42: 3489-98. https://doi.org/10.1007/s42690-022-00873-9	6.85
1911	Gill M K, Kocher G S and Panesar A S (2022) Evaluation of fungal consortium lignozyme for biodelignification of Agricultural residues. <i>Biofuels Bioprod Bioref</i> 16(6): 1772-80.	9.90
1912	Gill M S, Gill P P S, Pal R K and Singh Navpreem (2022) Mulching effects on soil temperature and yield of pear [<i>Pyrus pyrifolia</i> Burm.] Nakai] in humid subtropical climate of Punjab. <i>Mausam</i> 73(4): 951-58	6.64
1913	Gill R, Sandhu P S, Sharma S and Sharma P (2022) Biochemical responses associated with resistance to <i>Sclerotinia sclerotiorum</i> , the causal agent of stem rot in <i>Brassica juncea</i> . <i>Indian Phytopathol</i> 75: 731-39.	5.95
1914	Goel N, Singh S K, Dixit A K, Singh A, Singh M and Jain L (2022) Refinement of wheat straw harvester for paddy straw harvesting and bruising. <i>J Agril Engg (India)</i> 59(3): 201-16.	5.95
1915	Goyal M, Kaur H and Singh D P (2022) Biochemical profiling of geographically diverse cowpea (<i>Vigna unguiculata</i> L.) genotypes for nutritional quality and photochemical and antioxidant potential. <i>Agric Res J</i> 59(6) 1010-19	5.44
1916	Goyal M, Kaur H D and Kaur A D (2022). Intra-genotypic variability for antioxidant and bioactive potential in oat under dual purpose system. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00256-3	6.89
1917	Goyal P, Gupta N and Kaur S (2022) Screening of barley (<i>Hordeum vulgare</i> L.) genotypes for tolerance to salt stress. <i>Agric Res J</i> 59: 616-24.	5.44

1918	Goyal P, Thind S K and Srivastava P (2022) Improvement of plant regeneration efficiency using polyamines for double haploid production in wheat (<i>Triticum aestivum</i>). <i>Indian J Agril Sci</i> 92(6): 789-93. http://dx.doi.org/10.56093/ijas.v92i6.102874	6.21
1919	Grewal G K and Joshi N (2022) Evaluation of adjuvants on growth and virulence of <i>Metarhizium rileyi</i> against <i>Spodoptera litura</i> (f.) <i>Indian J Ento Online</i> published Ref. No. e21159 DOI: 10.55446/IJE.2021.358	5.89
1920	Grewal H K, Kler T K and Sidhu S K (2022) Exploring cattle sheds as complementary avifaunal habitat niches in rice dominated agricultural areas in Punjab, India. <i>Emir J Food Agric</i> 35(5): 1-9.	6.84
1921	Grewal J K, Kaur M, Mandal K and Sharma V K (2022) Carbon quantum dot-titanium doped strontium ferrite nanocomposite: visible light active photocatalyst to degrade nitroaromatics. <i>Catalysts</i> 12(10): 1126.	10.50
1922	Grewal J K, Kaur M, Sharma R K, Oliveira A C, Garg V K and Sharma V K (2022) Structural and photocatalytic studies on oxygen hyperstoichiometric trimetallic titanium doped strontium ferrite nanoparticles. <i>Magnetochem</i> 8(10):120.	9.33
1923	Grover G, Sharma A, Mackay I, Srivastava P, Kaur S, Kaur J, Burrige A, Allen S P, Bentley A and Chhuneja P (2022) Identification of a novel stripe rust resistance gene from the European winter wheat cultivar 'acienda': a step towards rust proofing wheat cultivation. <i>Plos One</i> 17(2): 1-8.	9.75
1924	Gudi S, Saini D K, Singh G, Halladakeri P, Kumar P, Shamshad M, Tanin M J, Singh S and Sharma A (2022) Unravelling consensus genomic regions associated with quality traits in wheat using meta-analysis of quantitative trait loci. <i>Planta</i> 255: DOI:10.1007/s00425-022-03904-4.	10.12
1925	Gupta M, Choudhary M, Singh A, Sheoran S, Singla D and Rakshit S (2022) Meta-Qtl Analysis for mining of candidate genes and constitutive gene network development for fungal disease resistance in maize (<i>Zea mays</i> L.). <i>Crop J</i> 11(2): 511-22.	10.65
1926	Gupta M, Kapoor S, Kaur A, Kaur M, Aggarwal P and Wagh R V (2022) Effect of pre-treatments on qualitative characteristics of osmotically dehydrated apple. <i>J A Horti</i> 24: 47-52.	5.13
1927	Gupta N, Mahajan M and Jawandha S K (2022). Influence of pre-harvest spray of putrescine on postharvest quality of Indian jujube. <i>Indian J Horti</i> 79(3): 305-10.	6.11
1928	Gupta P K, Balyan H S, Chhuneja P, Jaiswal J P, Tamhankar S, Mishra V K, Bains N S, Chand R, Joshi A K and Kaur S (2022) Pyramiding of genes for grain protein content, grain quality, and rust resistance in eleven Indian bread wheat cultivars: a multi-institutional effort. <i>Mol Breed</i> 42(21): 1-16.	9.30
1929	Gupta R K, Arun S, Bijay-Singh, Bhatt R, Al-Huqail A A, Siddiqui M H and Kumar R (2022) Precision nitrogen management in Bt cotton (<i>Gossypium hirsutum</i>) improves seed cotton yield and nitrogen use efficiency, and reduces nitrous oxide emissions. <i>Sustainability</i> 14: 2007. https://doi.org/10.3390/su14042007 .	9.25
1930	Gupta R K, Kaur J, Kang J S, Singh H, Kaur S, Sayed S, Gaber A and Hossain A (2022) Tillage in combination with Rice Straw Retention in a Rice-Wheat System Improves the Productivity and Quality of Wheat Grain through Improving the Soil Physio-Chemical Properties. <i>Land</i> 11: 1693. https://doi.org/10.3390/land11101693	9.95
1931	Gupta S and Kaur H (2022) Assessment of Musculoskeletal Problems of Polyhouse Workers through Subjective Analysis Technique. <i>J Comm Mobil Sustain Dev</i> 17(4): 1181-86.	5.67
1932	Gupta S, Mohan N, Nayak P, Nagaraju K C and Karanam M (2022) Deep vision-based surveillance system to prevent train-elephant collisions. <i>Soft Comp</i> 26(8): 4005-18.	9.50
1933	Gupta N, Mahajan M and Jawandha S K (2022) Influence of pre-harvest spray of putrescine on postharvest quality of Indian jujube. <i>Indian J Horti</i> 79(3): 305-310 (IF-0.12)	6.10



1934	Harish G N, Singh R, Sharma S and Taggar G K (2022). Changes in defense-related antioxidative enzymes amongst the resistant and susceptible soybean genotypes under whitefly, <i>Bemisia tabaci</i> (Hemiptera: Aleyrodidae) stress. <i>Phytoparasitica</i> 51: 63-75.	7.81
1935	Harminder S, Pathania Shashi, Mavi M S and Choudhary O P (2022) Salt stress response index and tolerance mechanisms of citrus rootstocks. <i>Agril Res J</i> 59(2): 293-97.	5.44
1936	Harshvardan H J, Kapoor R and Amandeep (2022) Hybridization and factors influencing seed set in oat. <i>Indian J Agri Res</i> DOI: 10.18805/IJARE.A-5813	5.20
1937	Heena, Kaushal S, Kalia A and Kaur V (2022) Proximate, mineral, chemical composition, antioxidant and antimicrobial potential of dropped fruits of <i>Citrus reticulata</i> Blanco. <i>J Food Meas Charact</i> 16(6): 4303-17.	8.43
1938	Hilli H J, Kapoor R, Singla A, Sharma P and Srivastava P. (2022) Towards mapping of <i>Helminthosporium</i> leaf blight/ <i>Pyrenophora</i> leaf spot resistance genes/qtl in oats. <i>Cereal Res Commun</i> 51: 471-81	7.24
1939	Hima D, Sonia K and Hunjan MS (2022) Chemical composition and antibacterial potential of <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight Arn. leaves essential oil against phytopathogenic bacteria of rice and potato. <i>J Essent Oil Bear Plants</i> 25:468-81, DOI: 10.1080/0972060X.2022.2105661	7.70
1940	Hunjan M S, Kumar S, Lore J S and Vera Cruz C M (2022) Efficiency of different <i>Rhizoctonia solani</i> inoculum source against sheath blight screening in rice under field conditions. <i>Trop Plant Pathol</i> https://doi.org/10.1007/s40858-021-00489-3 .	6.45
1941	Husain R, Gupta V, Seikh K, Sharma S and Arora J (2022) Predicting late blight severity of potato based on weather parameters in the Jammu province. <i>Agril Mechanization Asia</i> 53: 6360-72.	6.14
1942	Husain R, Gupta V, Arora J, Sharma S, K Davinder and Seikh K (2022) Weather based prediction of early blight of potato caused by <i>Alternariasolani</i> . <i>Agril Mechanization Asia</i> 53(2): 6351-59.	6.14
1943	Singh J and Singh V (2022) Chlorophyll meter based precision nitrogen management in spring maize. <i>J Plant Nutr</i> DOI: 10.1080/01904167.2022.2071727.	7.71
1944	Singh J and Singh V (2022) Mid-season proximal sensing for site-specific need-based fertilizer nitrogen management in spring maize. <i>J Plant Nutr</i> DOI: 10.1080/01904167.2022.2046075	7.71
1945	Singh J, M S Mavi and Saini S P (2022) Fertilizer prescription for target yield of wheat in alluvial soils. <i>Indian J Agril Sci</i> 91(10): 1528-31.	6.37
1946	Jain E and Vashishat N (2022) Toxicity of acephate to liver and kidney of female wistar rats. <i>Indian J Entomol</i> e22406 Dol. No.: 10.55446/IJE.2022.683	5.08
1947	Jain R, Singh J and Dhiman P (2022). Geoinformatics and surface water. <i>Int J Early Childh Spec Educ</i> 14(2): 5064-69. (Web of science indexed journal 2021 impact factor 0.76)	6.76
1948	Jain S and Rani R (2022) Dose optimization of combination product of tebuconazole + trifloxystrobin WG against powdery mildew of green pea incited by <i>Erysiphe polygoni</i> . <i>Pest Res J</i> 34(2):195-200.	5.49
1949	Jain S and Sukhmani (2022) Impact of knowledge and practices of processors on management of Paddy waste and by products. <i>Indian J Econ Dev</i> 18(4): 876-83.	5.15,
1950	Jain S, Singla N, Kalra S and Mahal A K (2022) Effectiveness of different management strategies against Nilgai population (<i>Boselaphus tragocamelus</i>) in Punjab Province of India. <i>Animal Biol</i> DOI 10.1163/15707563-bja10096: 1-22	7.48
1951	Jain V and Sharma S (2022) Physicochemical and proximate composition of mungbean x urdbean and mungbean x ricebean interspecific lines. <i>J Food Comp Anal</i> 111(4):104593	10.56
1952	Jangral S and Vashishat N (2022) Feeding guild structure of birds at Keshopur Chhamb wetland, Gurdaspur. <i>Indian J Entomol</i> DOI.: 10.55446/IJE.2021.391	5.08

1953	Jassal A, Sharma S and Sardana V (2022) Designing edible oil blends to achieve ideal fatty acid composition for human consumption. <i>J Environ Biol</i> 43:251-58 http://doi.org/10.22438/jeb/43/2/MRN-1799	5.57
1954	Jhanji S and Dhatt K K (2022) Unravelling physiological and biochemical attributes influencing post harvest quality of gladiolus spikes after packaging and low temperature storage. <i>Indian J Exptl Biol</i> 60(1): 41-48.	6.82
1955	Jhanji S and Kaur R (2022) Evaluation of phenoglad model on phenological development of gladiolus varieties under subtropical conditions of Punjab. <i>J Agromet</i> 24(4):353-58.	6.55
1956	Jhanji S, Dhatt K K, Kaur R and Dhatt U K (2022) Ameliorative effect of priming on germination potential of aged seeds of flowering winter annuals. <i>J Crop Weed</i> 18(1): 224-31.	5.46
1957	Jhans B, Kaur G, Gupta A, Singh A, Sharma S S and Sharma R (2022) Functional, bioactive and morphological properties of purple wheat bran enriched pasta. <i>Int J Food Sci Technol</i> 58: 1241-49.	9.61
1958	Jindal S, Pathak D, Pandher S, Rathore P and Vikal Y (2022) Inheritance and molecular tagging of genes introgressed from <i>Gossypium arboreum</i> to <i>G. hirsutum</i> for leafhopper tolerance. <i>J Genet</i> 101(2): (42) 1-7.	7.51
1959	Joshi N, Sharma S and Sharma P (2022) Enrichment programme efficacy on core life skills: A quasi experimental study among university students. <i>Indian J Ext Edu</i> 58(4): 134-38.	5.95
1960	Joshi R, Rehal J, Kaur A and Minhas K S (2022) Quality and Shelf Life of Ready to Cook Mozzarella Cheese Stick Snack with Different Packaging Materials and Methods under Refrigerated Storage. <i>Asian J Dairy Food Res</i> 10.18805/ajdfr.DR-1822	5.75
1961	Joshi S, Bathla S, Singh A, Sharma M, Stephen B and Sridhar K (2022) Development of mung bean (<i>Vigna radiate</i> L.)-based next-generation vegan milk: Processing, nutritional composition and quality attributes. <i>Int J Food Sci Technol</i> 58(2): 785-94.	9.61
1962	Kahlon M S (2022) Interactive effect of mulch, irrigation and nitrogen on maize productivity. <i>Appl Ecol Environ Res</i> 20:1793-806.	6.71
1963	Kamboj A, Mahajan S and Singh K (2022) Mulching Practices and awareness of farmers for Bio degradable mulches made from textile waste from Mansa and Moga. <i>Int J Curr Microbial Appl Sci</i> 11: 47-56.	5.30
1964	Kamboj R, Singh D and Kaur L (2022) Adoption Status of Direct Seeded Rice Technology by the Farmers of Punjab. <i>Indian J Ext Educ</i> 58(1): 76-80.	5.95
1965	Kamboj R, Singh D and Riar T S (2022) Problems and Prospects of Direct Seeded Rice in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 2:563-67.	5.65
1966	Kanwal V and Sirohi S (2022) Addressing agricultural income risks in India: efficacy of risk management options in hazard-prone regions. <i>Curr Sci</i> 122(2): 178-86.	7.17
1967	Kapil S, Mankoo R K, Dudeja I, Singh A and Kaur J (2022) Structural, antioxidant, antibacterial and biodegradation properties of rice straw xylan (native and modified) based biofilms. <i>Int J Food Sci Technol</i> 58(5): 2772-81.	9.61
1968	Kapoor S, Sidhu R K, Tandon R, Jindal S K and Mahajan B V C (2022) Postharvest quality of green chilli (<i>Capsicum annum</i>) cultivars under cold and ambient conditions. <i>Indian J Agricul Sci</i> 92 (1): 70-74. http://dx.doi.org/10.56093/ijas.v92i1.120842	6.37
1969	Karedla A K, Choudhary A, Chhuneja P K, Singh J and Singh N D (2022) Effect of sub-lethal doses of thiamethoxam on hypopharyngeal glands of <i>Apis mellifera</i> Linnaeus. <i>J Apicult Res</i> 10.1080/00218839.2022.204726	7.36
1970	Kasniya P K, Singh M, Romana B S and Singh A (2022) Survey and occurrence of major biotic stresses of rice in Sangrur district of Punjab. <i>Indian J Ecol</i> 49(6): 2105-11.	5.79
1971	Kataria A, Sharma S and Khatkar S K (2022) Antioxidative, structural and thermal characterisation of simulated fermented matrix of quinoa, chia and teff with caseinate. <i>Int J Food Sci Technol</i> 57: 5663-72.	9.61



1972	Katyal P, Bhardwaj R, Sharma S, Kaur J, Pathania N, Vyas P, Kapoor S and Kocher G S (2022) Microbial decomposer assisted in situ degradation of surface retained paddy straw. <i>Int J Recycl Org Waste Agric</i> 10.30486/IJROWA.2022.1935169.1292)	6.71
1973	Kaul S, Kaur K, Kaur J, Mehta N and Kennedy J F (2022) Properties of potato starch as influenced by microwave, ultrasonication, alcoholic-alkali and pre-gelatinization treatments. <i>Int J Biol Macromol</i> 226: 1341-51.	14.03
1974	Kaul S, Kaur K, Kaur P and Kaur J (2022). Development and shelf-life assessment of ready-to-bake frozen potato paranthas fortified with iron and zinc. <i>Int J Food Sci Technol</i> 57: 7214-21.	9.61
1975	Kaul S, Kaur K, Mehta N, Dhaliwal S S and Kennedy J F (2022) Characterization and Optimization of Spray Dried Iron and Zinc Nanoencapsules based on Potato Starch and Maltodextrin. <i>Carbohydr Polym</i> 282: 119107.	16.72
1976	Kaur A and Chandi R S (2022) Efficacy of insecticides against <i>Earias</i> spp. on okra. <i>Indian J Entomol</i> 84(2): 412-14	5.89
1977	Kaur A and Kocher G S (2022). Extraction and characterization of essential oils from peel of kinnow (<i>Citrus reticulata</i> L). <i>Agril Res J</i> https://doi.org/10.5958/2395-146x.2022.00135.1	5.44
1978	Kaur A and Kumar M (2022) Avian diversity in mustard crop. <i>Indian J Entomol</i> DOI. No.: 10.55446/IJE.2022.528	5.08
1979	Kaur A and Sharma V K (2022) Pathogenic behaviour of <i>Bipolaris sorokiniana</i> isolates on different barley varieties. <i>Agril Res J</i> 59: 364-67	5.44
1980	Kaur A and Singh G (2022) Zinc and iron application in conjunction with nitrogen for agronomic biofortification of field crops - a review. <i>Crop Pasture Sci</i> 73(7-8): 769-80.	8.25
1981	Kaur A P (2022) Migration a road of empowerment? Agency, resources and left behind women in Punjab (India). <i>Asian J Women's Study</i> 28(1): 1-19.	6.20
1982	Kaur A P and Kaur G (2022) Agriculture in crisis during Covid 19: Restrictions in mobility and Employment faced by internal migrants. <i>J Comm Mobiliz Sustain Dev</i> 2: 593-98.	5.67
1983	Kaur A, Aggarwal P, Kaur N and Kaur S (2022). Enhancement of biofunctional properties, sensory attributes, and shelf life of flatbread by incorporating red bell pepper (<i>Capsicum annum</i> L.). <i>Int J Food Sci</i> e17220. DOI: https://doi.org/10.1111/jfpp.17220 .	9.61
1984	Kaur A, Chahal G K and Dhatt A S (2022) Understanding of histological and physiological alterations in hull-less seeded pumpkin. <i>Scientia Horti</i> 304 https://doi.org/10.1016/j.scienta.2022.111321	9.46
1985	Kaur A, Grewal S K, Kaur S, Sharma A, Srivastava P, Garg M, Wani S H, Chhuneja P, Singh K and Kaur S (2022) Juvenile heat stress tolerance in <i>Triticum durum</i> - <i>Aegilops tauschii</i> derived synthetics: a way forward for wheat improvement. <i>Mol Biol Rep</i> 49(6): 5669-83 doi: 10.1007/s11033-022-07595-8	8.32
1986	Kaur A, Kaur P and Kumar P (2022) Problems with paddy straw management technologies in South- Western Punjab. <i>J Comm Mobiliz Sustain Dev</i> 2: 335-9.	5.30
1987	Kaur A, Kocher D K and Kumar R (2022) Larvicidal potential and residual activity effect of kinnow peel oil against <i>Aedes aegypti</i> L. <i>J Vector Borne Dis</i> 59: 228-35.	7.69
1988	Kaur A, Kocher G S and Keshani (2022) Extraction and characterization of essential oils from peel of kinnow (<i>Citrus reticulata</i> L.). <i>Agric Res J</i> 59(5): 964-69. DOI: 10.5958/2395-146X.2022.00135.1	5.44
1989	Kaur A, Pandey K, Kaur R, Vashishat N and Kaur M (2022) Nanocomposites of Carbon Quantum Dots and Graphene Quantum Dots: Environmental Applications as Sensors. <i>Chemosensors</i> 10(9):367.	10.22
1990	Kaur A, Saini M K, Sharma S and Kooner R (2022) Novel molecules targeted control of brinjal shoot and fruit borer, <i>Leucinodes orbonalis</i> in subtropical conditions of Punjab (India). <i>Pest Res J</i> 34(1): 44-45 DOI: 10.5958/2249-524X.2022.00008.5	5.49

1991	Kaur A, Sharma S and Singh N (2022) Comparison studies on sucrose metabolism and phenolic content during fruit growth and maturation in pear cultivars. <i>Acta Alimen</i> 51(4) DOI: 10.1556/066.2022.00044	6.65
1992	Kaur A, Sharma V K and Rani R (2022) Role of melanin production by species on <i>Helminthosporium</i> pathogenicity in Gramineous Hosts. <i>Indian J Ecol</i> 49(2): 533-41	5.79
1993	Kaur A, Singh K and Garg L (2022) Problem faced by the potato growers in adopting paddy straw management technologies in Jalandhar district of Punjab. <i>J Comm Mobiliz Sustain Dev</i> 1(SSI): 31-34.	5.67
1994	Singh J, Riar T S, Garg L (2022) Prospects of Integrated Farming System in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 16(1): 313-315.	5.65
1995	Kaur A, Singh K B, Gupta R K, Alataway A, Dewidar A Z and Mattar M A (2022) Interactive effects of nitrogen application and irrigation on water use, growth and tuber yield of potato under subsurface drip irrigation. <i>Agronomy</i> 13(1): 11.	9.95
1996	Kaur A, Singh K G and Singh A (2022) Effect of varying photoperiods with red and blue supplemental LED lighting on the growth, yield and quality of <i>Lactuca sativa</i> var. <i>Capitata</i> 'Iceberg' grown in soilless media under protected cultivation. <i>J Plant Nutr</i> 46(6): 1019-38. https://doi.org/10.1080/01904167.2022.2067765	7.71
1997	Kaur A, Taggar M S, Kalia A and Singh M (2022) Nitrate-induced carbohydrate accumulation in <i>Chlorella sorokiniana</i> and its potential for ethanol production. <i>Bioenergy Res</i> 15:253-63. https://doi.org/10.1007/s12155-021-10292-2 .	8.81
1998	Kaur A, Walia G and Singh R (2022) Leveraging social media platforms for valuing agri-entrepreneurship in Punjab, India. <i>Indian J Ext Edu</i> 58(3):70-73.	5.95
1999	Kaur B, Garcha K S, Bhatia D, Khosa J S, Sharma M, Mittal A, Verma N and Dhatt A S (2022) Identification of single major QTL and candidate gene(s) governing hull-less seed trait in pumpkin. <i>Front Plant Sci</i> 13: 948106. doi:10.3389/fpls.2022.948106.	11.75
2000	Kaur B, Kaur N and Kataria S K (2022) Assessing the variability in temperature and rainfall extremes use RC limdex. <i>J Agromet</i> 24(4): 439-41.	6.37
2001	Kaur G and Bhatia S (2022) Alpha-amylase-assisted extraction of protein concentrates from <i>Raphanus sativus</i> L. leaves. <i>Biomass Convers Bioref</i> 13: 15051–65. https://doi.org/10.1007/s13399-022-03611-w	10.90
2002	Kaur G and Bhatia S (2022) Radish leaf protein concentrates: Optimization of Alkaline extraction for production and Characterization of an alternative plant protein Concentrate. <i>J Food Measur Charact</i> DOI https://doi.org/10.1007/s11694-022-01411-4	8.43
2003	Kaur G, Kaur A P and Charak S (2022) Subsidiary occupations for rural development: constraints and challenges. <i>J Comm Mobiliz Sustain Dev</i> 2(Seminar Special Issue): 599-603.	5.67
2004	Kaur G, Kaur G, Kaur P and Kaur A (2022) Influence of ozonation and roasting on functional, microstructural, textural characteristics, and aflatoxin content of groundnut kernels. <i>J Text Stud</i> https://doi.org/10.1111/jtxs.12713	9.22
2005	Kaur G, Kaur P, Kaur G and Mehta S (2022) Comparison of physiochemical properties and colour of wheat flour: Effect of milling speed, packaging and storage. <i>Agric Eng Int: CIGR J</i> 24(4): 153-63.	6.00
2006	Kaur G, Pathak M, Singla D, Chhabra G, Chhuneja P and Sarao N K (2022) Quantitative trait loci mapping for earliness, fruit, and seed related traits using high density genotyping-by-sequencing-based genetic map in bitter melon (<i>Momordica charantia</i> L.). <i>Front Plant Sci</i> 12(799932): 1-13.	12.63
2007	Kaur G, Raheja S and Arora A (2022) Botanicals for the management of green mould causing Post-harvest decay of Kinnow mandarin. <i>Agric Res J</i> 59(1): 157-61.	5.44
2008	Kaur G, Sidhu G K, Kaur P and Kaur A (2022) Influence of ozonation and roasting on functional, microstructural, textural characteristics, and aflatoxin content of groundnut kernels. <i>J Text Stud</i> 53: 908-22.	9.94



2009	Kaur G, Yadav I S, Bhatia D, Vikal Y, Neelam K, Dhillon N K, Praba U P, Mangat G S and Singh K (2022) BSAsq Identifies a Major Locus on Chromosome 6 for Root-Knot Nematode (<i>Meloidogynegraminicola</i>) Resistance From <i>Oryzaglaberrima</i> . <i>Front Genet</i> 13:871833.	10.60
2010	Kaur H and Mohapatra L (2022) Determinants of Adoption of Integrated Nutrient Management in Potato Based Cropping System in Punjab. <i>J Comm Mobil Sustain Dev</i> 3: 834	5.67
2011	Kaur H, Grewal S K and Gill R K (2022) Characterization of quinoa (<i>Chenopodium quinoa</i> Willd.) genotypes for nutritional quality and antioxidant potential. <i>Punjab Agric Res J</i> 59(3): 486-95.	5.44
2012	Kaur H, Huggins D R, Carlson B, Stockle C and Nelson R (2022) Dryland fallow vs flex-cropping decisions in inland Pacific Northwest of USA. <i>Agril Syst</i> 201: 103432.	11.37
2013	Kaur H, Kaur M, Aggarwal R, Sharma S and Singh D (2022) Nanocomposite of MgFe ₂ O ₄ and Mn ₃ O ₄ as polyphenol oxidase mimic for sensing of polyphenols. <i>Biosensors</i> 12(6): 428.	11.74
2014	Kaur H, Kingra P K and Singh S P (2022) Managing Climate Change Impacts on Growth and Yield of Maize by Adjusting Sowing Time. <i>Mausam</i> 73(3): 673-82.	6.64
2015	Kaur H, Kumar M and Choudhary A (2022) Artificial T- perches as attractant for insectivorous birds against <i>Helicoverpa armigera</i> (Hubner). <i>Indian J Ento</i> 84(1): 44-48 DOI:10.55446/IJE.2021.340	5.89
2016	Kaur H, Sardana V and Sharma P (2022) Efect of sowing dates on phenology, chlorophyll index, symbiotic parameters and yield of spanish bunch groundnut (<i>Arachis hypogaea</i>) cultivars. <i>Agric Res J</i> 59(2): 236-42. doi No. 10.5958/2395-146X.2022.00037.0	5.44
2017	Kaur H, Sharma P, Sharma R, Sardana V and Banga S S (2022) Terminal heat stress modulates growing degreedays Heat use efficiency and yield stabilityIndex in <i>Brassica juncea</i> . <i>Annals Plant Soil Res</i> 24(30): 415-23.	5.22
2018	Kaur H, Sidhu G S, Mittal A, Yadav I S, Mittal M, Singla D, Singh N and Chhuneja P (2022) Comparative transcriptomics in alternate bearing cultivar dashehari reveals the genetic model of flowering in mango. <i>Front Genet</i> 13(1061168): 1-13.	10.77
2019	Kaur H, Sidhu G S, Sarao N K, Singh R and Singh G (2022) Assessment of genetic diversity of mandarin cultivars grown in major citrus regions of world using morphological and micro-satellite markers. <i>Horti Environ Biotechnol</i> 63(3): 425-37.	8.40
2020	Kaur H, Singh I, Sethi S, Bhatia D, Gill B S and Singh S (2022) Genetic Divergence for Seed Yield Enhancing and Quality Traits in Pigeonpea [<i>Cajanus cajan</i> (L.) Millsp.]. <i>Legum Res</i> DOI: 10.18805/LR-4739	6.67
2021	Kaur J and Prabhjyot-Kaur (2022) A critical assessment of changes in climate predicted by four GCMs under different RCP scenarios in Punjab (India). <i>Mausam</i> 73(4): 749-62.	6.64
2022	Kaur J and Singh B (2022) Nitrogen management for wheat (<i>Triticumaestivum</i> L.) intercropped with variable aged poplar (<i>Populus deltoides</i> Bartr.) plantations in North-Western India. <i>J Plant Nutr</i> 45(5): 686-702.	7.71
2023	Kaur J and Singh B (2022) Role of phosphorus and potassium nutrition in enhancing yield, nutrient use efficiency and quality of wheat under variable aged poplar (<i>Populusdeltoides</i> -Bartr.) plantations in India. <i>Agrofor Syst</i> 96: 1065-75	8.55
2024	Kaur J, Asthir B, Kaur G, Kaur P and Bedi S (2022) Comparative analysis of the antioxidant capacity of wheat genotypes at different temperatures in polytunnel. <i>Agrochemica</i> 65(4): 335-46.	6.60
2025	Kaur J, Goyal M, Lamba J S and Agrawal R K (2022) Sugarcane tops and additives influence nutritional quality and fermentation characteristics of mixed silage prepared with rice straw. <i>Range Mmgt Agro For</i> 43(2): 309-16.	6.37
2026	Kaur J, Jawandha S K, Gill P P S, Grewal S K and Singh H (2022) Effect of beeswax enriched with sodium nitroprusside coating on antioxidant properties and quality of lemon cv. PAU Baramasi Lemon 1 fruits during low temperature storage. <i>J Food Process Preserv</i> https://doi.org/10.1111/jfpp.16319 .	8.19

2027	Kaur J, Kaur G, Kaur K and Arora N K (2022) Effect of Chlormequat Chloride Application on Vegetative Growth and Overall Quality of Grape Cultivars Under Protected Cultivation. <i>Erwerbs-Obstbau</i> https://doi.org/10.1007/s10341-022-00781-9	6.89
2028	Kaur J, Prabhjyot-Kaur and Kothiyal S (2022) Futuristic changes in monthly meteorological parameters as simulated by four GCMs under four emission based scenarios at Ludhiana, Punjab. <i>Arab J Geosci</i> 15: 906.	7.83
2029	Kaur J, Ram H and Kumar V (2022) Performance of wheat (<i>Triticum aestivum</i>) as influenced by tillage, varieties and precision nitrogen management. <i>Indian J Agril Sci</i> 92(1): 118-22.	6.37
2030	Kaur J, Singla N and Kalra S (2022) Ecological and behavioural aspects of five striped palm squirrel, <i>Funambulus pennantii</i> Wrought on in natural habitat in agricultural landscape. <i>Indian J Ecol</i> 49(6): 2436-41. DOI: https://doi.org/10.55362/IJE/2022/3844 .	5.08
2031	Kaur J, Taggar M S, Kalia A, Sanghera G S, Kocher G S and Javed M (2022) Valorization of sugarcane bagasse into fermentable sugars by efficient fungal cellulolytic enzyme complex. <i>Waste Biomass Valorization</i> . https://doi.org/10.1007/s12649/022-01918-3	9.70
2032	Kaur K and Kumar P (2022) Impact analysis of KVK activities in different adopted villages of Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(2): 362-68.	5.30
2033	Kaur K and Kaur P (2022) Evaluating the impact of intra-seasonal change in temperature and solar radiation on phenology and yield of rice using CERES-rice model in Punjab. <i>Mausam</i> 73(2): 423-32.	6.64
2034	Kaur K and Kaur P (2022) Simulation of yield of rice cultivars under variable agronomic management options using CERES-Rice and INFOCROP-Rice models in irrigated plains of Punjab. <i>Agric Res J</i> 59(3): 438-46.	5.44
2035	Kaur K and Rana S (2022) Impact of vocational trainings on knowledge of rural women regarding preservation of fruits and vegetables. <i>J Comm Mobil Sustain Dev</i> 17(4): 1362-66.	5.67
2036	Kaur K, Dhillon T S and Singh R (2022) GGE biplot analysis for seed production potential of European carrot (<i>Daucus carota</i> L.) genotypes in plains and sub-mountainous zones of Punjab. <i>Genetika</i> 54: 233-54.	6.76
2037	Kaur K, Kaur P, Kumar S, Zalpouri and Singh M (2022) Ozonation as a potential approach for pesticide and microbial detoxification of food grains with a focus on nutritional and functional quality. <i>Food Rev Int</i> https://DOI.Org/10.1080/87559129.2022.2092129 .	12.48
2038	Kaur K, Sharma A, Mavi G S, Srivastava P, Kaur H, Sharma H, Singh S, Kushwah A and Sohu V (2022) Biofortified wheat: harnessing genetic diversity for improved nutritional quality to eradicate hidden hunger. <i>Crop Sci</i> 62(2): 802-19.	8.76
2039	Kaur K, Utreja D and Rani R (2022) Anti-fungal evaluation of synthesized 1,3,5-triazine derivatives against phytopathogenic fungi. <i>Agric Res J</i> 59(5): 945-52	5.44
2040	Kaur K, Utreja D, Dhillon N K and Pathak R K (2022) 3-Hydroxy-3-alkylindolin-2-ones: Regioselective synthesis, molecular docking and nematicidal studies against <i>Meloidogyne incognita</i> . <i>J Environ Sci Health Part B</i> 57(8): 657-69, DOI: 10.1080/03601234.2022.2097504.	7.99
2041	Kaur K, Utreja D, Dhillon N K, Anupam and Buttar H S (2022) Heterocyclic moieties as prospective Nematicides: An overview. <i>Curr Org Chem</i> 26(18): 1703-24.	8.18
2042	Kaur L and Sharma S G (2022) Production of bacterial ligninolytic enzymes and its potential applications in decolorization of dyes. <i>Cellul Chem Technol</i> 56(1-2):191-98	7.47
2043	Kaur M and Ashlesha (2022). Fodder productivity and quality assessment of bajra napier hybrid varieties under different nitrogen levels. <i>Range Mgmt Agro For</i> 43(1): 172-75.	6.37
2044	Kaur M and Oberoi H K (2022) Production potential of a bio-energy crop (sweet sorghum) for biomass, grain yield and bio-fuel under variable nutrient environment in North-West India. <i>Indian J Agron</i> 67(4): 412-16.	5.55
2045	Kaur M and Sharma K (2022) Rice productivity and water use efficiency under different irrigation management system in Northwestern India. <i>Indian J Ext Educ</i> 58(2): 65-68	5.95



2046	Kaur M and Singla N (2022) Potential of a synthetic predatory cue in reducing damage caused by <i>Rattus rattus</i> . <i>Int J Pest Manag</i> 68(1): 69-79. https://doi.org/10.1080/09670874.2020.1797230	6.90
2047	Kaur M, Grewal I S and Sidhu S S (2022) Improved randomized response technique for estimating population proportion of a sensitive characteristic. <i>Model Assist Stat App</i> 17(2): 87-97.	6.18
2048	Kaur M, Gupta N, Kaur N, Sohu R S, Mahal A K and Choudhary A (2022) Preliminary screening of sorghum (<i>Sorghum bicolor</i> L.) germplasm for salinity stress tolerance at the early seedling stage. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00327-5 1-11	7.24
2049	Kaur M, Kaur M, Singh D, Feng M and Sharma V K (2022) Magnesium ferrite-nitrogen doped graphene oxide nanocomposite: Effective adsorptive removal of lead(II) and arsenic(III). <i>Environ Sci Pollut Res</i> 29(32):48260-75.	10.22
2050	Kaur M, Kumar M and Sethi V P (2022) Maintaining the freeze thawing characteristics of tomato through development and evaluation of magnetic field assisted freezing system. <i>J Food Process Preserv</i> . https://doi.org/10.1111/jfpp.16900	8.19
2051	Kaur M, Kumar R, Sekhon M K and Kingra H S (2022) Comparative analysis of productivity and pesticide application in net house and open field vegetable cultivation. <i>Indian J Econ Dev</i> 18(1): 11-18.	5.15
2052	Kaur M, Oberoi H K, Gangaiah B and Satpal (2022) Effect of foliar application of plant-bio-regulators to mitigating drought effects on productivity and quality of single cut fodder sorghum in Punjab, India. <i>Agril Res J</i> 59(2): 216-20	5.44
2053	Kaur M, Ram H and Kaur S (2022) Performance of food barley (<i>Hordeum vulgare</i> L.) varieties under different sowing windows and seeding rates. <i>Agric Res J</i> 59: 625-30. DOI No. 10.5958/2395-146X.2022.00091.6	5.44
2054	Kaur M, Sandhu P S and Singh M J (2022) Economic contribution of home makers in the family income through their unpaid household work. <i>J Comm Mobiliz Sustain Dev</i> 16(3): 913-17.	5.67
2055	Kaur M, Sharma S and Sodhi HS (2022) White rot fungus <i>Calocybe indica</i> : Incredulous factory of lignocellulolytic enzymes and their potential applicability for mushroom cultivation. <i>Acta Alimentaria</i> 51(3): 424-36.	7.00
2056	Kaur M, Vyas P, Rahi P and Sharma S (2022) Chlorpyrifos and carbofuran-tolerant phosphate-solubilizing <i>Arthrobacter oxydans</i> and <i>Bacillus flexus</i> improved growth and phosphorus uptake in potato in pesticide amended soils. <i>Potato Res</i> 65: 213-31.	8.07
2057	Kaur M, Gupta N, Kaur N, Sohu R S, Mahal A K and Choudhary A (2022) Preliminary screening of sorghum (<i>Sorghum bicolor</i> L.) germplasm for salinity stress tolerance at the early seedling stage. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00327-5	6.85
2058	Kaur N and Aggarwal P (2022) Development and characterization of packing, microstructural, physico and phytochemical attributes of potential functional jamun (<i>Syzygium cumini</i>) pomace powder for direct compression: High antioxidant nutraceutical tablets. <i>J Food Sci Technol</i> https://doi.org/10.1111/ijfs.15933 .	9.61
2059	Kaur N and Katyal P (2022) Physico-chemical, nutritional and microbiological profiling of probiotic <i>Aloe vera</i> . <i>Ind J Hort</i> 79(2): 243-48.	6.16
2060	Kaur N and Kaur P (2022) Calibration and validation of CERES-Maize model under different environments for Ludhiana, Punjab. <i>J Agril Phys</i> 22(1): 99-106.	5.10
2061	Kaur N and Singla N (2022) Integrated management of rodent pests in sugarcane using rodenticides and antifertility agent triptolide. <i>Indian J Entomol</i> pp. 1-3. https://doi.org/10.55446/IJE.2021.362 .	5.08
2062	Kaur N, Aggarwal P, Kaur N and Kaur S (2022) Nutritional improvement of bhujia by incorporating colored bell peppers. <i>J Food Process Preserv</i> e16569. DOI: https://doi.org/10.1111/jfpp.16569	8.61

2063	Kaur N, Aggarwal P, Kaur N and Kaur S (2022) Phyto-nutritional profile, cooking quality, in vitro digestibility, organoleptic attributes and storage stability of variety bell pepper incorporated pasta. <i>J Food Meas</i> 1-11. DOI: 10.1007/s11694-022-01702-w	9.01
2064	Kaur N, Aggarwal P, Kumar V and Kaur S (2022). Influence of different extraction techniques on the extraction of phytochemicals and antioxidant activities from <i>Syzygium cumini</i> (jamun) pomace using Taguchi orthogonal array design: a qualitative and quantitative approach. <i>Biomass Convers Biorefin</i> 1-13. DOI: 10.1007/s13399-022-02826-1	10.05
2065	Kaur N, Kaur S, Tsolakis N, Mishra N and Srail J S (2022) Managing groundwater demand through surface water and reuse strategies in an overexploited aquifer of Indian Punjab. <i>Modeling Earth Syst Environ</i> 23:1-18. (Impact Factor:3.90)	9.90
2066	Kaur N, Singh M J and Kaur S (2022) Long term monthly and inter-seasonal weather variability analysis for lower Shivalik foothills of Punjab. <i>Mausam</i> 73(1): 173-80.	6.64
2067	Kaur N, Sohu R S, Bhardwaj R, Sharma S and Kaur M (2022) Effect of salinity on growth traits in sorghum (<i>Sorghum bicolor</i>). <i>Agric Res J</i> 59(5): 844-55	5.44
2068	Kaur P and Bala M (2022) Morphological descriptors and quality parameters in chrysanthemum (<i>Chrysanthemum morifolium</i> Ramat.) for DUS testing. <i>Agril Res J</i> 59(2): 313-17	5.44
2069	Kaur P, Arora A, Singh H and Hunjan M S (2022) Molecular characterization of <i>Xanthomonas citri</i> subsp. <i>citri</i> isolates and its resistance sources in citrus germplasm. <i>Agril Res J (PAU)</i> 59(4): 706-17	5.44
2070	Kaur P, Brar J S and Kaur G (2022) Salicylic acid and ascorbic acid extend the shelf life of guava (<i>Psidium guajava</i> L.) fruits under cold and ambient storage conditions. <i>Agric Res J</i> 59(4): 718-24.	5.44
2071	Kaur P, Dhakad A K and Dhillon G P S (2022) Genetic variability assessment of morphometric and economically important traits for <i>Eucalyptus</i> clones in north western India. <i>Indian Forester</i> 148(12): 1079-93	5.10
2072	Kaur P, Kaur G, Kyum M, Kaur S, Bains S, Sharma P, Kaur H, Sandhu S K and Vikal Y (2022) Marker-assisted pyramiding of southern leaf blight resistance <i>qtlsqslb3.1</i> and <i>qslb8.1</i> in maize. <i>Indian J Agril Sci</i> 92(12): 1437-42.	6.37
2073	Kaur P, Kaur H, Kalsi N K and Bhullar M S (2022) Development and greenness evaluation of solid-phase extraction and salting-out liquid-liquid extraction method for determination of herbicides in water, soil and rice. <i>J Iran Chem Soc</i> 19: 2983–3012. https://doi.org/10.1007/s13738-022-02508-9	7.64
2074	Kaur P, Kaur H, Kalsi N K and Bhullar M S (2022) Optimization of ultrasound-assisted extraction of herbicides from soil and rice using Response surface modelling. <i>Soil Sediment Contam Int J</i> 32(12): 1-30. DOI: 10.1080/15320383.2022.2041543	8.06
2075	Kaur P, Neelam K, Sarao P S, Babbar A, Kumar K, Vikal Y, Khanna R, Kaur R, Mangat G S and Singh K (2022) Molecular mapping and transfer of a novel brown planthopper resistance gene <i>bph42</i> from <i>Oryza rufipogon</i> (Griff.) to cultivated rice (<i>Oryza sativa</i> L.). <i>Mol Biol Rep</i> 49(9): 8597-606.	8.74
2076	Kaur P, Rani G and Bhullar M S (2022) Persistence of metribuzin in aridisols as affected by various abiotic factors and its effect on soil enzymes. <i>Int J Environ Anal Chem</i> 1-20. DOI: 10.1080/03067319.2022.2026938	8.83
2077	Kaur P, Saini K S, Kaur K and Kaur K (2022) Organic amendments and nitrogen levels influences grain quality of Rice (<i>Oryza sativa</i>) - Wheat (<i>Triticumaestivum</i>) cropping system. <i>Ind J Agril Sci</i> 92(4):521-25. http://dx.doi.org/10.56093/ijas.v92i4.124010	6.37
2078	Kaur P, Saini K S, Kaur K, Singh T and Walia S S (2022) Production potential, economics and energetics of rice (<i>Oryza sativa</i>)- wheat (<i>Triticum aestivum</i>) cropping system influenced by organic amendments and different levels of nitrogen. <i>Indian J Agron</i> 68(3): 246-52. https://doi.org/10.59797/ija.v68i3.2802	5.55



2079	Kaur P, Sharma S, Albarakaty F M, Kalia A, Hassan M M and Abd-Elsalam K A (2022) Bio-sorption and bioleaching of heavy metals from electronic waste varied with microbial genera. Sustainability 14(2):935. https://doi.org/10.3390/su14020935	9.25
2080	Kaur R, Bedi S and Kaur P (2022) Evaluation of growth and yield in wheat (<i>Triticum aestivum</i> L.) under heat stress conditions. Agril Res J 59(4):609-15	5.44
2081	Kaur R, Dhillon G S, Kaur A, Kaur S, Toor P I, Kaur D, Kumar A, Mavi G S, Grewal S K, Sharma A, Srivastava P, Chhuneja P and Kaur S (2022) Marker-assisted introgression of genes into rye translocation leads to the improvement in bread making quality of wheat (<i>Triticum aestivum</i> L.). Heredity 128: 531-41. doi:10.1038/s41437-022-00538-w	9.82
2082	Kaur R, Kaur K and Singh J (2022) Drying kinetics, chemical and bioactive compounds of yellow sweet pepper as affected by processing conditions. J Food Process Preserv 46: e16330	8.61
2083	Kaur R, Kaur N, Singh H and Sangha M K (2022) Compositional differences in peel and juice of cracked and normal fruits of Lemon (<i>Citrus limon</i> L. Burm.). J Agri Sci Tech 24(4): 861-72.	6.90
2084	Kaur R, Kumar P, Kumar A, Praba U P, Birdi R, Singh R, Kaur G, Lore J S, Neelam K and Vikal Y (2022) Osmate6 gene putatively involved in host defense response toward susceptibility against <i>Rhizoctoniasolani</i> in rice. J Plant Interac17(1): 744-55.	10.03
2085	Kaur R, Manchanda P and Sidhu G S (2022) Optimization of extraction of bioactive phenolics and their antioxidant potential from callus and leaf extracts of stevia rebaudianabertoni. J Food Measur Charact 16(3):1-10.	9.01
2086	Kaur R, Manchanda P, Bhushan K, Kalia A and Sidhu G S (2022) Quantification of phenolic constituents and bioactive properties of callus and leaf tissue of <i>Citrus jambhiri</i> Lush. Agric Res J 59(4): 725-29.	5.44
2087	Kaur R, Sharma S and Sodhi H S (2022) Effect of citric acid dips and packaging materials on browning in button mushroom. Indian J Horti 79(3): 370-75.	6.00
2088	Kaur R, Sharma S, Kaur S and Sodhi H S (2022) Biochemical characterization with kinetic studies of melanogenic enzyme tyrosinase from white button mushroom <i>Agaricus bisporus</i> . Int J Biotechnol Biochem 59(7):718-25.	11.00
2089	Kaur R, Singh B and Dhaliwal S S (2022) Macronutrient status of soils under different plantation cycles of poplar (<i>Populusdeltoides</i> Bartr.) based agroforestry system in Punjab. Indian J Ecol 49(4): 1417-23	5.79
2090	Kaur R, Singh R and Aulakh R K (2022) Diversity of arthropods in relation to insecticide and biopesticide treatments in okra. Indian J Entomol Dol. No.: 10.55446/IJE.2022.788	5.08
2091	Kaur R, Singh S and Joshi N (2022) Pervasive endosymbionts <i>Arsenophonus</i> plays a key role in the transmission of cotton leaf curl virus vectored by Asia 11-1 genetic group of <i>Bemisia tabaci</i> . Environ Ento 51(3): 564-77, https://doi.org/10.093/ee/invan024	7.45
2092	Kaur S and Dhillon N K (2022) Ecofriendly Management of Root Knot Nematode, <i>M. Incognita</i> , in Cucumber under Protected Cultivation. Agril Res J 59(2): 285-92.	5.44
2093	Kaur S, Aggarwal P and Kaur N (2022) Enhanced functionality and shelf stability of burfi by incorporating kinnow (mandarin) fruit juice. J Food Sci Technol 59: 4956-68.	9.61
2094	Kaur S, Aggarwal P, Singh A and Surasani R (2022) Utilization of kinnow peel as a functional ingredient in bread: Physicochemical, functional, textural and sensory attributes. Int J Food Sci Technol https://doi.org/10.1111/ijfs.16040 .	9.61
2095	Kaur S, Bhardwaj R D, Kaur J and Kaur S (2022) Induction of defense-related enzymes and pathogenesis-related proteins imparts resistance to barley genotypes against spot blotch disease. J Plant Grow Regul 41: 682-96.	10.27
2096	Kaur S, Boora R S, Singh D and Singh G (2022) Standardization of propagation techniques in sapodilla [<i>Manilkara achras</i> (Mill.) Fosberg] cv. Kalipatti under North Indian conditions. Agric Res J 59(6): 1119-24.	5.44

2097	Kaur S, Dhillon N K, Devi R and Buttar H S (2022) Assessment of root-knot nematode, <i>M. incognita</i> and identification of the source of resistance in cauliflower, <i>Brassica oleracea</i> . <i>J Appl Horti</i> 24(2):235-39.	5.13
2098	Kaur S, Grewal S K, Singh S and Virk H K (2022) Impact of phosphorous deficit conditions on morphophysiological traits and phosphorous metabolism in chickpea genotypes. <i>Protoplasma</i> 259(3):775-88. doi: 10.1007/s00709-021-01700	9.36
2099	Kaur S, Kaur K and Jindal J (2022) Status of phenolic metabolism and α amylase inhibitor in maize under <i>Chilopartellus</i> infestation. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-021-00230-5	6.85
2100	Kaur S, Prabhjyot-Kaur and Kaur H (2022) The role of meteorological parameters in determining yield of rice cultivated under flooded transplanted conditions in Ludhiana district - A case study. <i>J Agromet</i> 24(3): 299-304.	6.55
2101	Kaur S, Sachdev P A, Singh A and Surasani V K R (2022) Utilisation of Kinnow peel as a functional ingredient in bread: Physicochemical, functional, textural and sensory attributes. <i>Int J Food Sci Technol</i> 58: 2706-71.	9.61
2102	Kaur S, Shamshad M, Jindal S, Kaur A, Singh S, Sharma A and Kaur S (2022). RNA-Seq-based transcriptomics study to investigate the genes governing nitrogen use efficiency in indian wheat cultivars. <i>Front Genet</i> 13:853910. doi: 10.3389/fgene.2022.853910.	10.60
2103	Kaur S, Sharma S P, Sarao N K, Deol J K, Gill R, Abd-Elsalam K A, Alghuthaymi M A, Hassan M M and Chawla N (2022) Heterosis and combining ability for fruit yield, sweetness, β -carotene, ascorbic acid, firmness and Fusarium wilt resistance in muskmelon (<i>Cucumis melo</i> L.) involving genetic male sterile lines. <i>Horticultrae</i> 8: 82. https://doi.org/10.3390/horticultrae8010082	8.33
2104	Kaur S, Singla N and Mahal A K (2022) Carica Papaya modulates the organ histology, biochemicals, estrous cycle and fertility of <i>Bandicotabengalensis</i> rats. <i>J Appl Anim Res</i> 50 (1): 289-98.	7.63
2105	Kaur S, Suhalia A, Sarlach R S, Shamshad M, Singh P, Grover G, Brar A and Sharma A (2022) Uncovering the Iranian wheat landraces for salinity stress tolerance at early stages of plant growth. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00245-6	6.85
2106	Kaur Y, Arora A and Thind S K (2022) Spatial distribution of <i>Phytophthora nicotianae</i> in citrus rhizosphere. <i>Indian Phytopathol</i> 75(4): 969-77.	5.95
2107	Kaur, A, Sharma U, Singh S, Singh R, Vikal Y, Singh S, Malik P, Kaur K, Singh I and Bindra S (2022) Introgressing cry1ac for pod borer resistance in chickpea through marker-assisted back-cross breeding. <i>Front Genet</i> 13(847647): 1-15. https://doi.org/10.3389/fgene.2022.847647	10.77
2108	Kaura V, Malhotra P K, Mittal A, Sanghera G S, Kaur N, Bhardwaj R D, Cheema R S and Kaur G (2022) Physiological, biochemical, and gene expression responses of sugarcane under cold, drought and salt stresses. <i>J Plant Growth Regul</i> 41(8): 1-11. https://doi.org/10.1007/s00344-022-10850-	10.64
2109	Khan H, Krishnappa G R, Kumar S, Mishra C N, Krishna H, Devate N B, Parkash O, Yadav S S and Srivastava P (2022) Genome-wide association study for grain yield and component traits in wheat (<i>Triticum aestivum</i> L.). <i>Front Genet</i> 13:982589 https://doi.org/10.3389/fgene.2022.982589	10.77
2110	Khanna N, Bhullar M S, Jaidka M and Kaur T (2022) Maize weed control and yield using different applications of tembotrione. <i>Int J Pest Mgmt</i> DOI: 10.1080/09670874.2022.2050833.	7.90
2111	Khanna N, Jaidka M and Bhullar M S (2022) Quantification of intra- and inter-row weed competition in maize. <i>Maydica</i> 66(3): 5.	6.54
2112	Kharub A S, Ram H, Khippal A, Singh B, Kumar S, Berkesia N, Yadav M, Singh B P, Kaur M, Kumar D, Verma R P S and Singh G P (2022) Use of growth regulators for lodging tolerance and increasing productivity of barley (<i>Hordeum vulgare</i>): An empirical study. <i>Indian J Agril Sci</i> 92(11): 1306-10.	6.37



2113	Khipla N, Kaur J, Gosal S K, Gill R I S and Walia S S (2021) Integrated nutrient management to improve soil health, nutrient uptake and growth of Poplar (<i>Populus deltoides</i>) seedlings in nursery conditions. <i>Indian J Agrofor</i> 23(2):45-52.	5.19
2114	Khokhar A, Bhat M A, Singh M J, Yousuf A, Sharma V and Sandhu P S (2022) Soil properties, nutrient availability vis-à-vis uptake and productivity of rainfed maize-wheat system in response to long-term tillage and n management in Northwest India. <i>Commun Soil Sci Plant Anal</i> 53(22): 2935-54, DOI: 10.1080/00103624.2022.2096897.	7.58
2115	Khokhar A, Sharma V, Singh M J, Yousuf A, Sandhu P S, Kumar V and Bhat M A (2022) Effect of potassium and magnesium application on growth, yield and nutrient uptake of rainfed maize in the sub-montaneous region of Punjab, India. <i>J Plant Nutr</i> 45(14): 2202-12, DOI: 10.1080/01904167.2022.2063732.	8.28
2116	Khokhar J S, Jamwal N S, Sanghera G S and Singh P (2022) Evaluation of sugarcane (<i>Saccharum officinarum</i>) germplasm for quality, yield traits and effects of flowering on cane traits. <i>Indian J Agril Sci</i> 92(7): 842-46.	6.37
2117	Khushboo, Kaur M and Jeet K (2022) Mechanistic insight into magnesium ferrite-bentonite nanocomposite as adsorbent and photocatalyst. <i>J Photochem Photobiol A Chem</i> 425:113717.	10.29
2118	Kibasa V, Mahajan G and Chauhan B S (2022) Seed germination ecology of hood canarygrass (<i>Phalaris paradoxa</i> L.) and herbicides options for its control. <i>Scientific Rep</i> 12:15241 https://doi.org/10.1038/s41598-022-19418-8 .	11.00
2119	Kler T K, Kumar M, Kumar S and Sidhu S K (2022) Avian diversity in agricultural habitats of Punjab state. <i>Agric Res J PAU</i> 59(6): 1100-10.	5.44
2120	Kler T K, Hora H K, Sood A and Kumari P (2022) Predicting avian diversity with geospatial technologies. <i>Indian J Entomol</i> DOI.: 10.55446/IJ.2022.579.	5.08
2121	Kooner R, Sharma D K and Suri K S (2022) Botanicals for protection of mungbean against <i>Callosobruchus rganized</i> during storage. <i>Asian J Dairy Food Res</i> https://doi.org/10.18805/ajdfr.DR-1899	5.75
2122	Kooner R, Sharma D K and Suri K S (2022) Use of microwave heating technology for rganizedtions of stored green gram (<i>Vigna rganiz</i>) against cowpea bruchid, <i>Callosobruchus rganized</i> (Fabricius). <i>Legum Res</i> https://doi.org/10.18805/LR-4653 .	6.34
2123	Kooner R, Suri K S and Makkar G S (2022) Bioefficacy of Takumi 20% WG against rice stem-borers and leaf folder. <i>Indian J Ento</i> 1-4. https://doi.org/10.55446/IJE.2022.587	5.89
2124	Kothiyal S, Prabhjyot-Kaur and Kaur J (2022) Simulation and analysis of maize (<i>Zea mays</i> L.) yield trend under different emission scenarios in Ludhiana district of Punjab. <i>Agric Res J</i> 59(4): 639-52.	5.44
2125	Krishnappa G, Khan H, Krishna H, Kumar S, Mishra C N, Parkash O, Devate N R, Nepolean T, Rathan N D, Mamrutha H M and Srivastava P (2022) Genetic dissection of grain iron and zinc, and thousand kernel weight in wheat (<i>Triticum aestivum</i> L.) using genome-wide association study. <i>Scientific Rep</i> 12(1): DOI:10.1038/s41598-022-15992-z	10.00
2126	Kumar A, Aggarwal P, Kumar V, Babbar N and Kaur S (2022). Melon-based smoothies: process optimization and effect of processing and preservation on the quality attributes. <i>J Food Meas Character</i> https://doi.org/10.1007/s11694-022-01466-3	8.43
2127	Kumar A, Gill R K, Sandhu J S, Singh I and Singh S (2022). Notification and germplasm registration: Urdbean variety-Mash 1137. <i>Indian J Genet Plant Breed</i> 82: 377	6.51
2128	Kumar A, Jindal S K, Dhaliwal M S, Sharma A, Kaur S and Jain S (2022) Development of multiple disease resistant tomato lines through marker assisted breeding and their evaluation for horticultural traits. <i>Indian Phytopathol</i> 75: 47-55.	5.95
2129	Kumar A, Sachdev P, Kumar V, Babbar N and Kaur S (2022). Melon-based smoothies: Process optimization and effect of processing and preservation on the quality attributes. <i>J Food Meas Charact</i> 16: 4121-36.	9.01

2130	Kumar A, Sandhu N, Kumar P, Pruthi G, Singh J, Kaur S and Chhuneja P (2022) Genome-wide identification and in silico analysis of npf, nrt2, clc and slac1/slah nitrate transporters in hexaploid wheat (<i>Triticum aestivum</i>). <i>Scientific Rep</i> 12(11227): 1-20. Impact Factor: 4.997	11.00
2131	Kumar D, Singh M, Kumar S, Meena R K, Yadav M R, Makarana G, Kushwaha M, Dutta S, Kumar R and Rajesh (2022) Productivity and quality enhancement in fodder maize (<i>Zea mays</i>) cultivars through nutrient management strategies. <i>Indian J Agril Sci</i> 92(1): 126-30.	6.37
2132	Kumar K V, Gill B S, Kumar A, Sirari A, Dhillon S K and Meghana D P (2022) Genetic variability and character association among yellow mosaic disease resistant derivatives of soybean variety JS 335. <i>Agril Res J</i> 59(6): 1020-25.	5.44
2133	Kumar K, Kaur A, Kishore A, Kaur P, Babbar A, Kaur G, Kamboj I, Lore J S, Vikal Y and Mangat G S (2022) High-resolution mapping of the quantitative trait locus (qtls) conferring resistance to false smut disease in rice. <i>J Appl Genet</i> 63(1):35-45.	8.65
2134	Kumar K, Mandal S N, Neelam K, De L R and Benildo G (2022) Microrna-mediated host defense mechanisms against pathogens and herbivores in rice: balancing gains from genetic resistance with trade-offs to productivity potential. <i>BMC Plant Biol</i> 22(351):1-16. Impact Factor: 5.40	11.26
2135	Kumar K, Mandal S N, Pradhan B, Kaur P, Kaur K and Neelam K (2022) From Evolution To Revolution: Accelerating crop domestication through genome editing. <i>Plant Cell Physiol</i> 63(11):1607-23.	10.94
2136	Kumar P, Longmei N, Jat B S, Choudhary M, Yathish K R, Bhushan B, Goyal M and Rakshit S (2022) Heterotic Grouping of Indian Baby Corn Lines Based on Combining Ability. <i>Indian J Genet Plant Breed</i> 82(2): 161-66	6.51
2137	Kumar P, Sangwan A K, Singh N P, Sharma S, Gill P P S and Batth M K (2022) Evaluation of pear cultivars for physico-chemical and mineral content under north-west india conditions. <i>Agri Res J</i> 59(2):298-303.	5.44
2138	Kumar P, Sharma S, Singh R, Singh P and Kumar A (2022) First report of <i>Sclerotinia sclerotiorum</i> causing white rot of marigold in Punjab, India. <i>J Plant Pathol</i> 104:435	7.15
2139	Kumar R, Kaur N, Singh A D, Shobha, Chaudhary D, Singh B, Das A, Kumar P, Sharma P and Kaur Y (2022) Improvement in nutritional quality of traditional unleavened flat bread using quality protein maize. <i>Front Nutr</i> 9:963368. https://doi.org/10.3389/fnut.2022.963368	12.59
2140	Kumar S, Jacob S R, Mir R R, Vikas V K, Kulwal P, Chandra T, Kaur S, Kumar U, Kumar S and Sharma S (2022) Indian wheat genomics initiative for harnessing the potential of wheat germplasm resources for breeding disease-resistant, nutrient-dense, and climate-resilient cultivars. <i>Front Genet</i> 13: 834366 https://doi.org/10.3389/fgene.2022.834366	10.77
2141	Kumar S, Kaur H, Hunjan M S and Kaur K (2022) Biochemical changes induced in the maize leaf sheath upon inoculation with <i>Rhizoctonia solani</i> incitant of banded leaf and sheath blight. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00310-0 .	6.85
2142	Kumar S, Mohan C, Singh JP, Singh V and Verma R (2022) Genetic divergence in coriander (<i>Coriandrum sativum</i> L.). <i>Pharma Innov J</i> 11(6): 251-53.	5.20
2143	Kumar T and Kahlon M S (2022) Sensor based irrigation scheduling, soil physical properties and wheat productivity under different organic amendments. <i>Commun Soil Sci Plant Anal</i> https://doi.org/10.1080/0013624.2022.2071439 .	7.33
2144	Kumar T, Tiwari N, Bharadwaj C, Roorkiwal M, Reddy S P P, Patil B S, Kumar S, Hamwiah A, Vinutha T, Bindra S, Singh I, Alam A, Chaturvedi S K, Kumar Y, Nimmy M S, Siddique K H M and Varshney R K (2022) A comprehensive analysis of Trehalose6phosphate synthase (TPS) gene for salinity tolerance in chickpea (<i>Cicer arietinum</i> L.). <i>Scientific Rep</i> 12:16315 https://doi.org/10.1038/s41598-022-20771-x	10.38
2145	Kumar V and Aulakh C S (2022) Effect of planting geometry and potato seed tuber size on weeds and potato tuber yield. <i>Indian J Weed Sci</i> 54(3): 291-95.	5.84



2146	Kumar V, Joshi V K, Thakur N S, Kumar S, Gupta R K, Sharma N and Sharma A (2022) Bioprocess optimization for production of apple tea wine: influence of different variables on the quality attributes. <i>J Food Meas Charact</i> 16:1528-39.	8.43
2147	Kumar V, Kaur N and Singh M J (2022) Performance of taramira genotypes under rainfed situations as influenced by weather parameters. <i>Agril Res J</i> 59: 228-35.	5.44
2148	Kumar V, Kaur R, Aggarwal P and Singh G (2022) Underutilized citrus species: An insight of their nutraceutical potential and importance for the development of functional food. <i>Scientia Horti</i> 296: 110909.	10.34
2149	Kumar V, Sharma V, Singh M J and Sharma S C (2022) Impact of low cost interventions through frontline demonstrations on crop productivity and profitability of small and marginal farmers under dryland conditions. <i>Agril Res J</i> 59: 531-36.	5.44
2150	Kumari J and Nikhanj P (2022) Evaluation of edible coatings for microbiological and physico-chemical quality maintenance of fresh cut papaya. <i>J Food Process Preserv</i> 46(10): 2478-85.	8.61
2151	Kumari M, Kumar V, Kaur R, Kumar S and Sharma R (2022) Process optimization for the development of nutritionally enhanced nuggets using <i>Ficus geniculata</i> : A Nutritional Approach. <i>Plant Foods Hum Nutr</i> 77 DOI: 10.1007/s11130-022-00967-2	9.92
2152	Kumari P, Sharma R, Panwar S, Paul S and Banyal N (2022). Silicon as vital element in flower crop production. <i>J Plant Nutr</i> 46(4):1-16.	8.28
2153	Kumari S, Khanna V and Singh A (2022) Characterization and evaluation of extracellular hydrolytic proteins from rhizobacterial antagonists isolated from <i>Fusarium oxysporum</i> f. sp. <i>ciceris</i> infected chickpea fields. <i>Indian Phytopathology</i> 75(1):165	5.95
2154	Kumawat K C, Nagpal S and Sharma P (2022) Potential of plant growth-promoting rhizobacteria-plant interactions in mitigating salt stress for sustainable agriculture: A review. <i>Pedosphere</i> 32(2): 223-45.	11.51
2155	Kumawat K C, Singh I, Nagpal S, Sharma P, Gupta R K and Sirari A (2022) Co-inoculation of indigenous <i>Pseudomonas oryzae</i> and <i>Bradyrhizobium</i> sp. modulates the growth, symbiotic efficacy, nutrient acquisition, and grain yield of soybean. <i>Pedosphere</i> 32(3): 438-51.	11.51
2156	Kushwah A, Bhatia D, Barmukh R, Singh I, Singh G, Bindra S, Vij S, Bhardwaj C, Pratap A, Roorkiwal M, Kumar S, Varshney R K and Singh S (2022) Genetic mapping of QTLs for drought tolerance in chickpea (<i>Cicer arietinum</i> L.). <i>Front Genet</i> 13:953898. Doi: 10.3389/fgene.2022.953898	10.60
2157	Kushwaha N L, Elbeltagi A, Mehan S, Malik A and Yousuf A (2022) Comparative study on morphometric analysis and RUSLE based approaches for micro-watershed prioritization using remote sensing and GIS. <i>Arab J Geosci</i> 15:564	7.82
2158	Lohan S K, Narang M K, Javed M, Kumar V, Majumdar A and Raghuvirsingh P (2022) Optimization and evaluation of machine field parameters of remotely controlled two-wheel paddy transplanter. <i>J Field Rob</i> 39(6): 984-98 https://doi.org/10.1002/rob.22080	9.77
2159	Lubana G S, Buttar D S, Singh N, Aulakh S K, Sharma S and Hunjan M S (2022) Molecular identification and phylogenetic analysis of different races of <i>Fusarium oxysporum</i> f.sp. <i>melonis</i> in muskmelon using RAPD markers under Punjab conditions. <i>Agril Res J</i> 59(3): 453-61.	5.44
2160	Madhvi, Utreja D and Kalia A (2022) p-Toluenesulfonic acid: An effective catalyst to synthesize 5-aryl-pyrimido[4,5-b]quinoline-2,4(1H,3H,5H,10H)-diones and their antimicrobial activity. <i>Russ J Org Chem</i> 58(9): 1327-35.	6.862
2161	Madhvi, Utreja D and Sharma S (2022) Barbiturates: A Review on Synthesis and Antimicrobial Research Progress. <i>Curr Org Syn</i> 19(1): 31-55.	7.98
2162	Mahajan G and Chauhan B S (2022) Interference of jungle rice (<i>Echinochloa colona</i>) in mungbean. <i>Weed Sci</i> 70: 481-87.	8.58
2163	Mahajan G and Chauhan B S (2022) Screening of herbicides for rice seedling safety and <i>Echinochloa colona</i> management under Australian conditions. <i>Agronomy</i> 12: 1273.	9.95

2164	Mahajan G, Kumar V and Chauhan B S (2022) Biology and management of wild oat in Australia. <i>Indian J Weed Sci</i> 54: 376-88.	5.41
2165	Mahajan K, Gupta S K, Sharma S R and Kapoor S (2022) Effect of precooling on quality of pear fruits during storage. <i>Indian J Horti</i> 79(4): 502-06.	6.16
2166	Mahajan M, Bons H K, Dhillon G K and Sachdev Aggarwal P (2022). Unlocking the impact of drying methods on quality attributes of an unexploited fruit, karonda (<i>Carissa carandas</i> L.): A step towards food and nutritional security. <i>South Afr J Bot</i> 145: 473-80.	9.11
2167	Mahala P and Sharma R K (2022). Effect of different growth media on biometric parameter of brinjal and chilli seedlings under shade net house. <i>J Horti Sci</i> 17(2): 347-52.	5.08
2168	Mahar J B, Sharma S, Kaur R, Grover K, Dharni K and Nara U (2022) Ameliorative effect of lemongrass (<i>Cymbopogon Flexuosus</i> Nees ex Steud.)W. Watson and celery (<i>Apium graveolens</i> L.) against CCL4 induced oxidative stress and acute hepatotoxicity in rats: An in vivo assessment. <i>Ann Phytomed</i> 11(1):351-58. http://dx.doi.org/10.54085/ap.2022.11.1.38	5.95
2169	Mahawer A K, Yadav J and Arora N K (2022). Effect of hydrogen cyanamide (HCN) and abscisic acid (ABA) on fruit quality of Flame Seedless grapes (<i>Vitis vinifera</i> L.) during storage. <i>Pharma Innov J</i> 11(2): 2336-40.	5.23
2170	Maini A, Sharma V and Sharma S (2022) Assessment of soil biochemical properties and soil quality index under rainfed land use systems in submontane Punjab, India. <i>Indian J Biochem Biophys</i> 59:357-67.	7.92
2171	Malhotra P K, Sanghera G S, Kaur M and Kapoor M (2022) Optimization Of Selective Agents for In Vitro Regeneration of Sugarcane Transformants Using Nptii Gene. <i>Agric Res J</i> 59(4): 631-38	5.44
2172	Malik A, Jamei M, Karbasi M, Ali M, Prasad R and Yaseen Z M (2022) Multi-step daily forecasting of reference evapotranspiration for different climates of India: A modern multivariate complementary technique reinforced with ridge regression feature selection. <i>Agril Water Manag</i> https://doi.org/10.1016/j.agwat.2022.107812 .	10.52
2173	Malik A, Tikhamarine Y, Sihag P, Shahid S, Jamei M and Karbasi M (2022) Predicting daily soil temperature at multiple depths using hybrid machine learning models for a semi-arid region in Punjab, India. <i>Environ Sci Pollut Res</i> https://doi.org/10.1007/s11356-022-20837-3 .	10.22
2174	Malik P, Huang M, Neelam K, Bhatia D, Kaur R, Yadav B, Singh J, Sneller C and Singh K (2022) Genotyping-by-sequencing based investigation of population structure and genome wide association studies for seven agronomically important traits in a set of 346 <i>Oryza rufipogon</i> accessions. <i>Rice</i> 15(37): 1-23. https://doi.org/10.1186/s12284-022-00582-4	11.64
2175	Manchanda P, Kaur H, Mankoo R K, Kaur A, Kaur J, Kaur S and Sidhu G S (2022) Optimization of extraction of bioactive phenolics and their antioxidant potential from callus and leaf extracts of citrus sinensis (L.) Osbeck, c. <i>Reticulata</i> blanco and c. <i>Maxima</i> (burm.) Merr. <i>J Food Measur Charact</i> 17:1343-53. Impact Factor: 3.95	9.01
2176	Mandal A, Toor A S, Dhaliwal S S, Singh P, Singh V K, Sharma V, Gupta R K, Naresh R K, Kumar Y, Pramanick B (2022) Long-Term field and horticultural crops intensification in semiarid regions influence the soil physiobiochemical properties and nutrients status. <i>Agronomy</i> 12: 1010.	9.42
2177	Mandla D, Singla N, Brar S K and Singla L D (2022) Diversity, prevalence and risk assessment of nematode parasites in <i>Tatera indica</i> found in Punjab State. <i>Indian J Anim Res</i> 56(6): 736-41. Doi: 10.18805/IJAR.B-4369	6.43
2178	Mandla D, Singla N, Brar S K and Singla L D (2022) Molecular and phylogenetic analysis and risk assessment of a trematode parasite, <i>Artyfechinostomum sufrartyfex</i> Lane, 1915 with a new host record from India. <i>Biologia</i> 78(3) https://doi.org/10.1007/s11756-022-01241-1	7.65
2179	Mangat H K, Rani M, Pathak R K, Yadav I S, Utreja D, Chhuneja P K and Chhuneja P (2022) Virtual Screening, molecular dynamics and binding energy-mm-pbsa studies of natural compounds to identify potential ecr inhibitors against <i>Bemisia tabaci gennadius</i> . <i>Plos One</i> 17(1):1-13.	9.75



2180	Manhas U, Singh S P, Kingra P K, Setia R K and Sharma R (2022). Delineation of thermal requirements of Rice (<i>Oryza sativa</i> L) using Geospatial Technology in Punjab. <i>J Agromet</i> 24(1): 90-94.	6.55
2181	Manisha and Jhanji S (2022) Morpho-physiological and biochemical characterization of chrysanthemum varieties for early flowering under heat stress. <i>South Afr J Bot</i> 146: 603-613.	8.32
2182	Manjunath M, Yadav S K, Khokhar A, Patil S B, Asewar B V, Babu V S, Gopinath K A, Chary R G, Jyothilakshmi N, Srinivas K, Prabhakar M and Singh V K (2022) Diversity of culturable soil microorganisms in different rainfed regions of India. <i>Environ Ecol</i> 40(2A): 528-35	5.25
2183	Manjunatha L, Rani U, Singh S, Mahesha H S, Srinivasa N and Kumar Y (2022). Morphological and molecular diversity of <i>Ascochyta rabiei</i> (Pass.) Labr. Pathogenic to <i>Cicer arietinum</i> L. <i>Vegetos</i> 35:415-26 [https://doi.org/10.1007/s42535-021-00322-x].	6.21
2184	Mann S K and Kaur M (2022) Career Preferences of Home Science Graduates and Post Graduates of Punjab Agricultural University, Ludhiana. <i>J Comm Mob Sustain Dev</i> 17: 592-96.	5.67
2185	Mansotra P, Sharma P, Sirari A and Aggarwal N (2022) Ecological performance of multi-functional pesticide tolerant strains of <i>Mesorhizobium</i> sp. in chickpea with recommended pendimethalin, ready-mix of pendimethalin and imazethpyr, carbendazim and chlorpyrifos application. <i>Arch Microbiol</i> 204:117. https://doi.org/10.1007/s00203-021-02628-5	8.66
2186	Martolia D and Gupta R (2022) Exposure to work related risk factors experienced by gardeners. <i>J Comm Mobil Sustain Dev</i> 3(Seminar Special Issue): 782-86.	5.67
2187	Mbagatuzinde K, Bhullar M S, Kaur T and Brar A S (2022) Weed management in maize through integration of drip irrigation, mulch and herbicide. <i>Proc Natl Acad Sci India Sect B Biol Sci</i> 92: 791-800. https://doi.org/10.1007/s40011-022-01376-w	6.96
2188	Meena S S, Srivastava A, Meena H M, Singh V K, Kumar V and Meena B R (2022) Consequences of agro-forestry and rice-wheat based cropping system on soil micronutrients status in Mollisols of Uttarakhand. <i>Commun Soil Sci Plant Anal</i> 53(21) 2812-23, DOI: 10.1080/00103624.2022.2094393	7.33
2189	Mirzakaninafchi H, Singh M, Dixit A K, Prakash A, Sharda S, Kaur J and Mirzakaninafchi A (2022) Performance assessment of a sensor-based variable-rate real-time fertilizer applicator for rice crop. <i>Sustainability</i> 14(18): 11209. https://doi.org/10.3390/su141811209	9.25
2190	Mittal S, Saini S P and Singh P (2022) Manganese availability and transformations in soil profiles under different wheat based cropping systems in north-western India. <i>Indian J Agril Sci</i> 92(6):689-94.	6.25
2191	Modi R U, Manes G S, Mahal J S, Dixit A K, Singh A P and Mahal A K (2022) Field evaluation of tractor-operated seeder for sowing mat type paddy nursery. <i>Indian J Agric Sci</i> 92(9): 1066-70.	6.37
2192	Modi R U, Manes G S, Mahal J S, Dixit A K and Singh M 2022. Design of an innovative tractor-operated seeder for mat type paddy nursery. <i>J Scientific Indus Res</i> 81: 683-94.	7.06
2193	Modi R U, Manes G S, Mahal J S, Dixit A K and Singh M (2022) Development and evaluation of tractor operated seeder for mat type paddy nursery under controlled field conditions. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(3): 54-63.	6.14
2194	Mohanpuria R, Kaur S, Kaur T, Singh K B, Brar A S and Deol J S (2022) Integration effect of drip irrigation and mulching on weeds and spring maize productivity. <i>Indian J Weed Sci</i> 54(3): 240-44.	5.84
2195	Mohiuddin S, Riar T S, Garg L, Pervez A K M (2022) Problems of Integrated Farming Systems: A Comparative Analysis of Punjab State of India and Rangpur Division of Bangladesh. <i>Int J Agr Ext</i> 10(01): 89-89. https://doi.org/10.33687/ijae.010.01.3889	6.45
2196	Muria S, Gupta N, Kingra P K, Sharma A B, Bhardwaj R and Kaur N (2022) Influence of agro-meteorological variables on downy mildew development in pearl millet (<i>Pennisetum glaucum</i> (L.) R. Br.). <i>J Agromet</i> 24: 113-16.	6.75

2197	Namdeo S, Baghel R P S, Nayak S, Khare A, Prakash R, Pal A C and Sahu S (2022). Effect of dietary supplementation of ginger, garlic and turmeric on humoral immune response, anti-oxidant property and carcass traits of broilers. <i>Pharma Innov JSP-11(3)</i> : 787-91	5.23
2198	Nanglia S, Mahajan B V C, Singh N P, Bhullar K S and Kaur S (2022). Forced air cooling delays pericarp browning and maintains post-harvest quality of litchi fruit during cold storage. <i>Acta Physiologie Plantarum</i> https://doi.org/10.1007/s11738-022-03405-7	8.35
2199	Nanglia S, Mahajan B V, Singh N, Kapoor S, Bhullar K S, Kaur S and Kumar V(2022) Combined effect of acids and shellac coating on pericarp browning, enzymatic activities, and biochemical attributes of litchi fruit during storage. <i>J Food Process Preserv</i> DOI: 10.1111/jfpp.16535	8.19
2200	Natt S K and Katyal P (2022) Production and assessment of probiotic fruit Juice from Punjab Pink variety of guava. <i>J Scientific Indus Res</i> 81: 125-30.	6.73
2201	Neelam K, Kumar K, Kaur A, Kishore A, Kaur P, Babbar A, Kaur G, Kamboj I, Lore J S and Vikal Y (2022) High-resolution mapping of the quantitative trait locus (qtls) conferring resistance to false smut disease in rice. <i>J Appl Gene</i> 63(1): 35-45.	8.65
2202	Neemisha, Kumar A, Sharma P, Kaur A, Sharma S and Jain R (2022) Harnessing rhizobacteria to fulfil inter-linked nutrient dependency on soil and alleviate stresses in plants. <i>J Appl Microbiol</i> https://doi.org/10.1111/jam.15649 .	9.77
2203	Oberoi H K and Ashlesha (2022). Effect of stem rot disease on berseem protein content and digestibility. <i>Range Mgmt Agrofor</i> 43(1): 176-79.	6.37
2204	Ozukum M, Kumar S, Alam M S, Sharma S R and Awasthi A (2022) Microwave drying of paddy: Drying kinetics and modeling. <i>Agril Res J</i> 59(4): 758-70. https://DOI.Org/10.5958/2395-146X.2022.00107.7 .	5.44
2205	Ozukum M, Kumar S, Kaur K and Singh A (2022) Effect of microwave drying of paddy on milling characteristics, cooking quality, and microstructure of rice. <i>Acta Aliment</i> 51(4): 534-41.	6.65
2206	Padhy A K, Kaur P, Singh B, Kaur R, Bhatia S, Shamshad M, Sharma H, Kaur S, Srivastava P, Sharma A (2022) In silico characterization of thinopyrumelongatum-derived psye1 gene and validation in 7d/7e bread wheat introgression lines open avenues for carotenoid bio-fortification in wheat. <i>Cereal Res Commun</i> 51: 75-85.	7.24
2207	Padhy A K, Sharma A, Sharma H R, Ruchika, Pandey A, Srivastava P, Kaur S, Kaur H, Singh S and Kashyap L (2022) Bread wheat with enhanced grain carotenoid content: a novel option for wheat biofortification. <i>Mol Breed</i> 42(67):1-16. https://doi.org/10.1007/s11032-022-01338-0	9.30
2208	Pal R K, Kumar V, Kaur A and Singh P (2022) Optimizing Sowing Window for Cotton using CROPGRO-Cotton Model for South-Western Region of Punjab. <i>J Agril Phys</i> 22: 107-15.	5.10
2209	Pal R, Gupta A, Wadhwa M, Singh P and Singla A (2022) Relative appraisal among different sugarcane varieties for quality of sugarcane tops silage as non-conventional feed resource. <i>Indian J Anim Nutr</i> 39(1): 45-51. https://doi.org/10.5958/2231-6744.2022.00006.8	5.60
2210	Palial S, Kumar S, Atri C, Sharma S and Banga S S (2022) Antixenosis and antibiosis mechanisms of resistance to turnip aphid, <i>Lipaphis erysimi</i> (Kaltenbach) in <i>Brassica juncea</i> -fruticulosa introgression lines. <i>J Pest Sci</i> 95:749-60. doi: 10.1007/s10340-021-01418-8	11.74
2211	Pallavi S, Sharma S R, Dhall R K, Mittal T C and Prasad C (2022) Pyramided effects of γ -irradiation, packaging, and low-temperature storage on quality, sensory and microbial attributes of minimally processed onion rings. <i>J Food Process Preserv</i> https://doi.org/10.1111/jfpp.16305 .	8.19
2212	Panayampadan A S, Alam M S, Aslam R and Kaur J (2022) Vacuum impregnation process and its potential in modifying sensory, physicochemical and nutritive characteristics of food products. <i>Food Engg Rev</i> https://doi.org/10.1007/s12393-022-09312-4 Pp1-14.	11.76
2213	Panayampadan A S, Alam M S, Aslam R, Gupta S K and Sidhu G K (2022) Effects of alternating magnetic field on freezing of minimally processed guava. <i>LWT- Food Sci Technol</i> doi: https://doi.org/10.1016/j.lwt.2022.113544 .	10.95



2214	Pandey K, Singh K G and Singh A (2022) Multi sensors based smart nutrient reuse system for closed Soilless culture under protected cultivation. <i>Comp Electr Agri</i> 204:107495. https://doi.org/10.1016/j.Compaq.2022107495	11.57
2215	Pandey N, Randhawa H S and Sharma N (2022) Butterflies diversity in Maldevta region of Uttarakhand. <i>J Ento Zool Stud</i> 10(6): 219-228.	5.54
2216	Pandove G, Kaur A and Ramya S (2022) Insight of mechanism of action of plant growth promoting rhizobia in integrated nutrient management of leguminous crops. <i>Asian J Dairy Food Res</i> . DOI: 10.18805/ajdfr.DR-1909	5.75
2217	Pandove G, Kaur S, Yadav B K and Sidhu M S (2022) Impact of liquid microbial inoculants of <i>Azotobacter</i> sp. and <i>Stenotrophomonas maltophilia</i> on soil fertility and productivity-cum-economics of cluster beans. <i>J Crop</i> 37(4): 523-42. https://doi.org/10.1080/15427528.2022.2117752	6.36
2218	Parmar R P, Singh S K, Singh M and Verma A (2022) On-farm assessment of unmanned aerial vehicle (UAV) based spraying technology in green gram. <i>Indian J Ento</i> 84(2): 286-89.	5.08
2219	Patel E, Kalia A, Gill B S, Kaur A and Sandhu J S (2022) Direct organogenesis from cortical cells of hypocotyl segments in soybean. <i>In vitro Cell Dev Biol Plant</i> 97: 140-46.	8.60
2220	Pathania M and Kaur J (2022) Evaluation of different IPM modules against sucking insects in Bt cotton under South-Western Punjab conditions. <i>Agril Res J</i> 59(5): 931-37.	5.44
2221	Pathania S, Arora P K, Bhullar K S and Ram S (2022) Multi criterial decision-making analysis to identify micronutrient deficiencies in Kinnow (<i>Citrus reticulata</i> Blanco). <i>J Plant Nutr</i> 46(9): 1975-87 DOI: 10.1080/01904167.2022.2105718.	7.71
2222	Pathania S, Lore J S, Kalia A, Kaur A, Sharma M, Mangat G S and Sandhu J S (2022) Conversion of sheath blight susceptible indica and japonica rice cultivars into moderately resistant through expression of antifungal b-1,3-glucanase transgene from <i>Trichoderma</i> spp. <i>Trans Res</i> 31(4-5): 537-51.	9.15
2223	Pathania S, Singh H, Mavi M S, Choudhary O P and Sharma S (2022). Effectiveness of entropy weight method in evaluating abiotic stress tolerance in crops. <i>Spanish J Agril Res</i> 20(1):e0801. https://doi.org/10.5424/sjar/2022201-18616	7.24
2224	Patra S, Bhardwaj V, Trabelsi K, Kumar R et al (2022) Search for charged and radiative lepton flavour violating decays of $\Upsilon(1S)$. <i>J High Energy Phys</i> 05: 095 (The Belle collaboration)	11.52
2225	Paul A, Nirmaljit Kaur, Gill P P S and Gaur K (2022) Effect of girdling and root pruning on vegetative growth, fruit metabolites and yield of pear grown under sub-tropical conditions. <i>Agric Res J</i> 59(5): 903-10.	5.44
2226	Pawar T, Arora R K and Sharma S and Walia G (2022) Effect of Sowing Period and Disease Severity Grades of cotton leaf curl disease (CLCuD) on phenotypic characters of the American cotton in Punjab. <i>J Mycol Plant Pathol</i> 52(2):19-28.	5.79
2227	Peshin R, Singh K, Hansra B S, Sharma R, Nanda R, Singh N, Garg L and Yangsdon S (2022) Long-term Impact of Cotton Insecticide Resistance Management Programme: A Case Study from Punjab, India. <i>Indian J of Ecology</i> .49(5) 1968-79	5.79
2228	Kaur P, Sandhu S S, Kothiyal S and Kaur J (2022) Determination of sowing window for wheat in Punjab, India using sensitized, calibrated and validated CERES-Wheat model. <i>J Agril Phys</i> 22(2):215-27.	5.10
2229	Prasad C, Kaur G and Jaiswal A K (2022) Performance evaluation of mobile liquid cooled thermoelectric refrigeration system for storage-cum-transportation of fruits and vegetables. <i>Foods</i> DOI.org/10.3390/foods11131896: 1-18.	10.35
2230	Prasad C, Kaur G, Yogesh K and Angam R (2022) Performance and technoeconomic viability of water cooled thermoelectric refrigeration system for storage-cum-transportation of fruits and vegetables. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(3): 68-73.	6.23
2231	Prastuty, Kaur G and Singh A (2022). Shelf-life extension of muffins coated with cinnamon and clove oil nanoemulsions. <i>J Food Sci Technol</i> 59(5): 1878-88.	8.7

2232	Pratiksha and Sharma P (2022) Knowledge about causes, effects and mitigation of soil pollution among farming families of Punjab. <i>J Comm Mobil Sust Dev</i> 17(1): 321-28.	5.30
2233	Preet T, Ghai N and Jindal S K (2022) Mitigating the effects of elevated temperature through the use of growth regulators in bell pepper. <i>Agril Res J</i> 59(3):400-06.	5.44
2234	Preeti B, Ravindra M R, Surendra N B and Gajanan P D (2022) Impact of pulsed electric field treated milk on quality of paneer and khoa. <i>Food Sci Technol Int</i> 29(6): 1-12. https://doi.org/10.1177/10820132221102277	8.64
2235	Preety A and Makkar G S (2022) Appraisal of adoption constraints and impact of KVK interventions in Poplar based agroforestry system. <i>J Comm Mobiliz Sustain Dev</i> 17(1): 313-20.	5.67
2236	Priya B, Utreja D and Kalia A (2022) Schiff Bases of Indole-3-Carbaldehyde: Synthesis and Evaluation as Antimicrobial Agents. <i>Russ J Bioorg Chem</i> 48(6): 1282-90.	7.254
2237	Priya M V, Singh T, Saini K S and Sompal S (2022) Production potential and economic returns of bed planted chickpea (<i>Cicer arietinum</i> L.) as influenced by different intercropping systems. <i>Legum Res</i> 45(3): 347-51.	6.59
2238	Priyanka, Bhushan K and Kocher G S (2022) Valorisation of whey for fermented beverage production using functional starter yeast. <i>Acta Alimentaria</i> https://doi.org/10.1556/066.2021.00268	6.65
2239	Proch A, Malik D S, Sandhu K S, Singh Y, Gill G S, Sharma A, Sethi A P S and Kaur P (2022) Effect of sodium bisulphate in litter and low protein diet supplemented with proteolytic enzyme on ammonia concentration, growth parameters and litter quality of broiler during summer season. <i>Indian J Poult Sci</i> 56(2):141-47.	5.85
2240	Prusty A K, Natesan R, Panwar A S, Jat M L, Tetarwal J P, López-Ridaura S, Adelhart Toorop R, Akker J V, Kaur J, Ghasal P C and Groot J C (2022) Redesigning of farming systems using a multi-criterion assessment tool for sustainable intensification and nutritional security in northwestern India. <i>Sustainability</i> 14(7):3892. https://doi.org/10.3390/su14073892	9.25
2241	Puri K, Jain R and Singh J (2022) Studies on Deteriorating Air Quality in some Major Cities of Punjab. <i>Ecol Environ Conserv</i> 28(4): 2119-22.	5.41
2242	Rai N, Rai K K, Singh M K, Singh M J and Kaushik P (2022) Investigating NAC transcription factor role in redox homeostasis in <i>Solanum lycopersicum</i> L.: bioinformatics, physiological and expression analysis under. <i>Plants</i> 11(21): 2930	10.66
2243	Raj T, Kumar R, Singh G and Singh D (2022) Accumulated heat unit requirement and yield of irrigated wheat (<i>Triticum aestivum</i> L.) varieties under different method of sowing in south western Punjab. <i>Environ Ecol</i> 40:2829-34.	5.25
2244	Rajput P, Thakur A and Singh H (2022) Response on phenological, fruiting behaviour and growth characteristics of F1 candidate's rootstock seedlings of peach [<i>Prunus persica</i> (L.) Batsch]. <i>Int J Environ Clim Change</i> 12(11): 1101-12.	5.13
2245	Ram H, Kaur H and Sikka R (2022) Need-based nitrogen management of wheat through use of green seeker and leaf color chart for enhancing grain yield and quality. <i>J Plant Nutr</i> 45: 2655-71. https://doi.org/10.1080/01904167.2022.2035757	7.71
2246	Ram H, Singh B, Kaur M, Gupta N, Kaur J and Singh A (2022) Combined use of foliar zinc fertilisation, thiamethoxam and propiconazole does not reduce their effectiveness for enriching zinc in wheat grains and controlling insects and disease. <i>Crop Pasture Sci</i> 73: 427-36. doi:10.1071/CP21483 .	7.57
2247	Rama G, Kumar K, Arora A, Kaur N, Rattanpal H S, Brar J S, Arora P K and Chander S (2022) Variability in 'rough lemon' × 'sour orange' hybrids for foliar traits and their in vitro screening against Phytophthoranicotianae. <i>Indian J Ecol</i> 49(1): 261-65.	5.79
2248	Ramya S, Pandove G, Oberoi H, Kaur S and Kalia A (2022) Improvement in the quality attributes of forage cowpea by use of liquid microbial inoculants. <i>Indian J Anim Res</i> 56(8): 959-65.	6.4



2249	Rana B, Parihar C M, Nayak H S, Patra K, Singh V K, Singh D K, Pandey R, Abdallah A, Gupta N, Sidhu H S, Gerard B and Jat M L (2022) Water budgeting in conservation agriculture-based sub-surface drip irrigation using HYDRUS-2D in rice under annual rotation with wheat in Western Indo-Gangetic Plains. <i>Field Crops Res</i> 282: 108519.	11.22
2250	Randhawa H S, Chandi R S, Kaur A and Damanpreet (2022) Management of onion thrips <i>Thrips tabaci</i> Lindeman. <i>Indian J Ento</i> 84(2): 402-04	5.89
2251	Randhawa H S, Suri K S, Sarao P S, N Pandey and Bal R S (2022) Bioefficacy of new insecticidal molecules against plant hoppers in rice crop. <i>J Ento Zool Stud</i> 5(10):410-14	5.54
2252	Rani H, Bhardwaj R D, Kaur S and Grewal S K (2022) Investigating diverse barley (<i>Hordeum vulgare</i> L.) germplasm for thermostability of β -amylase: A key player of diastatic power. <i>Cereal Chem</i> 99: 1339-48. https://doi.org/10.1002/cche.10596	7.98
2253	Rani M, Utreja D and Sharma S (2022) Role of indole derivatives in agrochemistry: synthesis and future insights. <i>Curr Org Chem</i> 26: 651-78.	8.18
2254	Rani M, Utreja D, Dhillon N K and Kaur K (2022) A convenient one-pot synthesis of Bis(indolyl)methane derivatives and their antinematic evaluation against root knot nematode <i>Meloidogyne incognita</i> . <i>Russ J Org Chem</i> 58(10): 1527-33.	6.862
2255	Rani N, Tiwari D and Singh G (2022). Potential of poly-house technology for vegetable cultivation in the Punjab, India. <i>Ind Res J of Ext Edu</i> 22(2): 87-91.	5.22
2256	Rani P, Sharma S and Kaur A (2022) Participation of women in farm operations of Rabi crops in sub-mountainous region of Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(2): 1-9.	5.67
2257	Rani P, Sharma S and Kaur A (2022) Problems faced by women in agriculture: A study of sub-mountainous region of Punjab. <i>Ind Res J Ext Edu</i> 22(3): 68-72.	5.22
2258	Rani R, Negi P, Sharma S and Jain S (2022) Occurrence of oosporic stage of <i>Pseudoperonosporacubensis</i> on cucumber, in Punjab, India: A first report. <i>Crop Prot</i> 155: 105939	8.57
2259	Rashmi, Kaushal S and Sharma P (2022) Antimicrobial and antioxidant potential of banana (<i>Musa sapientum</i>) peel extracts of variety Grand Naine, 5-hydroxymethylfurfural major compound in methanolic peel extracts and its derivatives. <i>Agric Res J</i> 59(5): 953-63.	5.44
2260	Ratanoo R, Walia S S, Saini K S and Dheri G S (2022) Residual effects of chemical fertilizers, organic manure and biofertilizers applied to preceding gobhi sarson crop on summer mung bean (<i>Vigna radiata</i> L.). <i>Legum Res Int J</i> DOI: 10.18805/LR- 4767	6.59
2261	Rathore R (2022) Financial feasibility analysis of Ghritkumari (<i>Aloe vera</i>) cultivation as farm business enterprise in Churu district of Rajasthan. <i>Econ Affairs</i> 67(4):543-49.	5.08
2262	Rathore, R. (2022) Entrepreneurial Behavior of Farmers towards Cultivation of Medicinal and Aromatic Plants in the Ujjain district of Madhya Pradesh. <i>Ind Res J Ext Edu</i> 22(4):64-67.	5.22
2263	Rattanpal H S, Uppal G S, Gupta M and Gill B S (2022) Assessing genetic diversity in rough lemon (<i>Citrus jambhiri</i> Lush) using morphological characters. <i>J Environ Biol</i> 43: 651-59.	6.78
2264	Ravisankar N, Ansari M A, Shamim M, Prusty A K, Singh R, Panwar A S, Dutta D, Bhaskar S, Sanjay M T, Kaur J, Varghese C, Dash S, Bhowmik A and Bal S K (2022). Sustainable livelihood security of small farmers improved through a resilient farming system in the semiarid region of India. <i>Land Degrad Dev</i> 33(15): 2830-42. doi:10.1002/ldr.4358	10.98
2265	Rehal J, Aggarwal P, Dhaliwal I, Sharma M and Kaushik P (2022) A tomato pomace enriched gluten-free ready-to-cook snack's nutritional profile, quality, and shelflife evaluation. <i>Horticulturae</i> 8(5): 403 https://doi.org/10.3390/horticulturae8050403 .	8.923
2266	Rehal J, Beniwal V and Gill B S (2019). Physico-chemical, engineering and functional properties of two soybean cultivars. <i>Legum Res</i> 42(1):39-44.	6.23
2267	Rhythm, Sharma P and Sardana V (2022) Physiological and biochemical traits of drought tolerance in <i>Brassica juncea</i> (L.) Czern & Coss. <i>South Afr J Bot</i> 146: 509-20. https://doi.org/10.1016/j.sajb.2021.11.019	8.32
2268	Saeed A, Alam M S, Aslam R, Gupta S K and Kaur G (2022) Effects of alternating magnetic field on freezing of minimally processed guava. <i>LWT - Food Sci Technol</i> 163:1-9.	10.95

2269	Saggi M, Jain S, Bhatia A S and Sharda R (2022) Proposition of new ensemble data-intelligence model for evapotranspiration process simulation. <i>J Ambient Intell Humanized Comp</i> https://doi.org/10.1007/s12652-021-03636	9.66
2270	Sahni P, Sharma S, Singh B and Bobade H (2022) Cereal bar functionalised with non-conventional alfalfa and dhaincha protein isolates: quality characteristics, nutritional composition and antioxidant activity. <i>J Food Sci Technol</i> 59: 3827-35.	9.11
2271	Sahni T, Sharma S, Verma D, Kumar S, Sharma P and Bhatia S (2022) Experimental validation of syringic Schiff bases with pyridine moiety as antibacterial and antioxidant agents along with in silico studies. <i>Pharma Innov J</i> 11(4): 417-26	5.23
2272	Saikia R A and Mittal R (2022) Lifestyle of Farming Community in Punjab: A Major Health Determinant. <i>Indian J Ext Educ</i> 58(2):77-80.	5.30
2273	Saini D K, Chahal A, Pal N, Srivastava P and Gupta P K (2022) Meta-analysis reveals consensus genomic regions associated with multiple disease resistance in wheat (<i>Triticum aestivum</i> L.). <i>Mol Breed</i> 42: 1-23.	8.02
2274	Saini D K, Srivastava P, Pal N and Gupta P K (2022) Meta-QTLs, ortho-meta-QTLs and candidate genes for grain yield and associated traits in wheat (<i>Triticum aestivum</i> L.). <i>Theor Appl Genet</i> 135(3): 1049-81.	10.40
2275	Saini M K, Alam M S and Bhatia S (2022) Integrated management of <i>Callosobruchus maculatus</i> (Fab.) in Mung bean stored as seed. <i>Indian J Ecol</i> 49(5): 1989-95.	5.79
2276	Saini R, Kaur M, Singh R, Arora K, Singh G, Kaur G, Singh S, Singh A and Singh D (2022) Understanding sustenance of small farm holders: A study of income inequality among farm households in Indian Punjab. <i>Sustainability</i> 14: 13438.	9.89
2277	Saini S, Thakur A, Singh H and Bhatia D (2022). Variations in the hybrid progeny of low chill white x yellow fleshed peaches. <i>Indian J Horti</i> 79(4): 402-09.	6.16
2278	Saklani S, Grover K, Choudhary M, Sandhu K S and Javed M (2022) Fatty acid composition and oxidative potential of food products prepared using low erucic brassica oils. <i>Proc Natl Acad Sci India Sect B Biol Sci</i> DOI 10.1007/s40011-022-01415-6.	6.96
2279	Salaria P, Singh A, Jain S and Singh G (2022) Management of <i>Stemphylium</i> blight of garlic (<i>Allium sativum</i>) by botanicals. <i>Pest Res J</i> 34(1): 56-60	5.49
2280	Samita, Utreja D and Dhillon N K (2022) An efficacious protocol for the reduction of benzothiazole using Mg/MeOH and their antinemic activity against <i>Meloidogyne incognita</i> . <i>Russ J Bioorg Chem</i> 48(1): 135-42.	6.796
2281	San S H, Sagar D, Krishnan V, Awana M, Singh A, Bhowmik A, Singh R and Chander S (2022) Effects of <i>Helicoverpa armigera</i> (Hubner) infestation on metabolic sensors dynamics in chickpea. <i>Allelopath J</i> 57(1): 83-108.	6.96
2282	Sanchez J, Kaur P P, Pabuayon I C M, Karampudi N B R, Kitazumi A, Sandhu N, Catolos M, Kumar A, De L and Benildo G (2022) Decussate network with flowering genes explains the variable effects of <i>qdt12.1</i> to rice yield under drought across genetic backgrounds. <i>Plant Genome</i> 15(1):1-26.	10.22
2283	Sandhu A S, Singh P and Kaur N (2022) Farmer's field evaluation of above and below ground agronomic attributes and economic indices of different onion (<i>Allium cepa</i> L.) varieties in South-western Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(4): 1298-307.	5.67
2284	Sandhu AS, Singh P and Singh S (2022) Yield gaps and economic analysis of gram (<i>Cicer arietinum</i>) cultivation in south-western Punjab, India. <i>J Comm Mobiliz Sustain Dev</i> 17(3): 957-62.	5.67
2285	Sandhu K K, Vashishat N and Sidhu A (2022) Larvicidal potential of copper sulphide nano aqua dispersions against <i>Aedes aegypti</i> (Linnaeus). <i>Afr Entomol</i> 30: e13589. https://doi.org/10.17159/2254-8854/2022/a13589	7.19



2286	Sandhu N, Singh J, Singh G, Sethi M, Singh M P, Pruthi G, Raigar O P, Kaur R, Kaur R, Sarao P S, Lore J S, Singh U M, Dixit S, Sagare D B, Singh S P, Satturu V, Singh V K and Kumar A (2022) Development and validation of a novel core set of KASP markers for the traits improving grain yield and adaptability of rice under direct-seeded cultivation conditions. <i>Genomics</i> 114(2):110269. doi: 10.1016/j.ygeno.2022.110269.	10.31
2287	Sandhu O S, Jat M L, Gupta R K, Thind H S, Sidhu H S and Singh Y (2022) Influence of residue type and method of placement on dynamics of decomposition and nitrogen release in maize-wheat-mungbean cropping on permanent raised beds: a litterbag study. <i>Sustainability</i> 14: 864. https://doi.org/10.3390/su14020864 .	9.25
2288	Sandhu S K, Attri A and Bala R (2022) Effect of meteorological parameters on karnal bunt incidence in wheat under different agroclimatic zones of Punjab. <i>J Agromet</i> 24 (1): /https://doi.org/10.54386/jam.v24i1.781	6.55
2289	Sanghera G S and Kashyap L (2022) Stress indices based on cane and sugar yields: Implications in selection of sugarcane varieties for drought tolerance. <i>Agril Res J</i> 59: 816-34.	5.44
2290	Sanghera G S, Jamwal N S and Saini A (2022) Genetic variations and selection coefficients for agronomic, physiological and quality traits towards sugarcane improvement for waterlogged conditions. <i>Biolog Forum Int J</i> 14(2a): 286-93	5.11
2291	Sanghera G S, Saini A and Kashyap L (2022) Physiological and biochemical traits associated with waterlogged tolerance in sugarcane (<i>Saccharum</i> spp. hybrid complex). <i>Plant Physiol Rep</i> http://doi.org/10.1007/s40502-022-00642-3	5.50
2292	Sarah M, Gupta N, Kaur N, Bhardwaj R and Sharma A B (2022) Impact of <i>Sclerospora graminicola</i> infection on physiological mechanisms and hormonal regulation of floral reversion in pearl millet [<i>Pennisetum glaucum</i> (L.) R. Br]. <i>Physiol Mol Plant Pathol</i> 118(101806):1-10.	6.55
2293	Sarah M, Gupta N, Kingra P K, Sharma A B, Bhardwaj R and Kaur N (2022) Influence of agro-meteorological variables on downy mildew development in pearl millet (<i>Pennisetum glaucum</i> (L.) R. Br.). <i>J Agromet</i> 24(1): 113-16.	7.65
2294	Sarkar S, Sharma A, Tariq H and Satapathy D (2022) Role of Rumen Bypass Nutrients in Dairy Animal's Health and Productivity: A Review. <i>Indian J Anim Res</i> 1: 9	6.43
2295	Saxena R, Bishnoi R and Singla D (2022) Gene ontology: application and importance in functional annotation of the genomic data. <i>Bioinformatics</i> . http://dx.doi.org/10.1016/B978-0-323-89775-4.00015-8	12.93
2296	Schulden T F, Chhabra B, Steadham J, Yadav I S, Kolmer J A, Gill B S, Bowden R I, Chhuneja P, Erwin J and Rawat N (2022) Fine-mapping of wheat leaf rust (<i>Puccinia recondita</i> f. Sp. <i>Tritici</i>) resistance gene <i>lr57</i> from <i>Aegilops geniculata</i> . <i>Phytopathology</i> 112.	10.01
2297	Sekhon N S, Aggarwal P, Babbar N, Kaur S, Kaur N and Sardana V (2022) suitability of Brassica cultivars for ready to eat canned sag preparation. <i>Agril Res J</i> 59(3): 515-23. DOI No. 10.5958/2395-146X.2022.00075.8	5.44
2298	Sharma A and Brar A S (2022) Energy input-output modeling and sensitivity analysis for onfarmmechanically paddy straw bales formation. <i>Paddy Water Environ</i> 20(2): 255-64. DOI:10.1007/s10333-021-00888-x.	7.26
2299	Sharma A and Brar A S (2022) Investigation on baler technology for ex situ paddy residue biomass management with energy consumption analysis for wheat establishment. <i>Int J Environ Sci Technol</i> 19(7): 6267-84.	8.86
2300	Sharma A and Khar S (2022) Current developments in vegetable transplanters in developing countries: a comprehensive review. <i>Int J Veg Sci</i> DOI: 10.1080/19315260.2022.2046672.	6.94
2301	Sharma A B, Sidhu A, Manchanda P and Ahuja R (2022) 1, 2, 4-Triazolyl dithiocarbamate Silver nano conjugate: potent seed priming agent against bakanae disease of rice (<i>Oryza sativa</i>). <i>Euro J Plant Pathol</i> 162(4): 825-41.	8.22
2302	Sharma A, Khar S, Sharma S and Singh J P 2022. Investigation of physical traits of brinjal seedlings apropos to the design of a transplanter. <i>Environ Ecol</i> 40(2A): 476-81.	5.25

2303	Sharma A, Mani V, Pal R P, Sarkar S, Sharma H, Yadav S and Datt C (2022) Effect of boron supplementation on nutrient utilization and productive performance of peripartum Murrah buffaloes. <i>Biolog Trace Element Res</i> 200(10):4303-15. doi: 10.1007/s12011-021-03038-w.	10.00
2304	Sharma A, Mian A R A, Shamshad M, Rawal K S, Brar A, Burgueño J, Shokat S, Kaur R, Vikram P, Srivastava P, Sandhu N, Singh J, Kaur S, Chhuneja P and Singh S (2022) Preliminary dissection of grain yield and related traits at differential nitrogen levels in diverse pre-breeding wheat germplasm through association mapping. <i>Mol Biotechnol</i> 65:116-30. https://doi.org/10.1007/s12033-022-00535-8	8.86
2305	Sharma A, Rana C, Thakur H and Sharma K C (2022) Stability of Garden Pea Genotypes based on GGE Biplot and Regression Model. <i>Legum Res Int J</i> 1: .6. doi10.18805/LR-4903	6.67
2306	Sharma A, Shamshad M, Kaur S, Srivastava P, Mavi G S and Sohu V S (2022) Tackling a cereal killer on the run: unending fight between wheat breeding and foliar rusts. <i>New horizons in wheat and barley research: global trends, breeding and quality enhancementsp. Tritici</i> https://doi.org/10.1007/978-981-16-4449-8_10 .	9.75
2307	Sharma D K, Alam M S, Saini M K and Bhatia S (2022) Evaluation of some botanicals, thermal treatment and packing materials against pulse beetle, <i>Callosobruchuschinensis</i> in chickpea. <i>Indian J Ento</i> (Published online Ref no. e.21126) DOI 10.5958/IJE.2021.141	5.08
2308	Sharma H, Chawla N and Dhatt A S (2022) Role of phenylalanine/tyrosine ammonia lyase and anthocyanidin synthase for anthocyanin biosynthesis in developing <i>Solanum melongena</i> L. genotypes. <i>Physiologia Plantarum</i> 174(5):e13756. doi: 10.1111/ppl.13756.	10.50
2309	Sharma K, Dhingra M, Kaur R, Singh S, Kaur A, Kaur S and Sharma A (2022) Evaluation of triticum durum-aegilopstauschii derived primary synthetics as potential sources of drought stress tolerance for wheat improvement. <i>Cereal Res Commun</i> 50:1-12.	7.24
2310	Sharma M and Sandhu J S (2022) Shoot regeneration in recalcitrant indica rice through partial desiccation of callus. <i>Agril Res J</i> 59(5): 841-43.	5.44
2311	Sharma M, Lore J S, Kaur A and Sandhu J S (2022) Transgenic rice expressing <i>Trichoderma</i> spp. Endochitinase gene exhibits moderate resistance to sheath blight. <i>Plant Cell Tissue Organ Cult</i> 153: 53-65.	8.73
2312	Sharma M. and Singh A. (2022) Inclusion of women in dairy enterprise. <i>Indian J Ext Educ</i> 57(3): 192-95.	5.32
2313	Sharma N, Kaushal A, Yousuf A, Sood A, Kaur S and Sharda R (2022) Geospatial technology for assessment of soil erosion and prioritization of watersheds using RUSLE model for lower Sutlej sub-basin of Punjab, India. <i>Environ Sci Pollut Res</i> 28:35242-65.	11.19
2314	Sharma N, Mandal K, Bhullar H S, Brar P K and Sharma S (2022) Validation of analytical methodology for dissipation and persistence of diafenthiuron and cyantraniliprole on okra. <i>Int J Environ Anal Chem</i> DOI:10.1080/03067319.2022.2118589	8.83
2315	Sharma N, Sharma S and Kaur G (2022) Maternal health status in Punjab: Indications from NFHS 4 & 5. <i>J Comm Mobiliz Sustain Dev</i> 2(seminar special issue): 584-88.	5.67
2316	Sharma P, Riar T S and Garg L (2022) Extent of Agrochemicals usage on Rice Crop in Punjab. <i>J Comm Mobil Sustain Dev Special Issue</i> (1) 223-28	5.67
2317	Sharma P, Sharma S R, Dhall R K, Mittal T C and Prasad C (2022) Pyramided effects of γ -irradiation, packaging and low-temperature storage on quality, sensory and microbial attributes of minimally processed onion rings. <i>J Food Process Preserv</i> DOI: 10.1111/jfpp.16305	8.19
2318	Sharma R K and Sharma K K (2022) Population Dynamics of rice yellow stem borer and sheath blight. <i>Indian J Ento</i> (onlineRef. No. e21252): 1-4. Dol: 10.55446/IJE.2022.449	5.08
2319	Sharma R K and Sharma K K (2022) Seasonal variation in the population of whitefly (<i>Bemisia tabaci</i>) and incidence of web blight in black gram, <i>Vigna mungo</i> (L.) Hepper under sub-mountainous region of Punjab. <i>Indian J Ecol</i> 49(1): 245-50.	5.79
2320	Sharma R K, Khokhar Y and Singh S (2022). Management of fruit flies (<i>Bactrocera</i> spp.) in guava (<i>Psidium guajava</i>) by pheromone traps. <i>Indian J Agril Sci</i> 92(1): 14-17.	6.37



2321	Sharma R K, Kumar S, Vatta K, Bheemanahalli R, Dhillon J and Reddy K N (2022) Impact of recent climate change on corn, rice, and wheat in southeastern USA. <i>Scientific Rep</i> 12(1): 16928.	11.00
2322	Sharma R, Bhandari M, Kaur K, Singh A, Sharma S and Kaur P (2022) Molecular interactome and starch-protein matrix, functional properties, phytochemical constituents and antioxidant activity of foxtail millet (<i>Setaria italica</i>) flour as influenced during gaseous ozonation. <i>Cereal Chem</i> 99(5): 1101-1110.1002/cche.10559.	8.53
2323	Sharma R, Bhandari M, Sharma S and Bhardwaj R (2022). Compositional, structural and functional characteristics of millets as modified by bioprocessing techniques: A review. <i>J Food Process Preserv</i> 46(10) https://doi.org/10.1111/jfpp.16885	8.19
2324	Sharma R, Sharma S and Singh B (2022). Modulation in the bio-functional & technological characteristics, in vitro digestibility, structural and molecular interactions during bioprocessing of proso millet (<i>Panicum miliaceum</i> L.). <i>J Food Compo Anal</i> 107: 104372	10.52
2325	Sharma R, Thakur A, Kumar S and Kumar V (2022). Product optimization, storage quality and sensory acceptance of low calorie beverage developed from bitter melon and kiwifruit. <i>Braz Arch Biol Technol</i> DOI: 10.1590/1678-4324-2022210371	6.80
2326	Sharma S, Kataria A and Singh B (2022) Effect of thermal processing on the bioactive compounds, antioxidative, antinutritional and functional characteristics of quinoa (<i>Chenopodium quinoa</i>). <i>LWT- Food Sci Technol</i> 160: 113256.	12.06
2327	Sharma S, Kaur S, Choudhary O P, Singh M, Al-Huqail A A, Ali H M, Kumar R and Siddiqui M H (2022) Tillage, green manure and residue retention improves aggregate-associated phosphorus fractions under rice-wheat cropping. <i>Scientific Rep</i> 12:7167. DOI https://doi.org/10.1038/s41598-022-11106-x	10.38
2328	Sharma S, Madaan K and Kaur R (2022) Cordycepin: A hidden metabolite with pharmacological potential. <i>Int J Med Mush</i> 24(8): 1-20	7.71
2329	Sharma S, Malhotra N, Singh A, Sharma R, Domínguez R and Lorenzo J M (2022) Modulation in techno-functional, textural properties, in vitro starch digestibility and macromolecular-structural interactions of pasta with potato (<i>Solanum tuberosum</i> L.). <i>Molecules</i> 27: 7835.	10.93
2330	Sharma S, Parmar V, Sharma R and Singh B (2022). Virgin coconut and mustard oleogels as affected by beeswax and candelilla wax: Functional, textural, rheological and morphological characteristics. <i>Int J Food Sci Technol</i> 58: 3293-302.	9.61
2331	Sharma S, Singh P, Chauhan S and Choudhary O P (2022) Landscape position and slope aspects impacts on soil organic carbon pool and biological indicators of a fragile ecosystem in highaltitude cold arid region. <i>J Soil Sci Plant Nutr</i> https://doi.org/10.1007/s42729-022-00831-x .	9.87
2332	Sharma S, Singh P, Kaur S and Yadvinder-Singh (2022) Fertilizer-N application and rice straw incorporation impacts on crop yields, potassium use efficiency and potassium fractions in a rice-wheat cropping system. <i>Commun Soil Sci Plant Anal</i> https://doi.org/10.1080/00103624.2022.2028816 .	7.33
2333	Sharma S, Vashisht B B, Singh P and Yadvinder-Singh (2022) Changes in soil aggregate-associated carbon, enzymatic activity and biological pools under conservation agriculture-based practice in rice-wheat system. <i>Biomass Convers Bioref</i> https://doi.org/10.1007/s13399-021-02144-y .	10.99
2334	Sheikh M M, Riar T S, Walia S S and Garg L (2022) Integrated Farming Systems (IFS): A Comparative Status in Punjab, India and Northern Part of Bangladesh. <i>J Comm Mobil Sustain Dev</i> 18(1): 19-26	5.65
2335	Shelly P, Neemisha and Sharma S (2022) Modification in the composting environment through additives. <i>Commun Soil Sci Plant Anal</i> 53(17): 2141-2155.	7.58

2336	Shivani, Grewal S K, Gill R K, Virk H K and Bhardwaj R D (2022) Impact of post-emergent imazethapyr on morpho-physiological and biochemical responses in lentil (<i>Lens culinaris</i> Medik.). <i>Physiol Mol Biol Plants</i> 28: 1681-93. https://doi.org/10.1007/s12298-022-01244-x	8.39
2337	Shivani, Grewal S K, Gill R K, Virk H K and Bhardwaj R D (2022) Methylglyoxal detoxification pathway - Explored first time for imazethapyr tolerance in lentil (<i>Lens culinaris</i> L.). <i>Plant Physiol Biochem</i> 177: 10-22. DOI: 10.1016/j.plaphy.2022.02.007.	10.27
2338	Sidhu A S, Aulakh C S, Thakur M and Singh A (2022) Natural farming in India: Rationale and Implications. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(7):9361-86.	6.29
2339	Sidhu G S, Rattanpal H S, Arora A and Singh J (2022) Effect of chemical mutagens and phytophthora culture filtrate on 13 survival and plant regeneration from callus of <i>Citrus jambhiri</i> lush. <i>Fruits</i> 77(4): 1-9. Impact Factor: 0.586	6.59
2340	Sidhu R K, Sidhu M K and Dhatt A S (2022) Inheritance studies for different quantitative and qualitative fruit traits in brinjal (<i>Solanum melongena</i> L.). <i>J Horti Sci</i> 17: 298-306.	5.08
2341	Sidhu S K, Sekhon G S, Kumar S, Kler T K and Chandi A K (2022) Diversity of insectivorous avian species and their foraging activities at ponds in agricultural habitats in Punjab, India. <i>Pak J Zool</i> DOI: https://dx.doi.org/10.17582/journal.pjz/2022021 .	6.00
2342	Singh A, Kaur L, Garg L and Singh D (2022) Adoption status of recommended practices in marigold and gladiolus in Punjab state. <i>Indian J Ext Educ</i> 58(1): 101-05.	5.95
2343	Singh A, Kumar R, Mavi H K and Gupta M (2022) Economics of cotton cultivation in North India: A comparative state-wise analysis. <i>J Comm Mobiliz Sustain Dev Seminar Special Issue</i> 1: 61-70.	5.67
2344	Singh G, Buttar D S, Singh N, Aulakh S K, Sharma S P and Hunjan M S (2022). Molecular identification and phylogenetic analysis of different races of <i>Fusarium oxysporium</i> f.sp. melonis in Muskmelon using RAPD markers under Punjab conditions. <i>Agril Res J</i> 59(3): 453-61.	5.44
2345	Singh A, Kumar R, Mavi H K and Gupta M (2022) Economics of cotton cultivation in North India: A comparative state-wise analysis. <i>J Comm Mobiliz Sustain Dev</i> 1(SS1): 61-70.	5.67
2346	Singh A, Singh D, Jindal S K and Singh R (2022) Heterotic potential in elite lines of watermelon [<i>Citrullus lanatus</i> (Thunb.) Matsum and Nakai]. <i>Agril Res J</i> 59: 683-89.	5.44
2347	Singh A, Singh D, Singh R and Jindal S K (2022) Assessment of combining ability of watermelon germplasm derived from diverse geographic origin for yield and quality traits. <i>Genetika</i> 54: 959-76.	6.76
2348	Singh A, Singh R and Singh P (2022) Effect of consortium biofertilizer on growth and flowering of African marigold (<i>Tagetes erecta</i> L.). <i>Agric Res J</i> 59(2): 323-27	5.44
2349	Singh A, Mahajan G and Chauhan B S (2022) Germination ecology of wild mustard (<i>Sinapis arvensis</i> L.) and its implications for weed management. <i>Weed Sci</i> 70: 103-11.	8.58
2350	Singh B, Bhatia D, Narang D, Kaur R and Chhuneja P (2022) High-resolution genetic mapping of qtl governing resistance to corn leaf aphid, <i>rhopalosiphum maidis</i> (fitch) in barley. <i>Cereal Res Commun</i> 5(2): 379-89.	7.24
2351	Singh B, Gill R I S and Kaur N (2022) Performance of Poplar Plantation under different levels of nutrients in an agroforestry System. <i>Indian Forester</i> 148(5): 479-85.	5.10
2352	Singh D and Kaur P (2022) Status and Prospects of Green Manuring in Punjab State of India. <i>J Comm Mobiliz Sustain Dev</i> 2(supple): 345-50.	5.67
2353	Singh D, Dhillon T S, Javeed T, Singh R, Dobarra J, Dhankar S K, Ali B, Kianersi F, Poczai P and Kumar V (2022) Exploring the genetic diversity of carrot genotypes through phenotypically and genetically detailed germplasm collection. <i>Agronomy</i> 12:1921. https://doi.org/10.3390/agronomy12081921	9.94
2354	Singh G and Dhillon B S (2022) Growth and productivity of rice crop as influenced by crop residue incorporation under rice-wheat cropping system. <i>Pharma Innov</i> 11(2): 582-84.	5.23



2355	Singh G, Aggarwal N and Chandi R S (2022) Biorational management of whitefly <i>Bemisia tabaci</i> (Gennadius) in brinjal. <i>Indian J Ento Ref.</i> No. e21176. https://doi.org/10.55446/IJE.2021.388 .	5.89
2356	Singh G, Brar H S, Virk H K, Khokhar A, Kaur C, Singh K and Gupta R K (2022) Effect of foliar-applied urea on symbiotic parameters, yield and monetary returns of irrigated chickpea, <i>J Plant Nutr</i> 46(8): 1668-82, https://doi.org/10.1080/01904167.2022.2093745	8.28
2357	Singh G, Gudi S, Amandeep, Upadhyay P, Shekhawat P K, Nayak G, Goyal L, Kumar D, Kumar P, Kamboj A, Thada A, Shekhar S, Koli G K, Meghna D P, Halladakeri P, Kaur R, Kumar S, Saini P, Singh I and Ayoubi H (2022) Unlocking the hidden variation from wild repository for accelerating genetic gain in legumes. <i>Front Plant Sci</i> 13:1035878. https://doi.org/10.3389/fpls.2022.1035878	11.75
2358	Singh G, Kaur M, Garg V K and Oliveira A C (2022) Oxygen hyper stoichiometric trimetallic titanium doped magnesium ferrite: Structural and photocatalytic studies. <i>Ceram Int</i> 48(17): 24476-84.	10.53
2359	Singh G, Mavi M S, Choudhary O P, Kaur M and Singh B P (2022) Interaction of pyrolysed and un-pyrolysed organic materials enhances carbon accumulation in soil irrigated with water of variable electrical conductivity. <i>Soil Till Res</i> 215: 105193.	11.22
2360	Singh G, Rattanpal H S, Gupta M and Sidhu G S (2022) Genetic variability and heritability among mandarin (<i>Citrus reticulata</i> Blanco) genotypes under Indian sub-tropical conditions. <i>Appl Ecol Environ Res</i> 20(4): 2913-30.	6.71
2361	Singh G, Sachdeva J, Walia G S (2022) Paddy straw management in Punjab: an economic analysis of different techniques. <i>Indian J Ecol</i> 49(1):302-08.	5.79
2362	Singh G, Singh P, Sodhi G P S, Singh R and Singh K (2022) Impact of cotton development programme on adoption of recommended Bt-cotton cultivation practices. <i>Indian J Ext Educ</i> 58(2): 149-52.	5.95
2363	Singh G, Singh R and Singla A (2022) Efficacy of Different Insecticides against Blister Beetle <i>Mylabris pustulata</i> Thunberg (Coleoptera:Meloidae) in Pigeonpea and Mungbean. <i>Pest Res J</i> 34(2): 152-155	5.49
2364	Singh G, Singh R and Singla A (2022). Estimation of crop losses in <i>Cajanus cajan</i> (L.) Millsp. and <i>Vigna radiate</i> (L.) Wilczek caused by blister beetle, <i>Mylabris pustulata</i> Thunberg (Coleoptera: Meloidae). <i>Int J Trop Insect Sci</i> https://doi.org/10.1007/s42690-022-00861-z	6.77
2365	Singh G, Singh P, Sodhi G P S, Singh R and Singh K (2022). Impact of Cotton Development Programme on adoption of recommended Bt Cotton cultivation practices. <i>Indian J Ext Educ</i> 58(2): 149-52.	5.95
2366	Singh H and Khar A (2022) Potential of onion (<i>Allium cepa</i> L.) as traditional therapeutic and functional food: An update. <i>Indian J Agril Sci</i> 92: 1291-97 https://doi.org/10.56093/ijas.v92i11.123235	6.37
2367	Singh H and Mishra S K (2022) Varietal difference in tillering and yield responses of transplanted rice on different soil texture sites of south-western Punjab. <i>Acta Scientific Agri</i> 6(5): 8-11.	7.04
2368	Singh H, Kaur J, Bala R, Srivastava P, Sharma A, Grover G, Dhillon G S, Singh R P, Chhuneja P and Bains N S (2022) Residual effect of defeated stripe rust resistance genes/qtls in bread wheat against prevalent pathotypes of <i>Puccinia striiformis</i> f. <i>Sp.tritici</i> . <i>PloS One</i> 17(4): 1-20.	9.75
2369	Singh H, Kaur J, Bala R, Srivastava P, Chunneja P and Bains N S (2022) Confirmation of residual effect of defeated stripe rust resistance genes in bread wheat against prevalent pathotypes of <i>Puccinia striiformis</i> f. <i>sp tritici</i> . <i>PloS One</i> 17(4).e0266482. https://doi.org/10.1371/journal.pone.0266482 .	9.75
2370	Singh H, Verma P and Khar A (2022) Screening of short-day onion cultivars of India for vitamin-C content. <i>Indian J Horti Sci</i> 79: 160-67.	6.16

2371	Singh I, Singh S, Hans V S and Singh J (2022) Development of inclined plate honey moisture reduction system. <i>J Food Sci Tech</i> 59(2): 615-24. https://doi.org/10.1007/s13197-021-05049-w .	7.95
2372	Singh J and Brar B S (2022) Build-up and utilization of phosphorus with continuous fertilization in maize-wheat cropping sequence. <i>Field Crops Res</i> 276: 108389.	11.22
2373	Singh J P, Singh M C and Singh T (2022) Design of sub-surface drainage system for a farm in Muktsar district of Punjab State. <i>Agril Res J</i> 59(3): 563-69	5.44
2374	Singh J, Bedi S, Gudi S, Kumar P and Sharma A (2022) Coronal roots and stem lignin content as significant contributors for lodging tolerance in wheat (<i>Triticum aestivum</i> L.). <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00337-3	6.85
2375	Singh J, Bhatt R, Dhaliwal S S, Dhillon B S, Al-Huqail A A and Alfagham A (2022) Integrated use of phosphorus, farmyard manure and biofertilizer improves the yield and phosphorus uptake of black gram in silt loam soil. <i>PLoS ONE</i> 17(4): e0266753. https://doi.org/10.1371/journal.pone.0266753 .	9.24
2376	Singh J, Kaur S, Rasane P, Kumar V and Nanda V (2022) Effect of particle size on physical, techno-functional and antioxidant properties of corn silk powder. <i>Int J Food Sci Technol</i> https://doi.org/10.1111/ijfs.15988	9.71
2377	Singh J, Singh B and Dhaliwal S S (2022) Long term impact of poplar and eucalyptus based agroforestry systems on physico-chemical properties and nutrient status of soil in north-western India. <i>Range Mgmt Agrofor</i> 43(1): 66-73	6.37
2378	Singh J, Singh R and Singh B (2022) Yield loss assessment and control of fruit bat (<i>Pteropus giganteus</i>) in litchi orchards using the artificial light method. <i>J Appl Horti</i> 24(2): https://doi.org/10.37855/jah.2022.v24i02.40	5.13
2379	Singh J, Singh R and Singh B (2022) Yield loss assessment and control of fruit bat (<i>Pteropus giganteus</i>) in litchi orchards using artificial light method. <i>J Appl Horti</i> 24(2): 219-23	5.13
2380	Singh K, Kumar P, Kalra V P and Singh D (2022) Evaluation of short duration varieties of paddy through frontline demonstrations in Punjab. <i>Indian J Ecol</i> 49: 2051-54.	5.79
2381	Singh K, Kumar P, Kalra V P and Singh D (2022) Promotion of natural resource management technologies through frontline demonstrations in rice-wheat rotation in Punjab. <i>Indian J Ecol</i> 49: 2016-19.	5.79
2382	Singh K, Kumar P, Sharma S and Singh D (2022) Entrepreneurship development and socioeconomic impact of farmer first programme; A case study of mushroom cultivation in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 2(SS1): 678-83	5.67
2383	Singh K, Mishra S K, Singh M, Singh K and Brar A S (2022) Water footprint assessment of surface and subsurface drip fertigated cotton-wheat cropping system - A case study under semi-arid environments of Indian Punjab. <i>J Cleaner Prod</i> 365: 132735.	15.30
2384	Singh K, Pal R, Chalotra N and Brar A S (2022) Water productivity of sugarcane influenced by planting techniques, mulching and irrigation scheduling in Indo-Gangetic plains of India. <i>Sugar Tech</i> 24: 408-18.	7.59
2385	Singh K, Singh P, Singh M, Mishra S K, Iqbal R, Al-Ashkar I, Habib-ur-Rahman M and El Sabagh A (2022) Sub-surface drip fertigation improves seed cotton yield and monetary returns. <i>Front Plant Sci</i> 13:1038163. https://doi.org/10.3389/fpls.2022.1038163	12.63
2386	Singh K, Sharma R and Sahare H (2022) Implications of synthetic chemicals and natural plant extracts in improving vase life of flowers. <i>Scientia Horticulturae</i> 302: 111-33.	10.34
2387	Singh L, Dhillon G S, Kaur S, Dhaliwal S K, Kaur A, Malik P, Kumar A, Gill R K and Kaur S (2022) Genome wide Association Study for Yield and Yield-Related Traits in Diverse Blackgram Panel (<i>Vigna mungo</i> L. Hepper) Reveals Novel Putative Alleles for Future Breeding Programs. <i>Front Genet</i> 13:849016.	10.60



2388	Singh L, Kaur S and Aggarwal P (2022) Enhanced functional and textural properties of waffle premix by addition of phytonutrient-rich industrial potato waste. <i>Biomass Convers Biorefin</i> https://doi.org/10.1007/s13399-022-03246-x	10.05
2389	Singh L, Kaur S and Aggarwal P (2022) Techno and bio functional characterization of industrial potato waste for formulation of phytonutrients rich snack product. <i>Food Biosci</i> 49:101824.	11.32
2390	Singh L, Kaur S, Aggarwal P and Kaur N (2022) Characterisation of industrial potato waste for suitability in food applications. <i>Int J Food Sci</i> https://doi.org/10.1111/ijfs.16023 .	9.61
2391	Singh L, Kaushal A, Singh J and Sharda R (2022) Structural stability analysis of naturally ventilated polyhouses under different conditions. <i>J Agril Sci Technol</i> 24(5):1189-204.	7.10
2392	Singh L, Tak P S and Dhillon G P S (2022) Field evaluation of <i>Populus deltoides</i> . <i>Indian Forester</i> 148: 459-66.	5.10
2393	Singh M and Dhath K K (2022) Assessment of combining ability for morphological traits in periwinkle (<i>Catharanthus roseus</i> (L.) G. Don) genotypes using diallel analysis. <i>J Horti Sci Biotechnol</i> 97(2): 265-71	7.64
2394	Singh M C, Poonia S, Satpute S, Prasad V and Singh S (2022) Estimating seasonal reference evapotranspiration using limited weather data. <i>J Agromet</i> 24(1):99-102	6.55
2395	Singh M C, Satpute S, Prasad V and Sharma K K (2022) Trend analysis of temperature, rainfall, and reference evapotranspiration for Ludhiana district of Indian Punjab using non-parametric statistical methods. <i>Arab J Geosci</i> 15(3): 275.	7.83
2396	Singh M C, Sharma K K and Prasad V (2022) Impact of ventilation rate and its associated characteristics on greenhouse microclimate and energy use. <i>Arab J Geosci</i> 15(1):288.	7.83
2397	Singh M J, Yousuf A, Singh H, Singh S, Hartsch K, Werner M, Almaliki A H, Elnaggar A Y, Hussein E E and Ali H R (2022) Simulation accuracy of EROSION-3D model for estimation of runoff and sediment yield from micro-watersheds. <i>Water</i> 14:280.	7.25
2398	Singh M, Bala M and Singh S (2022) Optimization of nitrogen application and planting geometry for production of cut flowers of <i>Chrysanthemum morifolium</i> . <i>J Horti Sci</i> 17(2): 363-70.	5.08
2399	Singh M, Ghai N and Dhillon B S (2022) Application of salicylic acid for improving productivity of rice (<i>Oryza sativa</i> L.). <i>Agril Res J</i> 59(4):790-93.	5.44
2400	Singh M, Kaur S, Kaur A, Yadav I S, Sharma P, Chhuneja P and Singh K (2022) Nucleotide diversity and molecular characterization of soluble starch synthase i gene in wheat and its ancestral species. <i>J Plant Biochem Biotechnol</i> 32: 92-105.	7.53
2401	Singh M, Kumar T, Sood S, Malhotra N, Rani U, Singh S, Singh I, Bindra S, Kumar S and Kumar S (2022) Identification of promising chickpea interspecific derivatives for agro-morphological and major biotic traits. <i>Front Plant Sci</i> https://doi.org/10.3389/fpls.2022.941372	11.75
2402	Singh M, Nara U, Kaur K, Rani N and Jaswal C (2022) Genetic, genomic and biochemical insights of celery (<i>Apium graveolens</i> L) in the era of molecular breeding. <i>J Appl Res Med Aromatic Plants</i> https://doi.org/10.1016/J.jarmap2022.100420 .	9.97
2403	Singh M, Nara U, Rani N, Pathak D, Kaur K and Sangha M K (2022) Comparison of Mineral Composition in Microgreens and Mature leaves of Celery (<i>Apium graveolens</i> L.). <i>Biolog Trace Element Res</i> 201(8):1-11.	9.74
2404	Singh M, Nara U, Rani N, Pathak D, Sangha M K and Kaur K (2022) Mineral Content Variation in Leaves, Stalks, and Seeds of Celery (<i>Apium graveolens</i> L.). Genotypes <i>Biol Trace Element Res</i> https://doi.org/10.1007/s12011-022-03359-4 .	9.74
2405	Singh M, Riar T S and Garg L (2022) Problems Faced by Mushroom Growers in Punjab. <i>J Comm Mobil Sustain Dev</i> 17(3): 889-91	5.65
2406	Singh N and Banga G (2022) Media and information literacy for developing resistance to 'infodemic': Lessons to be learnt from the binge of misinformation during COVID-19 pandemic. <i>Media Cult Soc</i> 44(1): 161-71.	9.27

2407	Singh N P, Singh J, Singh S and Gill P S (2022) Soil-leaf nutrient relationships with fruit quality and yield of litchi (<i>Litchi chinensis</i>) in northern India. Indian J Agril Sci 92(12): 1453-57.	6.37
2408	Singh N, Dhatt K K and Singh S (2022) Growth and flowering of pompon Dahlia in response to application of organic manures. Indian J Horti 79(3): 346-52.	6.16
2409	Singh P and Benbi D K (2022) Nutrient management effects on carbon input through root and shoot biomass in a rice-wheat system. Agril Res J 59(1): 135-45.	5.44
2410	Singh P and Zhawar V K (2022) GABA improves secondary metabolic and defense activities under stripe rust (<i>Puccinia striiformis</i> f. sp. tritici) in wheat. J Plant Pathol 104: 1475-81. https://doi.org/10.1007/s42161-022-01186-z	7.73
2411	Singh P, Adhale P, Guleria A and Vaidya M K (2022) Is crop diversification vulnerable to climate, agricultural and socio-economic factors in Himachal Pradesh, India. Curr Sci 123(5): 707-11.	7.17
2412	Singh P, Adhale P, Guleria A, Bhoi P B, Bhoi A K, Bacco M and Barsocchi P (2022) Crop diversification in South Asia: A panel regression approach. Sustainability 14(15): 9363.	9.89
2413	Singh P, Dhaliwal A P S and Dhillon G S (2022) Acquisition of Skills and Knowledge Through Poultry Capacity Building Programs. Asian J Microbiol Biotech Environ Sci 24(1): 118-21	5.00
2414	Singh P, Kang K K, Kaur G and Brar J S (2022) Impact of different mulches on soil temperature and plant growth in guava nursery under subtropical conditions. Agric Res J 59(5): 918-25.	5.44
2415	Singh P, Sandhu A S and Kaur N (2022) Adoption status of crop production practices for direct seeded rice (DSR) in Bathinda district of south-western Punjab, India. J Comm Mobiliz Sustain Dev 17(4): 1284-88.	5.67
2416	Singh P, Sharma S and Kaur L (2022) Rural micro entrepreneurs in sub mountainous agro ecological zone of Punjab: An Analytic Hierarchy Process (AHP) analysis. Agril Res J 59(1):178-84.	5.44
2417	Singh P, Sharma S and Kaur L (2022) Socio-familial and marketing problems faced by women entrepreneurs: An analytical analysis. Indian Res J Ext Educ 22(2): 90-95.	5.22
2418	Singh P, Singh G and Sodhi G P S (2022) Data Envelopment Analysis based optimization for improving net ecosystem carbon and energy budget in cotton (<i>Gossypium hirsutum</i> L.) cultivation: methods and a case study of north-western India. Environ Dev Sustain 24: 2079-119.	8.19
2419	Singh R and Thakur T (2022). Mulching effect on soil temperature, weed management, growth and flower yield in rose (<i>Rosa hybrida</i> L.). J Agromet 24(1):103-05.	6.55
2420	Singh R, Gill D S and Boora R S (2022) Standardization of propagation techniques in jamun [<i>Syzygium cumini</i> (L.) Skeels] under Punjab conditions. Agric Res J 59(6): 1111-18.	5.44
2421	Singh R, Kaur G and Kaur G (2022) Shelf-life Prolongation of Spring Groundnut Pods (<i>Arachis hypogaea</i> L.) using Packaging Systems. J Scientific Indus Res 81: 393-401.	7.07
2422	Singh R, Kaur S, Aggrawal P and Kaur N (2022) Characterization of starch isolated from commercial and non-commercial potato cultivars. Agric Res J 59(3): 524-30.	5.44
2423	Singh R, Paalli S S, Brar A S and Kaur C (2022) Growth and phenology of wheat (<i>Triticum aestivum</i> L.) as influenced by irrigation scheduling under in situ rice residue management. Arch Agron Soil Sci https://doi.org/10.1080/03650340.2022.2089877 .	8.24
2424	Singh R, Pal R K, Gill K K, Mishra S K and Kaur A (2022) Validation of medium range weather forecasts and its economic impact on cotton-wheat cropping system in South-Western Punjab. Mausam 73(4): 915-28.	6.64
2425	Singh R, Singla N and Walia G S (2022) Management of rodent pests in wheat sown under different tillage systems. Indian J Entol Online https://doi.org/10.55446/IJE.2022.669 .	5.08
2426	Singh S (2022) Influence of surgical castration under local anaesthesia on the growth rate of suckling piglets. Vet Pract 23(1).	5.10



2427	Singh S and Dhkal M (2022) Management of gram caterpillar, <i>Helicoverpa armigera</i> (Hubner) with Bt formulation in chickpea under organic conditions. <i>Legum Res</i> https://doi.org/10.18805/LR-4769 .	6.59
2428	Singh S and Saini M K (2022) Broad-spectrum use of essential oils in managing stored grain insect-pests. <i>Indian J Ento Ref. No e.21166</i> https://doi.org/10.55446/IJE.2021.361 .	5.08
2429	Singh S and Sarao P S (2022) Field evaluation of biopesticides against rice insect pests under organic farming. <i>Indian J Ento Ref. No. e21131</i> . https://doi.org/10.55446/IJE.2021.348 .	5.08
2430	Singh S T, Gill R S, Hans V S and Mittal T C (2022) Experimental performance and economic viability of evacuated tube solar collector assisted greenhouse dryer for sustainable development. <i>Energy</i> 241(2): 122794. https://doi.org/10.1016/j.energy.2021.122794 .	13.15
2431	Singh S, Grover J and Yadav B K (2022) Effect of growth promoting substances on barseem (<i>Trifolium alexandrinum</i>) seed production in north-western India. <i>J Comm Mobiliz Sustain Dev</i> 17(2):1-7.	5.33
2432	Singh S, Kaushal S, Hunjan M S and Sharma P (2022) Chemical composition and molecular docking studies of <i>Cyamopsis tetragonoloba</i> (L.) Taub. leaves and fruits extracts as antifungal agents against rice phytopathogenic fungi. <i>Arch Phytopathol Plant Prot</i> https://doi.org/10.1080/03235408.2022.2081769 .	7.00
2433	Singh S, Prabhjyot-Kaur and Sandhu S S (2022) Crop-weather calendars for optimizing maize yield in Punjab. <i>Agric Res J</i> 59(1): 146-51.	5.44
2434	Singh S, Sandhu R K, Sharma R K, Kaur P, Makkar G S and Randhawa H S (2022) Field efficacy of biorational and chemical insecticides against mango hoppers. <i>Indian J Agril Sci</i> 92(10): 1274-78.	6.37
2435	Singh S, Singh I, Kumar A, Bindra S, Singh G and Singh P (2022) Notification and germplasm registration: Chickpea variety-PBG 8. <i>Indian J Genet Plant Breed</i> 82: 375.	6.51
2436	Singh T, Kaur J and Saini K S (2022) Energetics, productivity and profitability of soybean (<i>Glycine max</i>)-based intercropping systems under different planting patterns. <i>Legum Res</i> 45(2): 215-20.	6.59
2437	Singh T, Sandhu P S, Chahal G K and Walia S S (2022) Foliar thiourea confers moisture stress tolerance in rainfed maize through elevated antioxidative defense system, osmolyte accumulation and starch synthesis grown under different planting methods. <i>J Plant Growth Regul</i> https://doi.org/10.1007/s00344-021-10540-x	10.64
2438	Singh V, Aggarwal P, Kaur S and Kaur N (2022). Development, characterization, and shelf-life studies of phytonutrient-rich date bar from immature dates (<i>Phoenix dactylifera</i> L.). <i>Bio-mass Convers Biorefin</i> https://doi.org/10.1007/s13399-022-03010-1 .	10.05
2439	Singh V, Aggarwal P, Kaur S and Kaur N (2022). Intermediate moisture date (<i>Phoenix dactylifera</i> L.) based dessert with natural sugars: Phytonutritional profile, characterization, sensory quality, and shelf-life studies. <i>J Food Proc Preserv</i> e17237. https://doi.org/10.1111/jfpp.17237	8.61
2440	Singh V, Jawandha S K, Gill P P S and Singh D (2022). Pre-harvest putrescine application extend the shelf life and maintains the pear quality. <i>Int J Fruit Sci</i> 22: 514-24.	7.36
2441	Singh V, Singh K, Singh R S, Pal R, Anuradha and Kumar R (2022) CoPb 14185: A midlate sugarcane variety for North West Zone of India. <i>Electr J Plant Breed</i> 13(2): 754-63	5.14
2442	Singh V, Singh K, Singh RS, Pal R, Kumar R, Anuradha and Mohan C (2022) CoPb 96: An early maturing sugarcane variety for Punjab. <i>Electr J Plant Breed</i> 13(1): 98-105	5.14
2443	Singh Y J, Grewal S K and Gill R K (2022) Proline metabolism and phenylpropanoid pathway act independently in conferring resistance against yellow mosaic virus infection in black gram. <i>Physiol Mol Plant Pathol</i> 116: 101713 https://doi.org/10.1016/j.pmpp.2021.101713	7.65
2444	Singh YJ, Grewal SK and Gill RK (2022) Role of antioxidative defense in yellow mosaic disease resistance in black gram (<i>Vigna mungo</i> (L.) Hepper). <i>J Plant Growth Regul</i> 41: 2138-56. https://doi.org/10.1007/s00344-021-10431-1	10.17

2445	Singh Z, Singh G, Aggarwal N, Virk H K and Sharma P (2022). Symbiotic efficiency vis-a-vis chickpea performance as affected by seed inoculation with Mesorhizobium, phosphorus-solubilizing bacteria, and phosphorus application. <i>J Plant Nutr</i> 45(2): 246-58.	8.28
2446	Singh S, Sandhu R K, Sharma R K, Kaur P, Makkar G S and Randhawa H S (2022) Field efficacy of biorational and chemical insecticides against mango leaf hoppers (<i>Amritodus atkinsoni</i> and <i>Idioscopus</i> spp). <i>Indian J Agril Sci</i> 92(10): 1274-78.	6.37
2447	Singhal N, Sharma P, Sharda R, Siag M and Cutting N G (2021) Assessment of growth, symbiotic traits and yield of pea (<i>Pisum sativum</i> L.) under different irrigation methods. <i>Indian J Agril Sci</i> 91(9):1378-81.	6.21
2448	Singhal N, Siag M, Sharma P, Sharda R and Singh H (2022) Impact of moisture regimes on yield and soil microbial population in pea (<i>Pisum sativum</i>). <i>Indian J Agril Sci</i> 92(5): 572-76.	6.37
2449	Singla A, Singh R, Taggar G K, Sujyananad G K and Singh S (2022) Role of host plant resistance in chickpea against <i>Helicoverpa armigera</i> (Hübner). <i>J Ent Res</i> 46(2): 238-43.	5.89
2450	Singla C, Aggarwal R and Kaur S (2022) Groundwater decline in Central Punjab-Is it a warning? <i>Groundwater Sustain Dev</i> 16: 100718.	11.90
2451	Singla C, Aggarwal R, Kaur S and Sharma R (2022) Analysis of meteorological parameter changes using Mann-Kendall statistical tests in Indian Punjab. <i>Mausam</i> 74: 207-16.	6.64
2452	Singla D and Yadav I S (2022) Gaap: a gui-based genome assembly and annotation package. <i>Curr Genomics</i> 23(2): 77-82.	8.69
2453	Singla M, Hans V S and Singh S (2022) CFD analysis of rib roughened solar evacuated tube collector for air heating. <i>Ren Energ</i> 183(1): 78-89. https://doi.org/10.1016/j.renene.2021.10.055 .	14.00
2454	Singla N, Bakheta P and Jain R (2022) Impact of high-fiber ingredient mix on nutritional indices of the women suffering from metabolic syndrome. <i>Proc Natl Acad Sci India Sect B BioSci</i> 92: 223-30.	6.96
2455	Singla N, Singh R, Kaur N and Babbar B K (2022) Field efficacy of reduced active ingredient zinc phosphide formulation against rodents. <i>Indian J Ento</i> https://doi.org/10.55446/IJE.2021.367	5.08
2456	Singla P, Grover K and Dhillon P K (2022) Investigating natural sweeteners vis a vis their nutritional, antinutritional and bioactive characteristics. <i>J Comm Mobilization Sustain Dev</i> 17(4):204-12.	5.30
2457	Singla R, Kaur B and Goel R (2022) Controlled atmosphere and modified atmosphere storage for horticulture commodities: A review. <i>Pharma Innov J</i> 11(9): 1581-89 .	5.23
2458	Sinha A, Gill P P S, Jawanda S K and Grewal S K (2022) Composite coating of chitosan with salicylic acid retards pear fruit softening under cold and supermarket storage. <i>Food Res Int</i> 160:111724. https://doi.org/10.1016/j.foodres.2022.111724	12.48
2459	Sinha A, Gill P P S, Jawanda S K and Grewal S K (2022) Suppression of internal browning and maintenance of antioxidants in beeswax plus salicylic acid coated pear fruit during different storage conditions. <i>Int J Food Sci Technol</i> https://doi.org/10.1111/ijfs.15674	9.71
2460	Sinha A, Gill P P S, Jawanda S K, Kaur P and Grewal S K (2022) Salicylic acid enriched beeswax coatings suppress fruit softening in pears by modulation of cell wall degrading enzymes under different storage conditions. <i>Food Package Shelf Life</i> 32:100821, https://doi.org/10.1016/j.fpsl.2022.100821	12.43
2461	Sinha A, Gill P P S, Jawandha S K and Singh N P (2022). Chitosan coatings incorporated with salicylic acid enhanced postharvest quality of pear under different storage conditions. <i>J Food Measur Charact</i> https://doi.org/10.1007/s11694-021-01276-z	8.43
2462	Sinha A, Jawandha S K, Gill P P S, Kaur N and Arora A (2022) Pre-harvest application of calcium maintained fruit quality in cold stored plum. <i>Indian J Ecol</i> 49: 491-95.	5.79



2463	Sohi H S, Gill M I S, Chhuneja P, Arora N K, Maan S S and Singh J (2022). Construction of Genetic Linkage Map and Mapping QTL Specific to Leaf Anthocyanin Colouration in Mapping Population 'Allahabad Safeda' × 'Purple Guava (Local)' of Guava (<i>Psidium guajava</i> L.). <i>Plants</i> 11(15):2014. https://doi.org/10.3390/plants11152014	9.94
2464	Solanki C, Gupta S K and Alam M S (2022). Effects of pre-milling microwave dosage on dehulling of chickpea and pigeonpea. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(4): 7065-7.	6.17
2465	Sonali, Grewal S K and Gill R K (2022) Insights into carbon and nitrogen metabolism and antioxidant potential during vegetative phase in quinoa (<i>Chenopodium quinoa</i> Willd.). <i>Protoplasma</i> https://doi.org/10.1007/s00709-022-01736-3	9.36
2466	Sonia and Manshahia S K (2022) Reading Behaviour of Farm Women Regarding Household Messages in Print Media. <i>J Comm Mobil Sustain Dev</i> 17: 561-66.	5.67
2467	Sood P (2022) Imidacloprid induced reproductive toxicity in female albino rats. <i>Indian J Entomol</i> https://doi.org/10.55446/IJE.2022.534	5.08
2468	Sood P (2022) Pesticide Usage and its toxic effects-a review. <i>Indian J Entomol</i> https://doi.org/10.55446/IJE.2023.505	5.08
2469	Sood V K, Sanadya S K, Kumar S, Chand S and Kapoor R (2022). Health benefits of oat (<i>Avena sativa</i>) and nutritional improvement through plant breeding interventions. <i>Crop Pasture Sci</i> https://doi.org/10.1071/CP22268	8.29
2470	Sra M S and Garg R K (2022) Clonal variation in <i>Casuarina junghuhniana</i> and its hybrids for vegetative propagation as influenced by propagule size. <i>Indian Forester</i> 148(9): 884-88.	5.10
2471	Sran T S and Jindal S K (2022) Assessment of heterotic and combining ability effects along with genotype × environment factors influencing the variation of yield and quality components in pepper. <i>Scientia Horti</i> 299: 111040.	9.46
2472	Supreetha B G, Singh N P and Sharma S (2022). Fruit development and mineral profiling under different mulching regimes of strawberry. <i>Indian J Horti</i> 79: 213-20.	6.16
2473	Surasani V K R, Raju C V, Singh A and Joshi S (2022) Quality changes in fish sausages supplemented with pangas protein isolates as affected by frozen storage and casing material. <i>J Food Sci Technol</i> 59(6): 2127-40.	8.70
2474	Suri K S and Makkar G S (2022) Efficacy of Benzpyrimoxan 10 SC against rice planthoppers. <i>Indian J Ento</i> 84(4): 915-919.	5.89
2475	Suriti and Singh R (2022). Effect of mulching and nitrogen application on growth and flowering of <i>Gypsophila elegans</i> M. Bieb. <i>Agric Res J</i> 59(2): 318-22.	6.00
2476	Sushma, Verma R K, Prasher I B, Gautam A K, Rajeshkumar K C and Castañeda-Ruiz R F (2022) <i>Dictyocheirosporahimachalensis</i> sp. nov. from Himachal Pradesh, India. <i>Mycotaxon</i> 137: 455-63.	6.55
2477	Taggar G K, Singh R, Chhuneja P K, Randhawa H S, Singh S, Kumar R, Kaur J and Khokhar S (2022) Insecticidal potential of home-made neem extract against pod sucking bug, <i>Clavigrala gibbosa</i> (Spinola) in pigeonpea. <i>Int J Trop Insect Sci</i> 42: 1913-24. https://doi.org/10.1007/s42690-021-00721-2 .	7.02
2478	Tak Y, Kaur M, Kumar R, Gautam C, Singh P, Kaur H, Kaur A, Bhatia S, Jha N K, Gupta P K and Amarowicz R (2022) Repurposing Chia Seed Oil: A Versatile Novel Functional Food. <i>J Food Sci</i> https://doi.org/10.1111/1750-3841.16211	9.17
2479	Talwar D, Singh K, Kaur N and Dhatt A S (2022) Response of Soil salinity to brinjal (<i>Solanum melongena</i> L) genotypes for physio-chemical characters. <i>Plant Physiol Rep</i> 27: 521-37.	5.50
2480	Tamta M and Mahajan S (2022) Development of apparel products from eri/ramie blended and union fabrics. <i>Int J Bio Resour Stress Manag</i> 13(1): 765-70.	5.10
2481	Tanin M J, Sharma A, Saini D K, Singh S, Kashyap L, Srivastava P, Mavi G S, Kaur S, Kumar V and Kumar V (2022) Ascertaining yield and grain protein content stability in wheat genotypes having the <i>gpc-b1</i> gene using univariate, multivariate, and correlation analysis. <i>Front Genet</i> 13(1001904):1-21.	10.77

2482	Tasal P, Arora R, Arora N K and Jawandha S K (2022).Influence of Aloe vera and salicylic acid on storage life of grapes cv. Flame Seedless. Indian J Horti 79: 363-69.	6.16
2483	Teresa N W, Mahajan G and Chauhan B S (2022) Glyphosate resistance in jungle rice (<i>Echinochloa colona</i>) and alternative herbicide options for its effective control. Weed Technol 36: 38-47.	7.81
2484	Thakur P, Mavi H K and Brar A S (2022) Profitable and sustainable integration of vegetables in Paddy-Wheat cropping pattern: A successful model in Moga district of Punjab. Agril Res J 59(1): 152-56.	5.44
2485	Thakur S and Jindal V (2022) RNAi knockdown of capar gene affects survival and fecundity of Bemisia tabaci (Gennadius). J Asia Pacific Ent 25: 101940 https://doi.org/10.1016/j.aspen.2022.101940	7.30
2486	Thakur T (2022) Effect of soilless growing media compositions on quality flower production of potted Chrysanthemum (<i>Chrysanthemum morifolium</i>). Annals Plant Soil Res 24(2): 278-281.	5.22
2487	Thakur T, Singh N and Garg A (2022) Seed germination and seedling growth of annual chrysanthemum (<i>Glebionis coronaria</i> L). as influenced by priming and growing media. Curr Adv Agril Sci 14(2): 170-74.	5.12
2488	Thakur T and Dhatt K K (2022) Effect of Salinity on Seed Germination Indices and Seedling Parameters of Marigold (<i>Tagetes erecta</i>). Curr Adv Agril Sci 14(1):115	5.12
2489	Thapa S, Ritu Bala, Sharma V K, Srivastava P, Kaur J, Bromand F , Kumari P, Gupta K and Bohra Y (2022). Basis of Karnal bunt resistance in diploid and tetraploid triticeae species. Indian Phytopathol https://doi.org/10.1007/s42360-021-00448-7	5.95
2490	Thukral K, Kaur K, Suneja Y and Kaur G (2022) Distinctive characteristics of nitrogen metabolism in teosinte versus modern maize for water logging tolerance. J Plant Growth Regul https://doi.org/10.1007/s00344-022-10883-z	10.17
2491	Tiwari R K, Mittal T C, Sharma S R and Rani S (2022) Effect of the distillation methods on the chemical properties of the turmeric essential oil. J Food Process Preserv https://doi.org/10.1111/jfpp.17247	8.19
2492	Tiwari R K, Mittal T C, Singh S, Sharma S R and Rani S (2022) Design and development of solar hybrid distillation system for essential oil extraction from turmeric. J Food Process Preserv https://doi.org/10.1111/jfpp.17066	8.62
2493	Toor B S, Kaur A and Kaur J (2022) Fermentation of legumes with <i>Rhizopus oligosporus</i> : effect on physicochemical, functional and microstructural properties. Int J Food Sci Technol 57: 1763-72.	9.71
2494	Tumasyan A, Adam W, Andrejkovic J W and Kalsi A K (2022) Search for high-mass resonances decaying to a jet and a Lorentz-boosted resonance in proton-proton collisions at $\sqrt{s} = 13$ TeV. Phys Lett B 832:137263 [CMS Collaboration],	10.89
2495	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S and Kalsi A K (2022) Search for new physics in the lepton plus missing transverse momentum final state in proton-proton collisions at $\sqrt{s} = 13$ TeV. J High Energy Phys 07:067 [CMS Collaboration].	12.38
2496	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S and Kalsi A K (2022) Search for Resonances Decaying to Three W Bosons in Proton-Proton Collisions at $\sqrt{s} = 13$ TeV. Phys Rev Lett 129:021802 [CMS Collaboration].	15.16
2497	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S and Kalsi A K (2022) Search for Higgs Boson Pair Production in the Four b Quark Final State in Proton-Proton Collisions at $\sqrt{s} = 13$ TeV. Phys Rev Lett 129:081802 [CMS Collaboration].	15.16



2498	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S, Kalsi A K (2022) Search for a W' boson decaying to a vector-like quark and a top or bottom quark in the all-jets final state at $\sqrt{s} = 13$ TeV. J High Energy Phys 09:088 [CMS Collaboration].	12.38
2499	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S and Kalsi A K et al. (2022) Inclusive nonresonant multilepton probes of new phenomena at $\sqrt{s}=13$ TeV. Phys Rev D 105:112007. [CMS Collaboration],	11.30
2500	Tumasyan A, Adam W, Andrejkovic J W, Kalsi A K et al. (2022) Search for a right-handed W boson and a heavy neutrino in proton-proton collisions at $\sqrt{s}=13$ TeV. J High Energy Phys 04:047 [CMS Collaboration],.	12.38
2501	Tumasyan A, Adam W, Andrejkovic JW, Bergauer T, Chatterjee S, Kalsi A K (2022) Identification of hadronic tau lepton decays using a deep neural network. JINST 17:P07023 [CMS Collaboration].	7.42
2502	Tumasyan A, Dhingra N et al (2022) Search for invisible decays of the Higgs boson produced via vector boson fusion in proton-proton collisions at $\sqrt{s} = 13$ TeV. Phys Rev D 105, Article No. 092007 (CMS Collaboration).	11.40
2503	Tumasyan A, Dhingra N et al (2022) Search for supersymmetry in final states with two or three soft leptons and missing transverse momentum in proton-proton collisions at $\sqrt{s} = 13$ TeV. J High Energy Phys 04, Article No. 91 (CMS Collaboration)..	11.81
2504	Tumasyan A, Dhingra N et al. (2022) Inclusive nonresonant multilepton probes of new phenomena at $\sqrt{s}=13$ TeV. Phys Rev D 105, Article No. 112007. (CMS Collaboration)	11.40
2505	Tumasyan A, Dhingra N et al. (2022) Measurement and QCD analysis of double-differential inclusive jet cross sections in proton-proton collisions at $\sqrt{s} = 13$ TeV. J High Energy Phys 02, Article No. 142 (CMS Collaboration).	11.81
2506	Tumasyan A, Dhingra N et al. (2022) Measurement of the inclusive and differential higgs boson production cross sections in the decay mode to a pair of τ leptons in pp collisions at $\sqrt{s} = 13$ TeV. Phys Rev Lett 128: 081805 (CMS Collaboration).	15.16
2507	Tumasyan A, Dhingra N et al. (2022) Search for higgsinos decaying to two Higgs bosons and missing transverse momentum in proton-proton collisions at $\sqrt{s}= 13$ TeV. J High Energy Phys 05, Article No. 14 (CMS Collaboration).	11.81
2508	Tumasyan A, Dhingra N et al. (2022) Strategies and performance of the CMS silicon tracker alignment during LHC Run 2. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers. Detectors Assoc Equip 1037: 166795 (CMS Collaboration).	7.45
2509	Tyagi A, Sidhu M S, Mandal A, Kapoor S, Dahiya S, Rost J M, Pfeifer T and Singh K P (2022) Attosecond stable dispersion-free delay line for easy ultrafast metrology. Scientific Rep 12: 1-8.	10.38
2510	Tyagi S, Naresh R K, Bhatt R, Chandra M S, Alrajhi A A, Dewidar A Z and Mattar M A (2022) Tillage, water and nitrogen management strategies influence: water footprint, nutrient use efficiency, productivity and profitability of rice in typic ustochrept soil under semi-arid sub-tropical environment. Agronomy 12(5): 1186.	9.42
2511	Ubhi M K, Kaur M, Grewal J K, Oliveira A C, Garg V K and Sharma V K (2022) Insight into photocatalytic behavior of magnesium ferrite-bentonite nanocomposite for the degradation of organic contaminants. J Mater Res 38: 990-1006.	9.02
2512	Ubhi M K, Kaur M, Singh D, Javad M, Oliveira A C, Garg V K and Sharma V K (2022) Hierarchical nanoflowers of $MgFe_2O_4$, bentonite and B-,P-co-doped graphene oxide as adsorbent and photocatalyst: Optimization of parameters by Box-Behnken methodology. Int J Mol Sci 23(17): 9678.	12.20
2513	Upadhyay P, Gupta M, Sra S K, Sharda R, Sharma S, Sardana V, Akhatar J and Kaur G (2022) Genome wide association studies for acid phosphatase activity at varying phosphorous levels in Brassica juncea L. Front Plant Sci 13:1056028. doi: 10.3389/fpls.2022.1056028	11.75

2514	Utreja D, Salotra R, Kaur G, Sharma S and Kaushal S (2022) Chemistry of quinolines and their agrochemical potential. <i>Curr Org Chem</i> 26: 1895-913.	8.18
2515	Varinderpal-Singh, Mehtab-Singh and Bijay-Singh (2022) Spectral indices measured with proximal sensing using canopy reflectance sensor, chlorophyll meter and leaf colour chart for in-season grain yield prediction of basmati rice. <i>Pedosphere</i> 32(6):812-22. https://doi.org/10.1016/j.pedsph.2022.06.015	9.74
2516	Varinderpal-Singh, Kunal, Janpriya Kaur, Rajan Bhatt, Satwinderjit Kaur, Buta Singh Dhillon, K.B. Singh, Shaminder Singh, Seema Sharma, and Bijay-Singh (2022). Site-specific fertilizer nitrogen management in less and high N responsive basmati rice varieties using newly developed PAU-Leaf colour chart. <i>Commun Soil Sci Plant Anal</i> . published on-line. https://doi.org/10.1080/00103624.2022.2144346	6.77
2517	Varinderpal-Singh, Kunal, Kaur J, Bhatt R, Kaur S, Dhillon B S, Singh K B, Singh S, Sharma S and Singh B (2022) Site-Specific Fertilizer Nitrogen Management in Less and High N Responsive Basmati Rice Varieties Using Newly Developed PAU-Leaf Colour Chart. <i>Commun Soil Sci Plant Anal</i> 54(10): 1334-49.	7.33
2518	Vatta K, Bhogal S, Green A S, Sharma H, Petrie C A and Dixit S (2022) COVID-19 Pandemic-Induced disruptions and implications for national food security and farm incomes: Farm-level evidence from Indian Punjab. <i>Sustainability</i> 14(8): 4452.	9.89
2519	Verma J and Singh P (2022) Bio-Monitoring of Air Quality Using Leaf Characteristics. <i>Indian J Ecol</i> 49(6): 2404-07	5.79
2520	Verma A, Khurana R and Dixit A K 2022. Design and development of a tractor operated bio-mass incorporator. <i>Agril Mechanization Asia Afr Latin Amer</i> 53(1): 55-64.	6.14
2521	Verma A, Singh M, Parmar R P and Bhullar K S (2022) Feasibility study on hexacopter UAV based sprayer for application of environment-friendly biopesticide in guava orchard. <i>J Environ Biol</i> 43:97-104.	6.78
2522	Verma G, Dhaliwal S S and Sharma V (2022) Yield and zinc (Zn) accumulation response of Basmati rice to incremental zinc fertilization of a Zn-deficient soils. <i>Crop Pasture Sci</i> https://doi.org/10.1071/CP21391	8.29
2523	Verma N, Garcha K S, Sharma A, Sharma M and Dhatt A S (2022) Phenotypic categorization against two begomovirus infection (SqLCCV and ToLCNDV) in Cucurbita moschata Duch. <i>Ex Poir. Agril Res J</i> https://doi.org/10.5958/2395-146X.2022.00124.7	5.44
2524	Verma N, Taggar M S, Kalia A, Kaur J and Javed M (2022) Comparison of various delignification/desilication pre-treatments and indigenous fungal cellulose for improved hydrolysis of paddy straw. <i>Biotech</i> https://doi.org/10.1007/s13205-022-03211-5 .	8.41
2525	Verma T and Jhanji S (2022) Evaluation of post-harvest quality of marigold flowers after packaging and storage in different seasons. <i>Bangladesh J Bot</i> 51(2): 247-54.	6.31
2526	Verma V, Kaur M and Sharma S (2022) Insight into peroxidase and polyphenol oxidase mimetic activity of spinel ferrite nanoparticles and their GO composites. <i>Mater Chem Phys</i> 279: 125727.	10.09
2527	Verma N, Garcha K S, Sharma M, Sharma A and Dhatt A S (2022) Gene effects for begomoviruses resistance and plant architecture attributes in pumpkin (<i>Cucurbita moschata</i> Duchense). <i>Czech J Genet Plant Breed</i> 59: 67-75.	6.87
2528	Vidhi A, Pandove G, Oberoi H, Kaur S and Kalia Anu (2022) Amelioration in the quality traits of forage pearl millet (<i>Pennisetum glaucum</i>) by application of liquid microbial inoculants. <i>Indian J Anim Sci</i> 92(5): 599-603.	6.32
2529	Vij A and Mann S K (2022) Food consumption pattern of Farming families in Punjab. <i>Indian J Ext Educ</i> 58(2):21-25.	5.95
2530	Vij S, Pathak D, Rathore P, Kumar H, Sekhon PS, Bhatia D, Chhuneja P and Singh K (2022) Molecular mapping of CLCuD resistance introgressed from synthetic cotton polyploid in upland cotton. <i>J Genet</i> 101(25): 1-8.	7.51



2531	Viz L, Sharma R and Chhabra R (2022) Influence of coloured shade nets on growth and bio-chemical constituents in four species of <i>Ocimum</i> . <i>Bangladesh J Bot</i> 51(3): 547-54.	6.34
2532	Walia S S, Babu S, Gill R S, Kaur T, Kohima N, Panwar A S, Yadav D K, Ansari M A, Ravishankar N, Kumar S, Kaur K and Ansari M H (2022) Designing resource-efficient and environmentally safe cropping systems for sustainable energy use and economic returns in Indo Gangetic Plains, India. <i>Sustainability</i> 14(21):14636; https://doi.org/10.3390/su142114636	9.89
2533	Walia S S, Gill R S, Kaur T and Aulakh C S (2022) Bio-intensive complimentary cropping systems for north-west India. <i>Indian J Agril Sci</i> 92(8): 936-41.	6.37
2534	Yadav B and Thaman S (2021) Water quality and potassium and sulphur contribution through groundwater irrigation in Bathinda district of Punjab. <i>Agric Res J</i> 58(6): 1014-19.	5.44
2535	Yadav B K and Pal R K (2022) Effect of weather variability on soil temperature, enzyme activities and nutrient availability under pear tree orchard in semi-arid condition. <i>Mausam</i> 73(2): 405-12.	6.64
2536	Yadav B K and Singh P (2022) Spatial variability of bio-chemical soil properties under different land use systems at PAU, Regional Research Jewan Singh Wala Farm, Bathinda. <i>J Agril Phys</i> 22(1): 52-61	5.10
2537	Yadav B K, Grover J and Bishnoi C (2022) Spatial Knowledge and Attitude of Farmers towards Soil Testing Practices in Bathinda District of Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(2):333-36.	5.33
2538	Yadav I S, Bhardwaj S C, Kaur J, Singla D, Kaur S, Kaur H, Rawat N, Tiwari V K, Saunders D and Uauy C (2022) Whole genome resequencing and comparative genome analysis of three <i>puccinia striiformis</i> f. Sp. <i>Tritici</i> pathotypes prevalent in India. <i>PLoS One</i> 17. https://doi.org/10.1371/journal.pone.0261697 .	9.75
2539	Yadav K and Garg L (2022) Awareness and Adoption Status of Safety Measures used in Pesticide Handling by Vegetable Growers in Punjab. <i>J Comm Mobiliz Sustain Dev</i> 17(4): 1353-61.	5.65
2540	Yakubu C M, Sharma R, Sharma S and Singh B (2022). Influence of alkaline fermentation time on in vitro nutrient digestibility, bio- & techno-functionality, secondary protein structure and macromolecular morphology of locust bean (<i>Parkia biglobosa</i>) flour. <i>LWT- Food Sci Technol</i> 161: 113295.	12.06
2541	Yaqoob M, Sachdev P A and Babbar N (2022) Extraction and screening of kinnow (<i>Citrus reticulata</i> L.) peel phytochemicals grown in Punjab India. <i>Biomass Conver Biorefin</i> : https://doi.org/10.1007/s13399-021-02085-6+B146	10.05
2542	Yousuf A, Bhardwaj A and Yousuf F (2022) Development and evaluation of GIS-based runoff and sediment yield watershed scale model. <i>Arabian J Geosci</i> 15:1570. https://doi.org/10.1007/s12517-022-10863-3	7.80
2543	Zalpouri R, Singh M, Kaur P and Singh S (2022) Refractance Window Drying-a Revisit on Energy Consumption and Quality of Dried Bio-origin Products. <i>Food Engg Rev</i> 14(6): 257-70. https://doi.org/10.1007/s12393-022-09313-3 .	11.76
2544	Zhavar V K, Kandpal R P and Athwal R S (2022) Alternative promoters of <i>Grik2</i> (<i>glur6</i>) gene in human carcinoma celllines are regulated by differential methylation of CpG dinucleotides. <i>Genes</i> 13: 490. https://doi.org/10.3390/genes13030490	10.10

Sr.No.	2023	NAAS Score
2545	Akansha, Kaushal S, Arora A, Heena, Sharma P and Jangra J (2023) Chemical composition and synergistic antifungal potential of <i>Nigella sativa</i> L.seeds and <i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry buds essential oils and their major compounds, and associated molecular docking studies. <i>J Essen Oil Bear Pl</i> https://doi.org/10.1080/0972060X.2023.2220348 .	7.699
2546	Anand S, Dhaliwal L K and Suri K S (2023) Effect of different meteorological parameters on seasonal abundance of rice brown plant hopper under Punjab conditions. <i>Agric Res J</i> 60(1) : 52-58.	5.44
2547	Anju Bhushan, K and Kocher G S (2023) Preliminary Research on the Analytical and Volatile Profiles of Beers Produced with Raw Malt and Roasted Specialty Malts. <i>J Am Soc Brew Chem</i> https://doi.org/10.1080/03610470.2023.2213604	8.28
2548	Anupam, Dhillon N K, Kaur S and Buttar H S (2023) Integrated management of Meloidogyne-negraminicolain nursery beds of rice. <i>Indian Phytopath</i> 76 : 183–90.	5.95
2549	Arora K, Kumar S, Adhale P, Bhoi P B and Vatta K (2023) Addressing the impact of COVID-19 on dairy value chains: Evidence from Punjab, India. <i>Current Sci</i> 124 (5) : 570-77.	7.17
2550	Arora L, Aggarwal R, Dhaliwal I, Gupta OP and Kaushik P (2023) Assessment of sensory and nutritional attributes of foxtail millet-based food products. <i>Front Nutr</i> 10 :1146545. https://doi.org/10.3389/fnut.2023.1146545 .	12.59
2551	Arora P, Thukral R, Singla N and Bansal N (2023) Antireproductive changes instigated by efficient drug delivery via papaya seed chloroform extract-based nanoparticles in male rat <i>Bandicota Bengalensis</i> . <i>Pestic Biochem Physiol</i> . https://doi.org/10.1016/j.pestbp.2023.105408	10.63
2552	Arora R, Bons H K and Kocher G S (2023) Fermentative processing of unexploited fruit, karonda (<i>Carissa carandus</i> L.) into alcoholic beverages. <i>South African J Bot</i> 158 :73-79.	9.11
2553	Arora R, Singh P, Sarangi PK, Kumar S and Chandel A K (2023) A critical assessment on scalable technologies using high solids loadings in lignocellulose biorefinery: challenges and solutions. <i>Critical Reviews Biotechnol</i> https://doi.org/10.1080/07388551.2022.2151409	15.06
2554	Arora S, Kler T K, Kaur G and Kaur N (2023) Depredatory bird damage assessment and its management techniques in guava. <i>Erwerbs-Obstbau</i> 3-5.	7.20
2555	Aslam R, Shafiq A M, Asgar A, Yang T, Manicka M, Sivakumar (2023) A chemometric approach to evaluate the effects of probe-type ultrasonication on the enzyme inactivation and quality attributes of fresh amla juice. <i>Ultrasonic Sonochem</i> 2 :106268 https://doi.org/10.1016/j.ultsonch.2022.106268	15.64
2556	Bajaj K, Chhuneja P K, Singh J, Choudhary A and Mahindra B (2023) Assessment of Cry1AC and Cry2Ab proteins in pollen of various transgenic cotton cultivars and effect on <i>Apis mellifera</i> L. colonies. <i>J Ent Res</i> 47(2) : 245-52.	5.89
2557	Bal, SK, Gupta, R. and Bisht D (2023). Drudgery Reduction of Farm Women Through Technology Intervention. <i>J Community Mobilize Sustain Dev</i> 18(2) : 652-56.	5.67
2558	Bassi P, Kumar, V, Kaur R, Kumar S, Saini R K and Janghu S (2023) Valorisation of kinnow peel for development of phytochemical enriched tea infusion: standardisation of tea bag loading, dipping temperature and dips per minute for the better extraction of bioactive compounds. <i>Int J Food Sci Technol</i> 58 : 2715-21.	9.71
2559	Bhagat M A, Kaur N and Kaur S (2023) Effect of sowing dates on the phenology, grain yield and stress tolerance indices of barley (<i>Hordeum vulgare</i> L.) genotypes under subtropical conditions of Punjab. <i>J Agromet</i> 25 : 113-19.	6.00



2560	Bharti G, Dubey RK, Deepika R, Dubey M and Singh S (2023) Evaluation of Indoor Ornamental Plants Suitable for Indoor Vertical Garden in Response to Different Nutrient Formulations. <i>Indian J Ecol</i> 50 (3): 690-94.	5.79
2561	Bhatt R, Oliveira M W, Verma K K, Garg A K, Kaur G, Laing A M, Chandra M S and Majumdar D (2023) Challenges, scope, and upcoming strategies for direct seeding of rice: A global meta-analysis. <i>AMA-Agric Mech Asia Africa Latin America</i> 50 (4): 12825-63.	6.29
2562	Bisht, D, Martolia D and Bal S K (2023) Buying practices followed by homemakers of Ludhiana city. <i>J Community Mobilize Sustain Dev</i> 18 (2): 565-72.	5.67
2563	Biswas S, Bhullar M B and Kaur P (2023) Five new records and distribution of predatory mite fauna (Arachnida: Acari) associated with crop ecosystems of Northern India. <i>Intl J Tropic Insect Sci</i> 43 (3): https://doi.org/10.1007/s42690-023-01040-4 .	6.85
2564	Bolagram R and Dhatt K K (2023) Exploitation of heterosis in a diallel crosses of periwinkle (<i>Catharanthus roseus</i>) for morphological traits. <i>Indian J Agric Sci</i> 93 (5): 495-00.	6.37
2565	Bons H K and Sharma A (2023) Impact of foliar sprays of potassium, calcium, and boron on fruit setting behavior, yield, and quality attributes in fruit crops: a review. <i>J Plant Nutri</i> 46 (3): 3232-46.	8.28
2566	Brar H S and Singh M (2023) Energy budgeting and productivity response of cotton-wheat cropping system to mechanical sub-soiling, Energy Sources, Part A. <i>Recov Uti Env Effect</i> 45 (3): 8507-18. https://doi.org/10.1080/15567036.2023.2227590	8.90
2567	Brar J S, Das P, Adhikary T and Khehra S (2023) Energy assessing and optimising energy efficiency of pear orchards in north-western India. <i>Scient</i> 3 (3):337-51.	7.72
2568	Brar S K, Dhaliwal S S, Sharma V, Sharma S and Kaur M (2023) Replacement of rice-wheat cropping system with alternative diversified systems concerning crop productivity and their impact on soil carbon and nutrient status in soil profile of north-west India. <i>Cogent Food Agric</i> https://doi.org/10.1080/23311932.2023.2167483	8.31
2569	Brar S K, Dhaliwal S S, Sharma V, Sharma S, Kaur M (2023) Soil quality assessment in diversified long-term experimentation under different agriculturally based cropping systems. <i>J Soil Sci Plant Nutri</i> https://doi.org/10.1007/s42729-023-01134-5	9.87
2570	Burange P S, Behere G T and Firake D M (2023) Cerambycidae from selected sites of north India. <i>Indian J Ent</i> 82 (3): 435-3.38.	5.89
2571	Buttar H S, Dhillon N K, Kaur S and Anupam (2023) Effects of root-knot nematode (<i>Meloidogyne incognita</i>) population densities on the growth of cucumber. <i>Indian Phytopath</i> 76 : 303–07.	5.95
2572	Buttar H S, Singh A, Sirari A and Sharma S (2023) Pod rot of mungbean in Punjab, India: First record of association of <i>Fusarium equiseti</i> and <i>Fusarium chlamydosporum</i> . <i>Crop Protect</i> : 168 :106230	9.04
2573	Buttar H S, Singh A, Sirari A, Anupama, Kaur K, Kumar A, Lal M K, Tiwari R K and Kumar R (2023) Investigating the impact of fungicides and mungbean genotypes on the management of pod rot disease caused by <i>Fusarium equiseti</i> and <i>Fusarium chlamydosporum</i> . <i>Front Plant Sci</i> 14 : 1164245	12.62
2574	Chahal T S(2023) Effect of rootstock on plant growth, fruit yield and quality of sweet orange cv. early gold under central zone of Punjab. <i>Agric Res J</i> 60 (2): 211-16.	5.44
2575	Chahal T S, Singh J, Gill P P S, Grewal S K, Sinha A (2023) Seasonal variations in biochemical and antioxidant properties in 'Daisy' Tangerine fruits during fruit development. <i>Erwerbs-Obstbau</i> https://doi.org/10.1007/s10341-023-00881-0	7.21

2576	Chander S and Kumar K (2023) Optimization of IBA dose for rooting in fig (<i>Ficus carica</i> L.) cuttings. <i>Int J Med Aromat Plants</i> 9(1) : 105-08.	5.10
2577	Chandi A K, Kaur A and Chandi R S (2023) Effect of insecticides on locomotory behaviour and enzyme activity of <i>Spodoptera litura</i> (Fabricius) populations from Punjab. <i>J Environ Biol</i> 44 : 214-19.	5.57
2578	Chandora R, Singh M, Kumar S, Kaushik S K, Phogat B S, Raiger H L, Gill R K, Kanishka R C, Singh B, Negi N, Singh D, Tiwari J K, Murthy N, Anand S R, Misra D, Sutalia J M, Bhardwaj R, Bhingarde M T, Prajapati N, Chaudhary A N and Tripathi R M (2023) Notification of crop varieties and registration of germplasm, Quinoa variety, Him Shakti. <i>Indian J Genet</i> 83 (1) : 150.	6.47
2579	Charaya A, Chawla N, Dhatt AS, Sharma M, Sharma S and Kaur I (2023) Evaluation of biochemical composition of hulled and hull-less genotypes of pumpkin seeds grown in sub-tropical India. <i>Helion</i> 9 : e12995	9.77
2580	Chaudhary V, Katyal P, Puniya A K, Panwar H, (2023) Pilot-scale process to produce bio-pigment from <i>Monascus purpureus</i> using broken rice as substrate for solid-state fermentation. <i>European Food Res Technol</i> 1-11.	9.50
2581	Chauhan B S, Mahajan G (2023) Herbicide options for the management of Navua sedge (<i>Cyperus aromaticus</i>) plants established through seeds. <i>Agric</i> 12(10) : 1709.	9.41
2582	Chhabra R, Sharma R, Hunjan M S, Sharma V K, Sharma P and Chauhan S K (2023) Micro-structural and metabolic variations induced by <i>Bipolaris oryzae</i> inciting brown spot disease of rice. <i>Cereal Res Communic</i> https://doi.org/10.1007/s42976-023-00351-z	7.24
2583	Chhabra R, Sharma R, Hunjan M S, Sharma V K, Thakur S and Chauhan S K (2023) Efficacy of botanical extracts on imparting systemic acquired resistance against rice sheath blight incited by <i>Rhizoctonia solani</i> . <i>J Plant Dis Prot.</i> https://doi.org/10.1007/s41348-023-00722-y	7.85
2584	Chhabra R, Sharma R, Hunjan M, Sharma V K, Thakur S and Chauhan S (2023) Efficacy of botanical extracts imparting systemic acquires resistance against rice sheath blight incited by <i>Rhizicitoniasolani</i> . <i>J Plant Dis Protect</i> 130 : 551–69.	6.95
2585	Chhabra R, Sharma R, Kaur A and Sharma V K and Thakur S (2023) Phytochemical characterization and antifungal ability of three meliaceae species against <i>Bipolaris oryzae</i> . <i>Agri Res J</i> 60(1) : 146-52.	5.44
2586	Choudhary A, Kumar A, Nirmaljit Kaur A and Kaur H (2023). Molecular cues of sugar signaling in plants. <i>Physiol Plant</i> 174(1) : e13630.	10.50
2587	Choudhary A, Kumar A, Nirmaljit Kaur, Sharma A and Kaur H (2023) Cushion of mathematical modeling – more reliable approach for biochemical analysis in evaluating salinity stress tolerance in wheat. <i>Plant Growth Regul</i> https://doi.org/10.1007/s10725-023-01021-0	9.24
2588	Choudhary AK, Singh N and Singh D (2023) Mass multiplication and shelf life of <i>Trichoderma asperellum</i> in Talc based bioformulation. <i>Agri Res J</i> 60 (2) : 318-21.	5.44
2589	Dadhich B K, Panda B and Sidhu M S (2023) Nanodiamonds enable femtosecond-processed ultrathin glass as a hybrid quantum sensor. <i>Scient Rep</i> 13 , 6286. https://doi.org/10.1038/s41598-023-30689-7	11.00
2590	Devi K S, Banta G and Jindal V (2023) Technique to deliver dsRNA in <i>Bemisia tabaci</i> nymphs and its validation through silencing of juvenile hormone esterase gene. <i>J Appl Ent</i> https://doi.org/10.1111/jen.13147	7.90



2591	Dhaliwal S S, Sharma V, Shukla A K, Gupta R K, Verma V, Kaur M, Behera S K, Singh P (2023) Residual effect of organic and inorganic fertilizers on growth, yield and nutrient uptake in wheat under a basmati rice-wheat cropping system in North-Western India. <i>Agric</i> . https://doi.org/10.3390/agriculture13030556	9.60
2592	Dhaliwal S S, Sharma V, Shukla A K, Kaur J, Gupta R K, Verma V, Kaur M, Singh V K, Singh P (2023) Interactive effect of land use systems on depth-wise soil properties and micronutrients minerals in North-Western, India. <i>Heliyon</i> . https://doi.org/10.1016/j.heliyon.2023.e13591	9.78
2593	Dhaliwal S S, Sharma V, Shukla A K, Kaur, Behera S K, Verma V, Kaur L and Verma G (2023) Optimization of phosphorus (P) induced zinc (Zn) deficiency in low and high P soils and monitoring their effect on productivity, Zn and P uptake by wheat (<i>Triticum aestivum</i> L.) <i>J Plant Nutri</i> 46(6) : 917-28. https://doi.org/10.1080/01904167.2022.2144365	8.28
2594	Dhaliwal S S, Sharma V, Shukla A K, Verma V, Kaur M, Alsuhaibani A M, Gaber A, Singh P, Laing A M and Hossain A (2023) Minerals and chelated-based manganese fertilization influences the productivity, uptake, and mobilization of manganese in wheat (<i>Triticum aestivum</i> L.) in sandy loam soils. <i>Front Plant Sci</i> https://doi.org/10.3389/fpls.2023.1163528	12.63
2595	Dhaliwal S S, Sharma V, Shukla AK, Verma V, Kaur M, Singh P, Gaber A, Hossain A (2023) Effect of addition of organic manures on basmati yield, nutrient content and soil fertility status in north-western India. <i>Heliyon</i> . https://doi.org/10.1016/j.heliyon.2023.e14514	9.78
2596	Dhall R K, Kaur H and Manchanda P (2023) Genetics and marker-assisted breeding for sex expression in cucumber. <i>Frontiers in Genetics</i> 14 : 1180083. https://doi.org/10.3389/fgene.2023.1180083	10.77
2597	Dhand A and Garg N (2023) Genotype × Environment interaction using AMMI and MTSI analysis for growth and yield attributes of radish (<i>Raphanus sativus</i> L.) under high temperature stress conditions of North Indian plains. <i>Sci Hort</i> 313 , 111880, https://doi.org/10.1016/j.scienta.2023.111880	10.34
2598	Dhanger P, Khurana R, Dixit A K, Singh M and Mahal A K (2023) Performance evaluation of an electronically controlled tractor-operated applicator for liquid urea application. <i>Indian J Agric Sci</i> 93 (2) : 190-94.	6.37
2599	Dhanoa R K, Moslehian M S and Singh M (2023) A generalized Wigner–Yanase skew information, <i>Linear and Multilinear Algebra</i> 71(10) :1720-1729.	7.11
2600	Dharni K and Rathore R (2023) Status and trends of production and exports of Hives products from India. <i>Indian J Econ Dev</i> 19(1) : 209-15.	5.15
2601	Dhatt K K, Jhanji S and Kaur G (2023) Assessment of priming of cormels with plant growth substances on vegetative growth and cormel-associated traits in gladiolus. <i>Annals Plant Soil Res</i> 5(2) : 304-09.	5.22
2602	Dhillon B S and Ram H (2023) Improving nitrogen use efficiency and productivity through sowing environment and cutting stage in dual purpose barley (<i>Hordeum Vulgare</i> L.). <i>Cereal Res Communic</i> 51 : 249-62.	7.24
2603	Dhillon G K, Kour A and Salazar B M (2023) Potential of <i>Pleurotus ostreatus</i> as a novel protein source in rice-millet-based gluten-free muffins. <i>Cog Food Agric</i> 9(1) : 2191888.	8.31
2604	Dhillon N K, Kaur S, Anupam, Buttar H S, Singh K, Singh P, Khapte S and Kumar P (2023) Management of Root-Knot Nematode with Non-Chemical Methods for Sustainable Production of Cucumber under Protected Cultivation. <i>Agron</i> 13 : 124.	9.42

2605	Dhillon N K, Kaur Sukhjeet, Anupam, Buttar HS, Singh K, Khapte P S, Kumar P (2023) Management of Root- Knot Nematode with Non-Chemical Methods for Sustainable Production of Cucumber under Protected Cultivation. <i>Agron</i> 13 : 124. https://doi.org/10.3390/agronomy13010124	9.95
2606	Dhingra N (2023) Gamma-Ray Spectrometry for the Measurement of Mass Attenuation Coefficient and Bulk Density of Soil: A Review. <i>Communic Soil Sci Plant Anal</i> . https://doi.org/10.1080/00103624.2023.2223650 .	7.58
2607	Dudeja I, Mankoo R K and Singh A (2023) Citric acid crosslinked ternary blended (polyvinyl alcohol, lignin, lemongrass essential oil/nanoemulsions) biopolymeric hydrogel films: structural, functional, antioxidant, antifungal and biodegradable properties. <i>J Food Meas</i> 1-15 https://doi.org/10.1007/s11694-023-01905-9	9.61
2608	Dudeja I, Mankoo R K, Singh A and Kaur J (2023) Development, characterisation and biodegradability of rice straw lignin based sustainable biopolymeric films. <i>Int J Food Sci Technol</i> 58 : 2754-63.	9.61
2609	Ekta and Utreja D (2023) Sulfonamide functionalized silica nano-composite: characterization and fluorescence “turn-on” detection of Fe ³⁺ ions in aqueous samples. <i>Photochem Photobiol Sci</i> . 1-13.	10.33
2610	Ekta, Utreja D, Sharma S (2023) Computational Studies and Fluorescent Turn off Sensing of Biologically Important Cu ²⁺ Ion in Irrigation Water by Schiff Base. <i>Chem Select</i> 8(22) : e202204038.	8.30
2611	Gaikwad P N, Sharma V, Singh J, Sidhu G S, Singh H and Omar AA (2023) Biotechnological advancements in Phytophthora disease diagnosis, interaction and management in citrus. <i>Scientia Horticulturae</i> 310 https://doi.org/10.1016/j.scienta.2022.111739 .	10.34
2612	Garg A K (2023) Review of changes in soil chemical and biological characteristics when farming practices switch from conventional to organic. <i>Env Eco</i> 41 (2) : 1276-81.	5.25
2613	Garg N, Pandove G, Kalia A, Pandey V, Mahala P (2023) Differential effects of plant growth-promoting rhizobacteria used as soil application vis-à-vis root dip of seedlings on the performance of onion (<i>Allium cepa</i> L.) in three distinct agro-climatic zones of Indian Punjab. <i>Communic Soil Sci Plant Analys</i> . https://doi.org/10.1080/00103624.2022.2072507	7.33
2614	Garima and Sandhu S S (2023) Phenology, growth and productivity of rice (<i>Oryza sativa</i> L.) under reduced sunlight intensity and foliar nitrogen application. <i>J Agromet</i> 25(1) : 98-04.	6.00
2615	Gharu H S, Sangha M K and Walia G S (2023) Biochemical evaluation of micro-greens and seeds of Punjab Celery 1. <i>Agri Res J</i> 59(4) : 738-45.	5.44
2616	Gill J, Jindal V and Sangha K S (2023) Molecular characterization of <i>Trichogramma</i> spp. in sugarcane ecosystem in Punjab. <i>Indian J Agric Sci</i> 93(6) : 659-63.	6.80
2617	Gowthamchand, Dhaliwal S S, Sharma V, Verma G, Singh J and Kaur M (2023) Variation of Physico-Chemical Properties among Different Soil Orders under Different Land Use Systems of the Majha Region in North-Western India. <i>Sustainability</i> 15 :4779 https://www.mdpi.com/journal/sustainability	9.25
2618	Goyal H, Gill M S, Gill P P S, Jawandha S K, Singh N P (2023) Changes in Physicochemical and Enzymatic Activities of Mango Hybrids During Fruit Ripening. <i>Erwerbs-Obstbau</i> 65 : 355–62.	7.21
2619	Goyal M, Kaur H and Singh D P (2023) Biochemical profiling of geographically diverse cowpea genotypes for nutritional quality and photochemical and antioxidant potential. <i>Agri Res J</i> 59(6) : 1010-19.	6.15



2620	Goyal M, Kaur H D, Kaur A D and Kapoor R (2023) Nutritional and yield potential of oat (<i>Avena sativa</i> L.) genotypes in dual-purpose crop system. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-022-00348-0	7.24
2621	Goyal P, Kumar S and Sharda R (2023) A review of the Artificial Intelligence (AI) based techniques for estimating reference evapotranspiration. <i>Curr Trend future perspective Comp Electron Agric</i> . 209, 107836, https://doi.org/10.1016/j.compag.2023.107836 .	12.76
2622	Goyal P, Sharda R, Siag M and Biwalkar N (2023) Development of the crop coefficient for vertically trained cucumber vines grown in soilless media under naturally ventilated greenhouse conditions <i>Irrig Drain</i> . https://doi.org/10.1002/ird.2793	7.42
2623	Grewal J K, Kaur M, Ubhi M K, Oliveira A C, Garg V K and Sharma V K (2023) Structural, magnetic and photocatalytic properties of core-shell reversal nanocomposites of titanium doped strontium ferrite and silica. <i>J Mater Res</i> 38 : 1919-34.	9.02
2624	Grewal S K, Sharma K P, Bharadwaj R D, Hegde V, Sidhu SK, Singh S, Jain PK, Rasool S, Arya D K, Agrawal P K and Mondal B (2023) Characterization of chickpea cultivars and trait specific germplasm for grain protein content and amino acids composition and identification of potential donors for genetic improvement of its nutritional quality. <i>Plant Genet Resour</i> . https://doi.org/10.1017/S147926212300028X	7.28
2625	Gudi S, Saini D K, Halladakeri P, Singh G, Singh S, Kaur S, Goyal P, Srivastava P, Mavi G S and Sharma A (2023) Genome-wide association study unravels genomic regions associated with chlorophyll fluorescence parameters in wheat (<i>Triticum aestivum</i> L.) under different sowing conditions. <i>Plant Cell Rep</i> . https://doi.org/10.1007/s00299-023-03041-6 .	10.96
2626	Gupta R K, Bhatt R, Sidhu M S, Dhingra N et al., (2023) Evaluating Biogas Slurry for Phosphorus to Wheat in a Rice–Wheat Cropping Sequence. <i>J Soil Sci Plant Nutrit</i> . https://doi.org/10.1007/s42729-023-01293-5 .	9.61
2627	Gupta V, Gupta M, Sandhu S S, Singh M, Kaur S, Bharat R, Singh A P, Singh P and Singh B (2022) Evaluation of wheat varieties and their validation through CERES-Wheat model under lower foothills of Shivalik range of N-W Himalayas. <i>Agric Mech Asia, Africa Latin America</i> 53(02) : 6051-65.	6.14
2628	Haider M W, Kaur J, Bala R, Singh S, Srivastava P, Sharma A, Singh R and Kumari J (2023) Stripe rust resistance gene(s) postulation in wheat germplasm with the help of differentials and tagged molecular markers. <i>Scient Rep</i> 13 :9007 https://doi.org/10.1038/s41598-023-37367-8 .	11.00
2629	Harish G N, Singh R and GK Taggar (2023). Screening technique to evaluate soybean resistance to whitefly, Bemisia tabaci (Gennadius) under screen-house conditions. <i>J Ent Res</i> 47(2) : 309-16.	5.89
2630	Hilli H J, Kapoor R, Singla A, Sharma P and Srivastava P (2023) Towards mapping of Helminthosporium leaf blight /Pyrenophora leaf spot resistance genes/QTLs in oats. <i>Cereal Res Commun</i> 51 :471–81.	7.24
2631	Ingle YV, Arora Anita, Kakoti RK and Patil Prakash (2023) Eco-friendly management of Phytophthora root rot and gummosis in mandarin. <i>Indian J Ecol</i> 50 : 706-11.	5.79
2632	Izhar T, Chakraborty M, Prasad Y, Ali N, Kapoor R and Gupta S K (2023) Production and genetic characterization of interspecific hybrids between pearl millet <i>Pennisetum glaucum</i> (L.) × Napier grass <i>Pennisetum purpureum</i> (K.) <i>The Pharma Innov J</i> 12(6) : 1789-92.	5.23
2633	Jain S, Singla N, Kalra S and Mahal A K (2023) Effectiveness of Different Management Strategies against Nilgai Population (<i>Bosela phustragocamelus</i>) in Punjab Province of India. <i>Anim Biol J</i> 73 : 43-64. DOI 10.1163/15707563-bja10096	7.48

2634	Jhanji S, Gaur K and Dhatt K K (2023) Evaluation of corm treatments with benzyladenine and gibberellic acid on growth and flowering attributes of gladiolus. <i>Agric Res J</i> 60(2) : 238-45.	5.44
2635	Jhanji S, Kaur G, Kaur R and Dhatt U K (2023) Physiological and biochemical changes during flower development and senescence in Chrysanthemum and Gladiolus. <i>Acta Physiol Plant</i> 45 : 14.	8.74
2636	Joshi S, Bathla S, Singh A, Sharma M, Inbaraj S B and Sridhar K (2023) Development of mung bean (<i>Vigna radiate</i> L.) based next-generation vegan milk: Processing, nutritional composition and quality attributes. <i>Intl J Food Sci Technol</i> 58(2) : 785-94.	9.61
2637	Joshi S, Sharma S, Sharma R, Gupta A and Kumar R (2023) Influence of pre-gelatinization in conjunction with guar gum addition on texture functionality, bioactive profile, in vitro nutrient digestibility, morphology and secondary structure of protein of quality protein maize pasta. <i>Intl J Food Sci Technol</i> 58 : 3448-57.	9.61
2638	Kalsi A K, Tumasyan A, Adam W, Andrejkovic JW et al (2023) Search for heavy resonances and quantum black holes in $e\mu$, $e\tau$, and $\mu\tau$ final states in proton-proton collisions at $\sqrt{s}=13$ TeV. <i>J High Energy Physics</i> 5 : 227	12.38
2639	Kalsi B S, Singh S, Alam M S, and Bhatia S (2023) Microwave Drying Modelling of Stevia rebaudiana Leaves Using Artificial Neural Network and Its Effect on Color and Biochemical Attributes. <i>J Food Qual.</i> 2811491, https://doi.org/10.1155/2023/2811491	9.20
2640	Kapil S, Mankoo R K, Dudeja I, Singh A and Kaur J (2022) Structural, antioxidant, antibacterial and biodegradation properties of rice straw xylan (native and modified) based biofilms. <i>Intl J Food Sci Technol.</i> https://doi.org/10.1111/ijfs.16118	9.61
2641	Kapoor A, Kapoor S and Aggarwal P (2023) Rheological, microstructural and biochemical characterisation of fruit pomace jams. <i>J Food Meas Charact</i> 1-13.	9.01
2642	Kapoor S, Gandhi N, Kaur G, Khatkar S K, Bala M, Nikhanj P and Sharma D (2023) Electropray application of guava seed oil for shelf life extension of guava fruit. <i>Int J Food Sci Technol</i> 58 : 2669-78.	9.12
2643	Karedla A K, Choudhary A, Singh J and Chhuneja P K (2023) Effect of sub-lethal doses of <i>thiame thoxam</i> on the memory of <i>Apis mellifera</i> Linnaeus. <i>Current Sci</i> 124(4) : 451-56.	6.76
2644	Kasniya PK, Singh M, Romana BS and Singh A.2022. Survey and Occurrence of Major Biotic Stresses of Rice in Sangrur District of Punjab. <i>Indian J Ecol</i> 49(6) : 2105-11.	5.79
2645	Katyal P, Bhardwaj R, Sharma S, Sekhon JR, Neemisha Pathania, Pratibha Vyas, Shammi Kapoor and Gurvinder Singh Kocher (2023). Microbial decomposer assisted in situ degradation of surface retained paddy straw. <i>Int J Recycl Org Waste Agric</i> 12 (3) : 467-75.	6.68
2646	Kaul A, Singh B and Singh M (2023) Weed management with pre and post-emergence herbicide in kharif maize in sub mountainous areas of Punjab, India. <i>Indian J Weed Sci</i> 55(1) : 32-35.	5.84
2647	Kaur A, Chhabra R, Sharma R, Sharma VK, Sharma P and Khattar N (2023) Botanical extracts: A step towards eco friendly pest management strategy. <i>Agric Res J</i> 60 (2) : 167-76.	5.44
2648	Kaur A, Kaur M, Singh V and Vyas P (2023) Nanocomposites of Ferrites with TiO ₂ , SiO ₂ and Carbon Quantum Dots as Photocatalysts for Degradation of Organic Pollutants and Microbes. <i>Magnetochem</i> 9(5) : 127.	9.38



2649	Kaur A, Sharma V K, Rani Ritu, Hunjan M S (2023) Morpho-molecular characterization based diversity analysis of Bipolaris isolates infecting graminaceous hosts. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-023-00409-y	7.24
2650	Kaur A, Singh K B, Gupta, R K, Alataway A, A Z Dewidar and M A Mattar (2023) Interactive Effects of Nitrogen Application and Irrigation on Water Use, Growth and Tuber Yield of Potato under Subsurface drip irrigation. <i>Agron</i> 13(1) : 11, https://doi.org/10.3390/agronomy13010011	9.40
2651	Kaur A, Singh K B, Brar A S, Gupta R K, Kingra P K. (2023) Interactive effect of nitrogen and irrigation on evapotranspiration, growth, yield and water productivity of subsurface drip-irrigated spring maize: Field and simulation studies. <i>Irrig Drain</i> . https://doi.org/10.1002/ird.2812	7.42
2652	Kaur A, Singh R and Singh P (2023) Plant Spacing Combined with Nitrogen Nutrition Affects Loose Flower Production in Rosa gruss-an-teplitz Under Open Conditions. <i>Int J Environ Climat Change</i> 13(8) :771-76.	5.13
2653	Kaur B, Boparai A K and Singh K (2023) Effect of integrated nutrient sources on agronomic performance of onion (Onion Cepa L) and soil properties. <i>Indian J Ecol</i> 50 : 367-71.	5.79
2654	Kaur B, Garcha KS, Sandhu JS, Sharma M and Dhatt AS (2023) Interspecific hybridization for transfer of hull-less seed trait from <i>Cucurbita pepo</i> to <i>C. moschata</i> . <i>Scient Rep</i> 13 : 4627.	11.00
2655	Kaur B, Kaur N and Yousuf A (2023) Projections in extreme maximum and minimum temperature events for Jalandhar district of Punjab. <i>J Agric Phys</i> 22 : 31-37.	5.10
2656	Kaur D, Grewal S K, Bhardwaj R D, Singh S (2023) Insights into changes of enzyme activity for maintaining redox homeostasis in chickpea under water deficit stress. <i>Acta Physiol Plant</i> 45 : 7. https://doi.org/10.1007/s11738-022-03480-w	8.74
2657	Kaur G and Jhanji S (2023) Plant growth regulators improved cutting induced physio-biochemical responses to postponement senescence in chrysanthemum. <i>Indian J Exp Biol</i> 61(6) : 450-62.	6.94
2658	Kaur G and Jhanji S (2023) Plant growth regulators preserved the longevity of cut stems of <i>Chrysanthemum morifolium</i> by orchestrating physio-biochemical and anatomical responses. <i>Plant Physiol Biochem</i> 196 : 1098-110.	11.74
2659	Kaur G and Singla N (2023) Mitigating neophobia behaviour of <i>Bandicota bengalensis</i> in accepting poison bait and traps using sulphur compounds as additives. <i>App Animal Behav Sci</i> 264 https://doi.org/10.1016/j.applanim.2023.105947	8.57
2660	Kaur G, Kaur G and Kaur P (2023) Moisture sorption isotherms characteristics for shelf-life prediction of peanuts (<i>Arachis Hypogaea</i> L.). <i>J Sci Food Agric</i> . https://doi.org/10.1002/jsfa.12475 :1-16.	8.23
2661	Kaur G, Sharma N, Singh A, Kapoor S and Khatkar S K (2023) Ultrasound-assisted micro-emulsions of anthocyanins extracted from black carrot pomace and its utilisation as functional component in kulfi: implication on in vitro release, bio-functional components and rheological characteristics. <i>Int J Food Sci Technol</i> 58 : 2744-53.	9.61
2662	Kaur G, Taggar M S and Kalia A (2023) Cellulase-immobilized chitosan-coated magnetic nanoparticles for saccharification of lignocellulosic biomass. <i>Env Sci Pollut Res</i> . https://doi.org/10.1007/s11356-023-27919-w	11.19
2663	Kaur Gurjeet, Sidhu Gagandeep Kaur and Kaur Preetinder (2023) Moisture sorption isotherms characteristics for shelf-life prediction of peanuts (<i>Arachis Hypogaea</i> L.). <i>J Sci Food and Agric</i> . https://doi.org/10.1002/jsfa.12475	10.13

2664	Kaur H and Gupta N and Kaur G (2023) Sole and combined effect of micronutrients on germination and seedling growth attributes of sweet corn (<i>Zea mays</i> L. <i>saccharata</i>). <i>J Plant Nutr</i> 46 : 2473-87. https://doi.org/10.1080/01904167.2022.2155558	8.28
2665	Kaur H, Dhall R K, Sharma P (2023) Association studies in pea for yield and yield attributing traits. <i>Genetika</i> 55: 373-85. https://doi.org/10.2298/GENSR2301373K .	6.75
2666	Kaur H, Goyal M, Kaur A and Kapoor Rahul (2023) Nutritional and yield potential of oat (<i>Avena sativa</i> L.) genotypes in dual purpose crop system. <i>Cereal Res Communic.</i> https://doi.org/10.1007/s42976-022-00348-0	7.24
2667	Kaur H, Kaur J, Bala R, Srivastava P, Raheja S and Biswas B (2023) Evaluation of monogenic lines with known Lr genes and commercial wheat cultivars for leaf rust (<i>Puccinia triticina</i>) resistance across different environments in Punjab, India. <i>Cereal Res Communic.</i> https://doi.org/10.1007/s42976-023-00405-2	7.24
2668	Kaur H, Manchanda P, Kumar P, Dhall R K., Chhuneja, P and Weng Y (2023) Genome-wide identification and characterization of parthenocarpic fruit set-related gene homologs in cucumber (<i>Cucumis sativus</i> L.). <i>Scient Rep</i> 13: 2403. https://doi.org/10.1038/s41598-023-29660-3 .	11.00
2669	Kaur H, Oberoi H K, Ganapathy K N and Bhardwaj R (2023) Effect of popping and malting processing techniques on physiochemical, antinutrients and antioxidant properties of millets flour. <i>J Food Sci Technol</i> https://doi.org/10.1007/s13197-023-05758-4	9.61
2670	Kaur J and Dharni K (2023) Data Mining Based Stock price prediction using hybridization of technical and fundamental analysis. <i>Data Tech App.</i> https://doi.org/10.1108/DTA-04-2022-0142 .	7.67
2671	Kaur J and Pandove G (2023) Understanding the beneficial interaction of plant growth promoting rhizobacteria and endophytic bacteria for sustainable agriculture: a bio-revolution approach. <i>J Plant Nutri.</i> https://doi.org/10.1080/01904167.2023.2206425 .	8.28
2672	Kaur J, Bedi S, Singh R and Singh T (2023) Effect of priming on enhancing storability of high and low vigour brinjal (<i>Solanum melongena</i> L.) seeds. <i>J Appl Hortic</i> 25(1): 48-53.	5.13
2673	Kaur J, Jawandha S K, Gill P P S, Grewal S K, Singh H, Adhikary T (2023) Beeswax enriched gibberellic acid coatings preserve antioxidant properties and quality of lemon fruit under cold storage condition. <i>Acta Physiol Plant</i> 45: 93 https://doi.org/10.1007/s11738-023-03567-y	8.74
2674	Kaur J, Jawandha SK, Gill PS, Jan Z, Grewal SK (2023) Composite coatings of beeswax+ naphthalene acetic acid preserved fruit quality and antioxidants in stored lemon fruits. <i>Food Sci Biotech.</i> https://doi.org/10.1007/s10068-023-01364-4	9.23
2675	Kaur J, Keshani and GS Kocher (2023) Processing a New Functional Beer with Added Yeast Isolated from Northwestern Himalayas. <i>Acta Sci Nutril Health</i> 7 (4): 16-22.	7.32
2676	Kaur J, Singh B and Singh A (2023) Sorghum–mung bean combination snacks: Effect of extrusion temperature and moisture on chemical, functional, and nutritional characteristics. <i>Legume Sci</i> e186 https://doi.org/10.1002/leg3.186	11.60
2677	Kaur J, Kaur Navneet, Sandhu S K, Kaur H (2023) Microclimate and thermal indices of Garden Pea (<i>Pisum sativum</i> L.) under poplar (<i>Populus deltoides</i> Bartr.) based agroforestry system. <i>J Agromet</i> 25(2): 330-32.	6.00



2678	Kaur J, Taggar M S, Kalia A, Sanghera G S, Kocher G S and Javed M (2023) Valorization of sugarcane bagasse into fermentable sugars by efficient fungal cellulolytic enzyme complex. <i>Waste Biomass Valor</i> 14 (3): 963-75. https://doi.org/10.1007/s12649-022-01918-3	9.70
2679	Kaur J, Kaur K and Sharma M (2022) Knowledge level of rural women regarding safe and judicious use of chemicals at household level. <i>J Comm Mobiliz Sustain Dev</i> 18 (1):328-30.	5.30
2680	Kaur K, Kler T K and Sandhu S K (2023) T-perches determining avian feeding guilds in maize crop. <i>Indian J Entomol.</i> https://doi.org/10.55446/IJE.2023.700 .	5.08
2681	Kaur K, Kumar S, Kaur P, Saini M K, Singh A, Bala M and Singh D (2023) Optimization of process parameters for ozone disinfestation of <i>C maculatus</i> : effects on germination, in vitro protein digestibility, nutritional, thermal and pasting properties of mung bean grains. <i>Ozone: Sci Eng</i> https://doi.org/10.1080/01919512.2023.2210615	8.60
2682	Kaur K, Mavi G S, Bhagat I, Sharma A, Srivastava P, Kaur H and Sohu V S (2023) Phenotypic Evaluation of Grain Zinc Enhanced Wheat Lines for Agronomic and Quality Traits. <i>Indian J Agric Res</i> 57 :1 30-34.	5.27
2683	Kaur M, Bhardwaj R D, Singla P, Kaur S and Grewal S K (2023) Drought stress-induced alterations in source–sink relationships in barley during grain development. <i>Gesunde Pflanzen</i> https://doi.org/10.1007/s10343-023-00887-4 .	8.08
2684	Kaur M, Bhatia S, Gupta U, Decker, E, Tak Y, Bali M and Bala S (2023) Microalgal bioactive metabolites as promising implements in nutraceuticals and pharmaceuticals: inspiring therapy for health benefits. <i>Phytochem Rev.</i> 1-31	13.70
2685	Kaur M, Gaba J, Singh K, Bhatia Y Singh A and Singh N (2023) Recent Advances in Recognition Receptors for Electrochemical Biosensing of Mycotoxins-A Review. <i>Biosensors</i> 13 (3): 391.	11.74
2686	Kaur M, Sharma M, Dhatt A S, Sharma A, Khosa J S, Meena O P, Chawla N and Sidhu M K (2023) Evaluation of F1 hybrids for horticultural and quality traits and pumpkin yellow vein mosaic disease resistance in pumpkin. <i>Ind J Hort</i> 80 : 64-70.	6.00
2687	Kaur M, Singh D and Singh T (2023) Do attributes of happy seeder technology influence its adoption speed? An investigation using duration analysis in Northern India. <i>Intl J Agric Sustainabil</i> 21 :1, 2198324, DOI: 10.1080/14735903.2023.2198324	9.51
2688	Kaur N, Aggarwal P, Kumar V and Kaur S (2023) Ultrasound-Assisted Extraction of Phytochemicals from Java Plum (<i>Syzygium cumini</i> L.) Pomace: Process optimization, phytochemical characterization using HPLC, FTIR, SEM and mineral profiling. <i>Waste Biomass Valorization</i> 14 (3): 949-61.	9.45
2689	Kaur P, Zalpouri R, Modi R, Sahota P P, Dhillon T S and Sidhu Kaur A (2023) Development and standardization of processing technique for ready-to-use lab fermented Kanji mix using refractance window dried black carrot powder. <i>Scient Rep</i> 13 : 185. https://doi.org/10.1038/s41598-023-27450-5 .	11.00
2690	Kaur P, Kocher G S and Taggar M S (2023) Comparative assessment of fungal consortium ligninolytic enzymes versus sequential acid-alkali pretreatments for bioethanol production from rice straw. <i>Bioenerg Res</i> https://doi.org/10.1007/s12155-023-10612-8	9.85
2691	Kaur P, Choudhary M, Katyal P and Kaur A (2023) Evaluation of prebiotic and antioxidant potential of citrus peel waste. <i>Act Sci Nutr Health</i> 7 : 64-71.	7.31
2692	Kaur R, Kaur N, Kumar S, Dass A and Singh T (2023) Carbon capture and sequestration for sustainable land use – A review. <i>Indian J Agric Sci</i> 93 (1): 11-18.	6.37

2693	Kaur S and Sood P (2023) Quantification of heavy metal residues in fecal matter of blue rock pigeon (<i>Columba livia</i>) in Punjab. <i>Indian J Entomol</i> https://doi.org/10.55446/IJE.2023.1019	5.08
2694	Kaur S, Bishnoi R, Priyadarshini P, Singla D, Chhuneja P (2023) DSP: database of disease susceptibility genes in plants. <i>Func Integ Genom</i> 23 : 204.	8.90
2695	Kaur S, Jindal S K, Sharma A and Gill R (2023) Marker-assisted identification of Meloidogyne incognita and Phytophthora infestans resistant elite indeterminate tomato lines for protected cultivation. <i>Indian J Genetic Plant Breed</i> 83 : 103-13. https://doi.org/10.31742/ISGPB.83.1.13	7.34
2696	Kaur S, Kocher D K, Kaur A and Kumar R (2023) Larvicidal potential and retention efficacy period of citronella leaf oil against <i>Aedes aegypti</i> L. <i>Indian J Entomol</i> . https://doi.org/10.55446/IJE.2023.607 , 1-6	5.08
2697	Kaur V, Kaushal S, Heena and Utreja D (2023) Occurrence, isolation, pharmacological potential, metabolism, and toxicity of Myristicin: a naturally occurring alkoxy-substituted allylbenzene. <i>Mini Rev Org Chem</i> https://doi.org/10.2174/1570193X20666230314105024	8.49
2698	Kaur Y, Arora A and Thind S K (2023) Management of Phytophthora nicotianae, the incitant of citrus foot rot, with new generation fungicides. <i>Agric Res J</i> 60(1) : 66-73.	5.44
2699	Khan H, Krishnappa G, Kumar S, Mishra CN, Parkash O, Rathore A, Das RR, YadavR, Krishna H, Bishnoi OP and Sohu VS (2023). Genetic gains in grain yield in wheat (<i>Triticum aestivum</i> L.) cultivars developed from 1965 to 2020 for irrigated production conditions of northwestern plains zone of India. <i>Cereal Res Communic</i> 51 : 437-46.	7.24
2700	Kharakwal V, Bains K, Bishnoi M and Devi K (2023) Health risk assessment of arsenic, lead and cadmium from milk consumption in Punjab, India. <i>Env Monitor Assess</i> 195 https://doi.org/10.1007/s10661-023-11256-z .	9.30
2701	Kharb V, Sharma V, Dhaliwal S S and Kalia A (2023) Influence of iron seed priming on seed germination, growth and iron content in rice seedlings. <i>J Plant Nutri</i> . https://doi.org/10.1080/01904167.2023.2220731	7.81
2702	Khokhar S, Taggar G K and Grewal S K (2023) Alteration in the developmental physiology of <i>Maruca vitrata</i> (Fabricius) on jasmonic acid and salicylic acid treated pigeonpea. <i>Arthropod-Plant Interact</i> 17 : 389-00.	8.41
2703	Kooner R, Sharma D K and Suri K S (2023) Efficacy of Two-in-one model traps and sun drying against <i>Callosobruchus</i> (F.) in mungbean. <i>Indian J Ecol</i> 85(1) : 129-33.	5.89
2704	Kooner R, Suri KS and Makkar GS (2023) Bioefficacy and dynamics of flonicamid 50 WG in rice and Basmati. <i>Pesticide Res J</i> 35(1) : 21-27.	5.49
2705	Kothiyal S, Kaur P and Kaur J (2023) A critical analysis of effect of projected temperature and rainfall for differential sowing of maize cultivars under RCP4.5 and RCP6.0 scenarios for Punjab. <i>Theor Appl Climatol</i> 151 : 329–54.	9.41
2706	Kothiyal S, Kaur P, Sandhu S S and Kaur J (2023) Modelling viable adaptive options under climate change scenarios to increase maize productivity in Indian Punjab. <i>Arabian J Geosci</i> 16 : 403.	6.00
2707	Kothiyal S, Prabhjyot-Kaur, S S Sandhu and Jatinder Kaur. 2023. Modelling the climate change impact of mitigation (RCP 2.6) and high emission (RCP 8.5) scenario on maize yield and possible adaptation measures in different agroclimatic zones of Punjab, India. <i>J Sci Food and Agric</i> . https://doi.org/10.1002/jsfa.12779	10.13



2708	Kumar D, Singh M, Kumar S, Meena R K, Kumar R, Yadav M R, Kushwaha M, Makarana G, Bhattacharjee S, Kashya S, Biswal B, Rajesh and Kumar P(2023) Energy budgeting and carbon footprints estimation of fodder maize varieties sown under different nutrient management practices in Indo-Gangetic plains of India. <i>Agron</i> 13 (981) : 1-21	9.95
2709	Kumar D, Singh M, Meena R K, Kumar S, Meena B L, Yadav M L, Makarana G and KushwahaM (2023) Productivity and profitability improvement of fodder maize under combined application of indigenously prepared panchagavyawith organic and inorganic sources of nutrient. <i>J Plant Nutri.</i> 46 (14) : 3519-34.	8.28
2710	Kumar D, Singh S and Lal S(2023) Job Satisfaction and Stress Among the Field Veterinarians in the Jammu Region of Jammu and Kashmir. <i>J Community Mobilize Sustain Dev</i> 18(3) :365-70.	5.67
2711	Kumar K, Yu Q, Bhatia D, Honsho C, Gmitter J F G (2023) Construction of a high density genetic linkage map to define the locus conferring seedlessness from Mukaku Kishu mandarin. <i>Front Plant Sci</i> 14 : 1087023.	12.63
2712	Kumar R, Kumar S and Chahal P (2023) Information and communication technologies (icts) implementation. <i>Indian J Agric Sci</i> 93(1) : 119-21.	6.37
2713	Kumar S M, Maninder K, Madhvi S, Sarita, Krishna Veda K, Thakur J, Rawat M Phogat B and Guru P N (2023) Hesperidin from citrus peel waste: extraction and its health implications. <i>Qual Assur Saf Crop Foods</i> 15(2) : 71–99.	7.67
2714	Kumar S, Kaur S B, and Thakur S (2023) Climate change and its impact on productivity of major kharif and rabi crops in Punjab. <i>Mausam</i> 74(1) : 151-60.	6.91
2715	Kumar S, Kaur H, Hunjan MS and KaurK (2023) Biochemical changes induced in the maize leaf sheath upon inoculation with <i>Rhizoctonia solani</i> incitant of banded leaf and sheath blight. <i>Cereal Res Commun</i> 51 : 413–23.	7.24
2716	Kumar V and Grewal G K (2023) Influence of temperature on survival and development of <i>Helicoverpaarmigera</i> (Hubner). <i>Ecol Environ Conserv</i> 29(3) : 342-47.	5.41
2717	Kumar V and Kaur A (2023) Combi-product of b-Cyfluthrin + Imidacloprid (Solomon 300 OD) for Managing Sucking Insect Pests in Bt Cotton. <i>Pesticide Res J</i> 35(1) : 68-73.	5.49
2718	Kumar V, Aulakh C S and Kaur J (2023) Planting geometry and dehauling schedule affecting productivity of seed potato (<i>Solanum tuberosum</i>). <i>India J Agron</i> 68(1) : 67-72.	5.55
2719	Kumar V, Grewal G K and Burange P S (2023) Biopesticides and insect growth regulators against <i>Bemisia tabaci</i> (Gennadius) infesting BT cotton. <i>Indian J Ent</i> 81(4) : 749-52.	5.89
2720	Kumar V, Kumar, A and Jindal V (2023) Effect of Bt and non-Bt cotton on biology of <i>Thrips tabaci</i> and its management using insecticides. <i>Indian J Ent</i> https://doi.org/10.55446/IJE.2023.508)	5.89
2721	Kumar V, Mahajan G, Sheng Q and Chauhan B S (2023) Weed management in wet direct-seeded rice (<i>Oryza sativa</i> L.): Issues and opportunities. <i>Adv Agron.</i> 179 : 91-133. https://doi.org/10.1016/bs.agron.2023.01.002	15.27
2722	Kumari A, Goyal M, Cheema H K and Singh D P (2023) Modulation of enzymes and metabolites in response to shoot fly infestation in resistant and susceptible sorghum genotypes. <i>Cereal Res Commun</i> https://doi.org/10.1007/s42976-023-00387-1	7.24
2723	Kumari R, Ghai N, Jindal S K, Kumar S and Sharma K (2023) Performance of twelve bell pepper (<i>Capsicum annuum</i> L.) genotypes to elevated temperature. <i>J Biomech Sci Eng.</i> http://dx.doi.org/10.17605/OSF.IO/RVUHP	5.15

2724	Kumari S and Singh H (2023) Participatory evaluation of Chickpea production technology under central Punjab conditions. <i>Indian J Ext Edu</i> 59 (3) : 113-17.	5.95
2725	Kundra V, Aulakh C S and Bhullar M S (2023) Integration of allelopathic water extracts with cultural practices for weed management in organic wheat. <i>Indian J Weed Sci</i> 55(1) : 24-31.	5.84
2726	Lata H, Sharma A, Thakur H, Thakur A, Rana R S and Kaur M (2023) Heterosis and combining ability vis-à-vis association for green fruit yield and component traits involving male sterile lines in chilli (<i>Capsicum annuum</i>) under wet temperate zone of North Western Himalayas. <i>Plant Breed.</i> https://doi.org/10.1111/pbr.13114	8.54
2727	Lohan S K, Kumar P and Kumar S (2022) Agricultural work-related fatalities and injuries in Punjab (India). <i>Inj prevent.</i> http://dx.doi.org/10.1136/injuryprev-2022-044566	9.77
2728	Maan S S, Brar J S, Mittal A, Gill M I S, Arora N K, Sohi H S and Chhuneja P (2023) Construction of Genetic Linkage Map and QTL mapping of fruit quality traits in guava (<i>Psidium guajava</i> L.). <i>Front Plant Sci</i> 14 : 1788	12.63
2729	Madane D A, Singh M C and Satpute S (2023) Carbon footprint status of Indian Punjab in relation to different pre- to post-harvest activities of paddy cultivation. <i>Pad Wat Env.</i> https://doi.org/10.1007/s10333-023-00928-8 .	7.55
2730	Madane D A and Waghaye A M (2023) Spatio-temporal variations of rainfall using innovative trend analysis during 1951–2021 in Punjab State, India. <i>Theor Appl Climatol.</i> https://doi.org/10.1007/s00704-023-04496-z .	9.41
2731	Mahajan G and Chauhan B S (2023) Improving wheat productivity through integrated management of <i>Avena Ludoviciana</i> . <i>Agron J.</i> https://doi.org/10.1002/agj.2.21251 .	8.65
2732	Mahajan G and Chauhan BS (2023) Herbicide options for sterile oats (<i>Avena ludoviciana</i>) control in winter-planted sorghum. <i>Weed Technol.</i> 1-15. https://doi.org/10.1017/wet.2022.90 .	7.81
2733	Mahajan M, Singla P and Sharma S (2023) Sustainable postharvest processing methods for millets: A review on its value-added products. <i>J Food Process Engg</i> : e14313. https://doi.org/10.1111/jfpe.14313	8.89
2734	Majumdar A, Sharma A and Belludi R (2023) Natural and engineered resistance mechanisms in plants against phytoviruses. <i>Pathogen</i> doi: 10.3390/pathogens12040619	10.53
2735	Mangshatabam, A, Pal, R K, Anjusha, S, G and Sharma A (2023) Assessing the Impact of Climate Change on Agricultural Production Using Crop Simulation Model. <i>Int J Environ</i> 14(7) : 538-50.	5.19
2736	Manjunath M, Khokhar A, Chary G R, Singh M, Yadav SK, Gopinath KA et al., (2023) Microbial consortia enhance the yield of maize under sub-humid rainfed production system of India. <i>Frontiers Sustain Food Sys</i> 7 , 1108492	11.01
2737	Martolia D and Bisht, D (2023) Stress experienced during COVID 19 pandemic and coping strategies sought by homemakers of Ludhiana. <i>J Community Mobilize Sustain Dev</i> 18(2) : 529-34.	5.67
2738	Mavi M S, Singh G, Choudhary O P and Dey D (2023) Moderation of nitrogen availability through the application of pyrolyzed and unpyrolyzed organic materials in saline water irrigated soil. <i>Environ Monit Assess</i> 195 :467	9.31
2739	Mavi M S, Singh G, Choudhary O P, Singh A, Vashisht B B, Sekhon K S, Pathania N and Singh B (2023) Successive addition of rice straw biochar enhances carbon accumulation in soil irrigated with saline or non-saline water. <i>Environ Res</i> https://doi.org/10.1016/j.envres.2022.114733	14.43



2740	Megha M, Gill P PS, Jawandha S K, Kaur P and Sinha A (2023) Sodium alginate enriched with pomegranate peel extract maintains pear cv. Punjab Beauty cell membrane integrity and postharvest life. <i>South African J Bot</i> 158 : 149-57.	9.11
2741	Mehta P and Dhaliwal L K (2023) Agromet wheat app for estimation of phenology and yield of wheat under Punjab conditions. <i>Intl J Biometeorol.</i> https://doi.org/10.1007/i000484-022-02423-x .	9.74
2742	Mishra P K, Sharma A, Prakash A (2023) Current research and development in cotton harvesters: A review with application to Indian cotton production systems <i>Heliyon</i> 9 : e16124. https://doi.org/10.1016/j.heliyon.2023.e16124 .	9.78
2743	Mishra P K, Singh M, Dixit A, Patel B, Gauta A, Pandey S K and Sharma K (2023) Effect of Cleaning Methods on Trash Contents and Fiber Quality for Seed Cotton. <i>Intl Bio-Resour Stress Manag</i> 14(2) : 338-46.	5.11
2744	Mishra S, Satpute S and Kaur S (2023) Performance of filter media for improving the irrigation water quality of village pond. <i>Indian J Soil Conserv</i> 51(1) : 76-81.	5.28
2745	Mittal S, Saini S P, Hari Mohan Meena, Pritpal Singh (2023) Soil Manganese Dynamics and Performance of Wheat Cultivars in Relation to Soil and Foliar Manganese Application with and Without Manures in North-western, India. <i>J Soil Sci Plant Nutri</i> https://doi.org/10.1007/s42729-023-01151-4	9.87
2746	Mohindru B and Chhuneja P K (2023) Differential expression of hygienic trait characteristics between hygienic and non-hygienic <i>Apis mellifera</i> Linnaeus colonies. <i>J Ent Res.</i> 47(1) : 195-99.	5.89
2747	Naveena J H and Choudhary M (2023) Consumption pattern of rice bran oil among adults in the highest rice producing region of Punjab. <i>ProcNatl Acad Sci, India, Sect B Biol Sci</i> 93 :957–965. https://doi.org/10.1007/s40011-023-01494-z .	6.96
2748	Naveena K K T, Singh H, Kaur N and Kaur K (2023) CPPU and salicylic acid application improved fruit retention, yield, and fruit quality of mango cv. Dusehri. <i>J Horti Sci Biotech</i> https://doi.org/10.1080/14620316.2023.2185164	7.92
2749	Nayak P, Vaheed S, Gupta S and Mohan N (2023) Predicting students' academic performance by mining the educational data through machine learning-based classification model. <i>Edu Inform Technol.</i> https://link.springer.com/article/10.1007/s10639-023-11706-8	9.00
2750	Negi P, Rani R and Jain S (2023) Distribution and prevalence of downy mildew disease on cucurbits in Punjab. <i>Indian J Ecol</i> 50(1) : 146-50.	5.79
2751	Negi P, Rani R and Jain S (2023) Survival and infectivity of oospores of <i>Pseudoperonosporacubensis</i> causing downy mildew of cucurbits in the alluvial plains of Northwestern India. <i>Indian Phytopath</i> 76 : 347-54.	5.95
2752	Omkar R, Jindal S K, Dhaliwal M S, Sharma A, Kaur S and Gill R (2023) Appraisal for multiple disease resistance in advanced breeding lines of tomato (<i>Solanum lycopersicum</i> L.). <i>Genetic Resour Crop Evol.</i> https://doi.org/10.1007/s10722-023-01618-4	7.88
2753	P Kaur, GS Kocher, M S Taggar (2023) Comparative Assessment of Fungal Consortium Lignolytic Enzymes Versus Sequential Acid–Alkali Pretreatments for Bioethanol Production from Rice Straw. <i>Bio Energ Res.</i> https://doi.org/10.1007/s12155-023-10612-8 .	9.85
2754	Padhy A K, Sharma A, Sharma H, Srivastava P, Singh S, Kaur P, Kaur J, Kaur S, Chhuneja P and Bains N S (2023) Combining high carotenoid, grain protein content and rust resistance in wheat for food and nutritional security. <i>Frontiers Genetics.</i> https://doi.org/10.3389/fgene.2023.1075767	10.77

2755	Pal V, Singh Guriqbal and Dhaliwal S S (2023) Effects of sequential and tank mix applications of zinc, iron and nitrogen on symbiotic parameters, productivity and economics of chick-pea (<i>Cicer arietinum</i> L.) under field conditions. <i>J Soil Sci Plant Nutri</i> 23(2) : 2673-86.	9.61
2756	Palial G, Thakur S, Sharma R, Sharma J P and Dhakad A K (2023) Genetic divergence and correlation estimates for quantitative traits in <i>Salix</i> . <i>Acta Physiol Plant</i> 45 (99) : 1-15.	8.74
2757	Pankaj, Sharma, S., Singh, V. and Angmo, P. (2023). Changes in soil biological and chemical environment during wheat growth stages under nitrogen and straw management practices in rice-wheat system. <i>J Plant Nutri</i> . https://doi.org/10.1080/01904167.2023.2209112 .	8.28
2758	Parihar D S, Narang M K, Dogra B, Prakash A and Mahadik A (2023) Rice residue burning in Northern India: an assessment of environmental concerns and potential solutions– a review. <i>Environ. Res Commun</i> . https://doi.org/10.1088/2515-7620/acb6d4	9.32
2759	Parija B, Kaur Navneet, Dhaliwal T K and Gill R I S (2023) Optimization of planting geometry and weed control improves the productivity of potato under poplar-based agroforestry system. <i>Agrofor Sys</i> https://doi.org/10.1007/s10457-023-00847-x	8.42
2760	Parmar R, Jain L, Prakash A, Sharda S, Kumar S, Singh M and Singh H (2023) Automatic Spray Control System For Four Wheel Drive (4wd) Self-Propelled High Clearance Boom Sprayer. <i>Agric Res J</i> 60 (2) : 246-54.	5.44
2761	Pathania M, Arora PK and Sharma U (2023) Assessment of electrostatic sprayer against citrus psylla <i>Diaphorinacitrikuwayama</i> in kinnow mandarin. <i>Indian J Ento</i> https://doi.org/10.55446/IJE.2023.853 Ref. No. e23853.	5.08
2762	Pathania S, Bajaj A, Mavi M S and Choudhary O P (2023) Comprehensive evaluation, analysis of mechanisms and the prediction of salinity tolerance in pomegranate. <i>Sci Hort</i> 313 : 111918. https://doi.org/10.1016/j.scienta.2023.111918 .	10.34
2763	Peshin R, Singh K, Garg L, Hansra B S, Nanda R and Sharma R (2023) Impact evaluation of rice integrated pest management dissemination programs on adoption and pesticide use in Punjab, India. <i>Intl J Tropic Ins Sci</i> https://doi.org/10.1007/s42690-023-00994-9	7.02
2764	Prasad J V N S, Veni V G, Srinivasarao C, Kundu S, Ramakrishna B, Reddy K S, Singh R, Singh S K, Murai AS, Rohilla P P, Makkar G S, Rampal V K, Grover J, Brar J S, Goyal N K, Jakhar D S, Kiran BVS, Singh VK, and Bhaskar S (2023) Can adoption of climate resilient management practices achieve carbon neutrality in traditional green revolution states of Punjab and Haryana? <i>J Env Mang</i> https://doi.org/10.1016/j.jenvman.2023.117761	14.90
2765	Preet T, Ghai N, Jindal S K and Sangha M K (2023) Salicylic acid and 24-Epibrassinolid induced thermotolerance in bell pepper through enhanced antioxidant system and heat shock proteins. <i>J Agr Sci Tech</i> 25 : 171-83.	7.28
2766	Priya and Kumar R (2023) Silicon Quantification in Sugarcane Plants Mediated Defence Against Early Shoot Borer, <i>Chilo infuscatellus</i> and its Effect on Larval Mandibles, Yield and Quality Attributing Parameters. <i>Silicon</i> https://doi.org/10.1007/s12633-023-02345-2	8.94
2767	Priya, Kumar R, Bhatt R, Kyashap L and Shera P S (2023) Silicon retention in soil and sugarcane cultivars and its impact on stalk borer, yield and quality indices in north west India. <i>Silicon</i> https://doi.org/10.1007/s12633-023-02508-1	8.94
2768	Priya, Kumar R, Singh D (2023) Silicon Uptake and Accumulation in Sugarcane for Resistance Against Top Borer <i>Scirpophagaexcerptalis</i> Walker and its Influence on Larval Mandibles. <i>Silicon</i> https://doi.org/10.1007/s12633-023-02479-3	8.94
2769	Rai G K, Kumar P, Choudhary S M, Singh H, AdabK, Kosser K R, Magotra I, KumarR R, M Singh, Rajni Sharma, G Corrado and Y Roupahel (2023) Antioxidant potential of glutathione and crosstalk with phytohormones in enhancing abiotic stress tolerance in crop plants. <i>Plants</i> 12 : 1133. https://doi.org/10.3390/plants12051133 .	10.50



2770	Raina S, Gupta A, Singh A, Surasani V K R and Sharma S (2023) Functionality of pasta enriched with pumpkin seed meal: cooking quality, techno-functional properties, textural and structural characterisation. <i>Intl J Food Sci Technol</i> 58 : 2735-43.	9.61
2771	Rajesh Kumar KC, Varma RK, Sruthi OP et al. (2023) Groenewaldia (<i>Lenti theciaceae</i>), a new corticolous fungal genus from India. <i>Mycol Progress</i> 22 : 43 https://doi.org/10.1007/s11557-023-01888-3	8.54
2772	Rana N, Singh S, Dhakad A K and Dhatt K K (2023) Coding phenological growth stages of Yellow Bells (<i>Tecoma stans</i> (L.) Juss. Ex Kunth) using BBCH scale. <i>Current Plant Biol</i> 34 : 100228	5.40
2773	Rana S and Kaur K (2023) Self Help Groups: A Ray of hope in challenging times. <i>J Community Mobilize Sustain Dev</i> 18(1) : 304-08.	5.67
2774	Rana S, Kapoor S, Sharma S and Kalia A (2023) <i>Pleurotus Florida</i> mediated biosynthesis of nanoparticles and Biofortification. <i>Food Science and Biotechnology</i> https://doi.org/10.1007/s10068-023-01307-z	9.23
2775	Randhawa H S, Chandi R S, Kaur A and Dhillon B S (2023) Insecticidal potential of home-made neem extract against jassid, <i>Amrasca biguttula biguttula</i> (Ishida) infesting okra. https://doi.org/10.55446/ije.2023.1180 .	5.89
2776	Rani M, Jindal S K and Meena O P (2023) Genetic variability for plant growth, fruit, seed and biochemical traits in bell pepper breeding populations under North Indian conditions. <i>Genetika</i> 55 : 111-24.	6.75
2777	Rara S, Singla N, Brar S K, Mandla D and Singla L D (2023) Severe Infection of <i>Nippostrongylus brasiliensis</i> in <i>Bandicota bengalensis</i> Inhabiting Commensal Areas of Punjab, India: Prevalence, Risk Factor Analysis, Molecular Identification and Phylogenesis. <i>Acta Parasitolog</i> 68 : 172-81. https://doi.org/10.1007/s11686-022-00652-z	7.534
2778	Rathore R (2023) Dairy Entrepreneurship in Kandi region of Punjab: Prospects and Constraints. <i>IntJ Bio-Resour Stress Manag</i> 14(3) : 450-56.	5.10
2779	Ratra S, Singh K (2023) Methodical strategy for STATCOMs optimal placement to enhance voltage stability margin considering circular optimization algorithm. <i>J VLSI design Tools Techn</i> :24-34.	9.913
2780	Rosheen, Sharma S and Utreja D (2023) Salicylic Acid: Synthetic Strategies and Their Biological Activities. <i>J Plant Nutri</i> 8(13) : e202204614.	8.30
2781	Roy T, Alam M S and Gupta R (2023) Optimization of foaming process for development of modified aloe polysaccharide (MAP) juice and powder using foam-mat drying. <i>Food Sci Biotech.</i> https://doi.org/10.1007/s10068-023-01354-6	9.23
2782	Sabhikhi H S, Hunjan M S and Kaur Y (2023) Development of common scab in potato cv. Kufri Pukhraj in Indian Punjab is influenced by scab lesion severity on seed tubers and duration of crop in the field. <i>J Plant Dis Prot.</i> https://doi.org/10.1007/s41348-023-00719-7	7.85
2783	Sain S K, Monga D, Mohan M, Sharma A and Beniwal J (2023) Reduction in Seed Cotton Yield Corresponding with Symptom Severity Grades of Cotton Leaf Curl Disease (CLCuD) in Upland Cotton (<i>Gossypium hirsutum</i> L.). <i>Int J Curr Microbiol App Sci</i> 9(11) : 3063-76.	5.95
2784	Saini, R, Kaur, S, Aggarwal, P and Dhiman, A (2023) The influence of conventional and novel blanching methods on potato granule, phytochemicals, and thermal properties of colored varieties. <i>Front Nutr.</i> https://doi.org/10.3389/fnut.2023.1178797	12.59
2785	Salaria P, Jain S, Bhardwaj R D, Rani R and Jhanji S (2023) Physiological and biochemical responses of chilli pepper (<i>Capsicum annum</i> L.) to sudden wilt syndrome. <i>Physiol Molec Plant Patho</i> 126 : https://doi.org/10.1016/j.pmpp.2023.102038	8.74

2786	Salaria S, Shayla B, Singh I, Rani U, Kumar A S, Gill B S, Singh S (2023). Introgression of morphological, phonological and productivity traits along with disease resistance from <i>Cicer pinnatifidum</i> into cultivated chickpea: a success story. <i>Euphytica</i> 219 : 47	8.19
2787	Saloni, Bhullar M B and Kaur P (2023) Seasonal incidence of sucking insects on capsicum grown under protected conditions. <i>Agric Res J</i> 59 : 1095-99.	5.44
2788	Sandhu B S, Kaur T, Bhullar M S (2023) Influence of residue management and simulated rainfall timings on pyroxasulfone efficacy and productivity of wheat in North West India. <i>Crop Protect.</i> https://doi.org/10.1016/j.cropro.2023.106357 .	9.04
2789	Sandhu K K, Vashishat N and Kocher D K (2023) Formulation of eucalyptus oil-zinc sulfide hybrid nanoemulsion and evaluation of its larvicidal potential against <i>Aedes aegypti</i> . <i>African Entomol</i> 31 : e12791. https://doi.org/10.17159/2254-8854/2023/a12791	7.19
2790	Sandhu K K, Vashishat N and Kocher D K (2023) Potential larvicidal bioefficacy of copper sulfide-based hybrid nanoemulsions of eucalyptus oil against <i>Aedes Aegypti</i> (Linnaeus). <i>J Vector Borne Dis</i> 60 (3) : 79-87.	6.74
2791	Sandhu N, Sethi M, Kaur H, Dhillon A, Kumar A, Kaur A, Kaur S, Singh V, et al., (2023). Mining natural genetic variations for nitrogen use efficiency utilizing nested synthetic hexaploid wheat introgression libraries. <i>Env Exp Bot.</i> https://doi.org/10.1016/j.envexpbot.2023.105394	12.03
2792	Sandhu S K and Prabhjyot-Kaur (2023) A case study on the changing pattern of monsoon rainfall duration and its amount during the recent five decades in different agroclimatic zones of Punjab state of India. <i>Mausam</i> 74(3)	6.94
2793	Sanghera G S, Kashyap Land Anuradha (2023) Stress Indices Based on Cane and Sugar Yields: Implication in Selection of Sugarcane Varieties for Drought Tolerance. <i>Agri Res J</i> 59 : 816-34.	5.44
2794	Sekhon G S, Aulakh R K and Kler T K (2023) Village ponds as unexplored habitation sites for resident migratory and migratory bird species in Punjab State, India. <i>Indian J Ecol</i> 50(3) : 864-69.	5.79
2795	Sethi V P (2023) A simulated study on the performance evaluation of amorphous silicon solar PV module for temperature, irradiance and tilt angle dependence. <i>Glob J Engg Technol Adv</i> 14(2) : 8-29.	12.46
2796	Sethi V P (2023) Microcontroller based logic control system for automated novel paddy straw bale combustor technology applied to greenhouse heating. <i>Glob J Engg Technol Adv</i> 14(2) : 30-42.	12.46
2797	Sharma A, Khar S, Chaudhary D and Thakur P (2023) Study of biometric attributes of plug type tomato seedlings pertinent to transplanter design. <i>Indian J Ecol.</i> 50 (2) : 503-07. https://doi.org/10.55362/IJE/2023/3926 .	5.79
2798	Sharma H, Singh S, Shamshad M, Padhy A K, Kaur R, Kashyap L, Srivastava P, Mavi G S, Kaur S, Sharma A, Sohu V S and Bains NS (2023) Variability in iron, zinc, phytic acid and protein content in pre-breeding wheat germplasm under different water regimes. <i>Plant Growth Regulation</i> , 100 :531-543 https://doi.org/10.1007/s10725-022-00943-5	9.24
2799	Sharma I, Arora K, Kumar S, Bhoi P B and Vatta K (2023) Global trade competitiveness of Indian buffalo meat: Trends and determinants. <i>Buffalo Bull</i> 42(1) : 105-24.	6.20
2800	Sharma M, Bhatia M and Singh P (2023) Farmers' perspective on relevance and importance of kisanmelas. <i>J Community Mobilize Sustain Dev</i> 18 (1) : 277-82.	5.67



2801	Sharma N, Kaushal A, Yousuf A, Sood A, Kaur S and Sharda R (2023) Geospatial technology for assessment of soil erosion and prioritization of watersheds using RUSLE model for lower Sutlej sub-basin of Punjab, India. <i>Envir Sci Pollut Res</i> 30 :515–31. https://doi.org/10.1007/s11356-022-22152-3	11.19
2802	Sharma N, Kaushal, A and Yousuf A (2023) SWAT model application for simulating water balance and water yield in the lower Sutlej sub-basin. <i>J Soil Water Conserv</i> 22(1) : 354-60. https://doi.org/10.5958/2455-7145.2022.00045.5	5.20
2803	Sharma P, Singh I, Khosla G, Singh G, Singh S, Dhaliwal S K and Singh S (2023) Variability and Association Studies for Yield and Yield Related Traits in Pigeonpea [<i>Cajanus cajan</i> (L.) Millsp.]. <i>Legume Res</i> 46(5) : 568-73.	6.67
2804	Sharma R, Kumari P, Sharae H and Paul S (2023) Insight to the biotechnological interventions in flower crops for abiotic stress tolerance. <i>Sci Hort</i> 318 : 112102.	10.34
2805	Sharma T and Shera P S (2023) Biological characteristics of ectoparasitoid, <i>Fulgoraacia melanoleuca</i> (Fletcher) on various stages of its host, <i>Pyrilla Perpusilla</i> (Walker). <i>Int J Trop Insect Sci</i> https://doi.org/10.1007/s42690-022-00938-9	7.02
2806	Sharma U and Sanjta S (2023) Age Specific and Fertility Lifetable of <i>Callosobruchus Maculatus</i> (F.) on Chickpea. <i>Indian J Entomol</i> . https://doi.org/10.55446/IJE.2023.884	5.08
2807	Sharma U, Sanjta S and Sharma S K (2023) Nanopesticides: An approach towards precision insect-pest management in agriculture. <i>J Entomoll Res</i> 47 (2) : 288-94.	5.89
2808	Sharma Y, Sidana B K, Kumar S, Kaur S, Sekhon M K, Mahal A K, Mehan S (2023) Pre and Post Water Level Behaviour in Punjab: Impact Analysis with DiD Approach. <i>Sustainability</i> 15 (3) : 2426.	9.89
2809	Sheikh M M, Riar T S, Walia S S and Garg L (2023) Integrated farming systems: A comparative status in Punjab, India and Northern part of Bangladesh. <i>J Community Mobilize Sustain Dev</i> 18 (1) : 19-26.	5.67
2810	Shikha D, Singh R and Kumar S (2023) Biology of <i>Pieris brassicae</i> (Linnaeus) on Cauliflower. <i>Indian J Entomol</i> . https://doi.org/10.55446/IJE.2023.1060	5.08
2811	Shilpa, Kler T K and Kaur G (2023) Assessment of avian feeding guilds in winter and rainy crop seasons of guava. <i>Indian J Entomol</i> . https://doi.org/10.55446/IJE.2023.785	5.08
2812	Shivani, Grewal S K, Gill R K, Virk H K, Bhardwaj R D (2023) Effect of herbicide stress on synchronization of carbon and nitrogen metabolism in lentil (<i>Lens culinaris</i> Medik.). <i>Plant Physiol Biochem</i> . 196 : 402-14. https://doi.org/10.1016/j.plaphy.2023.01.063	11.44
2813	Shukla A K, Behera S K, Singh V K, Chandra Prakash, Sachan A K, Dhaliwal S S, Srivastava P C, Pachauri S P, Tripathi Ajay, Jagannath Pathak, Nayak A K, Anil Kumar, Rahul Tripathi, Dwivedi B S, Datta S P, Meena M C, Das S and Trivedi V K (2023) Pre-monsoon spatial distribution of available micronutrients and sulphur in soils of Indo-Gangetic plain of India and delineation of soil management zones. <i>PLoS ONE</i> 15(6) : e0234053. https://doi.org/10.1371/journal.pone.0234053	8.78
2814	Sidhu A and Singa N (2023) Antifertility effects of quinestronol in male lesser bandicoot rat, <i>Bandicota bengalensis</i> and potential in managing rodent population under field conditions. <i>Integr Zoolog</i> https://doi.org/10.1111/1749-4877.12733	8.08
2815	Sidhu R, Kaushal S, Kaur V and Sharma P (2023) Chemical composition, synergistic antimicrobial and antioxidant potential of <i>Hibiscus rosa-sinensis</i> L. leaves essential oil and its major compound <i>J Essen Oil Bear Plant</i> https://doi.org/10.1080/0972060X.2023.2189529	7.70

2816	Singh A, Aulakh C S, Chawla N and Sidhu A S (2023) Pre-harvest exogenous application of growth regulators extends storability and maintains the seed potato quality. <i>J Stored Prod Res</i> https://doi.org/10.1016/j.jspr.2023.102129 .	8.83
2817	Singh A, Bhardwaj U, Kaur R and Vyas P (2023) Chemical composition, microencapsulation and comparative antimicrobial studies of unencapsulated and encapsulated carrot seed essential oil. <i>J Essen Oil Bear Plant</i> 26(1) : 232-43.	7.70
2818	Singh A, Duche RT, Wandhare A G, Kaur J, Singh B P, Sihag M K, et al (2023) Milk-derived antimicrobial peptides: overview, applications, and future perspectives. <i>Probiotic Antimicrob Protein</i> 15 (1) : 44-62.	11.27
2819	Singh A, Singh P and Mahajan M (2023) Agronomic and biochemical attributes and economic indices of sugarcane (<i>Saccharum officinarum</i>) in saline vis-à-vis non saline soils. <i>Indian J Agric Sci</i> 93 : 106-09. https://doi.org/10.56093/ijas.v93il.130246	6.37
2820	Singh A, Singh P and Mahajan M (2023) Net primary production, biochemical composition and economics of sugarcane (<i>Saccharum officinarum</i> L.) cultivation in saline and non-saline soils of south-western Punjab, India. <i>Intl J Plant Produc</i> https://doi.org/10.1007/s42106-023-00248-1	8.61
2821	Singh A, Singh P, and Mahajan M (2023) Net primary production, biochemical composition and economics of sugarcane (<i>Saccharum officinarum</i> L.) cultivation in saline and non-saline soils of south-western Punjab, India. <i>Intl J Plant Produc</i> https://doi.org/10.1007/s42106-023-00248-1	8.61
2822	Singh A, Singh P, Dhillon GPS, Sharma S, Singh B and Gill RIS (2023) Differential impacts of soil salinity and water logging on Eucalyptus growth and carbon sequestration under mulched vs. unmulched soils in south-western Punjab, India. <i>Plant and Soil</i> 482 : 401-25. https://doi.org/10.1007/s11104-022-05700-1	10.99
2823	Singh B, Kaur A, Chandi RS and Sharma A (2023) Virus–vector relationship of squash leaf curl China virus and its transmission through whitefly vector, Bemisia tabaci (Gennadius) causing yellow vein mosaic disease of pumpkin. <i>Indian Phytopathology</i> https://doi.org/10.1007/s42360-023-00647-4	5.95
2824	Singh D P, Sohu R S, Goyal M and Singh P (2023) Analysis of variability and correlations among different forage traits in guar (<i>Cyamopsis tetragonoloba</i> L.Taub.). <i>Elect J Plant Breed</i> 14(1) : 323-28.	5.14
2825	Singh G and Aggarwal N (2023) Alternate hosts of Bemisia tabaci (Gennadius) and their role in its carry-over to cotton in North-Western India. <i>Intl J Pest Manag.</i> https://doi.org/10.1080/09670874.2023.2172227 .	7.77
2826	Singh G and Aggarwal N (2023) Development and survival of different generations of Bemisia tabaci (Gennadius) on brinjal under North Indian conditions. <i>Pest Manage Horti Ecosys</i> 29 (1) : 1-7.	5.05
2827	Singh G and Aggarwal N (2023) Estimation of economic threshold level (ETL) of Bemisia tabaci (Gennadius) in brinjal (<i>Solanum melongena</i> L.). <i>J Entomolo Res</i> 47 (1) : 140-145.	5.05
2828	Singh G and Aggarwal N (2023) Preference and performance of Bemisia tabaci (Gennadius) on different host plants. <i>Indian J Entomol.</i> https://doi.org/10.55446/IJE.2023.874	5.08
2829	Singh G, Singh B, Singh A, Kumar V and Surasani V K R (2023) Development and characterization of barley-based non-conventional pasta supplemented with chickpea flour. <i>Int J Food Sci Technol</i> https://doi.org/10.1111/ijfs.16553	9.61



2830	Singh G, Singh S, Singh M and Dhatt K K (2023). Efficacy of post-emergence herbicides on weed control and turfgrass quality characteristics in Bermuda grass selection no. 1. <i>Indian J Weed Sci</i> 5(1) : 1-5.	5.84
2831	Singh G, Virk H K, Khokhar A, Kaur C, Brar H S, Singh K, Singh M, Kaur K, Singh S, Singh M, Kaur G, Singh J, Taggar G K, Singh R and Gill K K(2023) Response of pigeonpea varieties to sowing dates at high plant density under different agroclimatic zones of Punjab. <i>Agric Res J</i> 60 (1) : 13-23.	5.44
2832	Singh Guriqbal, Brar H S, Virk H K, Khokhar A, Kaur C, Singh K and Gupta R K (2023). Effect of foliar-applied urea on symbiotic parameters, yield and monetary returns of irrigated chickpea. <i>J Plant Nutri</i> 46(8) : 1668-82.	8.28
2833	Singh H, Grewal S K, Singh R, Bhardwaj R D (2023) Induced defense responses in cultivated and wild chickpea genotypes against <i>Helicoverpa armigera</i> infestation. <i>Biol Futura</i> https://doi.org/10.1007/s42977-022-00151-2	7.07
2834	Singh H, Lombardo M, Goyal A and Khar A (2023) Genotypic variation in Na, K and their ratio in 45 commercial cultivars of Indian tropical onion: A pressing need to reduce hypertension among the population. <i>Front Nutri</i> https://doi.org/10.3389/fnut.2023.1098320	12.66
2835	Singh H, Sekhon B S, Kumar P, Dhall R K, Devi R, Dhillon T S, Sharma S, Khar A, Yadav R K, Tomar B S, Ntanasi T (2023) Genetic Mechanisms for Hybrid Breeding in Vegetable Crops. <i>Plants</i> 12 : 2294. https://doi.org/10.3390/plants12122294	10.66
2836	Singh H, Sharma R, Gupta A, Joshi S, Dar B N, Singh B, and Sharma S (2023). Characterization of jackfruit seed enriched pasta: product-functionality profile, secondary protein structures, bioactive composition and molecular morphology. <i>Qual Assur Saf Crops Foods</i> 15 : 11-19.	7.67
2837	Singh J, Chahal T S, Gill PPS and Jawandha S K (2023) Comparison of Fruit Color and Quality Changes During Fruit Development in 'Kinnow' and 'W. Murcott' Mandarins. <i>Erwerbs-Obstbau</i> 65 : 369–377	7.21
2838	Singh J, Kaur S, Rasane P, Kumar V and Nanda V (2023). Effect of particle size on physical, techno-functional and antioxidant properties of corn silk powder. <i>Intl J Food Sci Technol</i> 58 : 2679-85.	9.71
2839	Singh J, Sandal S K, Yousuf A and Sandhu P S (2023) Effect of Drip Irrigation and Fertigation on Soil Water Dynamics and the Productivity of Greenhouse Tomato. <i>Water</i> . 15 : 2086. https://doi.org/10.3390/w15112086	9.50
2840	Singh J, Sharma A, Sharma V, Gaikwad PN, Sidhu G S, Kaur G, Kaur N, Jindal T, Chhuneja P and Rattanpal H S (2023) Comprehensive genome-wide identification and transferability of chromosome-specific highly variable microsatellite markers from citrus species. <i>Scient Rep</i> 13 : 10919. https://doi.org/10.1038/s41598-023-37024-0	11.00
2841	Singh K, Mishra S K, Singh M, Brar H S, and Singh A (2023) Comparison of Cotton (<i>Gossypium Hirsutum</i>) Hybrids and Their Non-Transgenic in India. <i>Emirates J Food Agric</i> 35 (6) https://doi.org/10.9755/ejfa.2023.v35.i6.3103 .	7.03
2842	Singh K, Singh P, Singh M, Brar A S (2023) Sub-surface drip fertigation enhances seed cotton yield and economic returns in semi-arid environments. <i>Agric Res J</i> 60 (1) : 28-37.	5.44
2843	Singh L P, Kumar P and Lohan S K (2023) Development of a real time work related postural risk assessment system of farm workers using a sensor based artificial intelligence approach. <i>Journal of Field Robotics</i> 1-14.	9.76
2844	Singh M C, Sur K, Al-Ansari N, Arya P K, Verma V K and Malik A (2023) GIS integrated RUSLE model-based soil loss estimation and watershed prioritization for land and water conservation aspects. <i>Front Env Sci</i> 11 :113624.	11.41

2845	Singh M, Biswas A, Verma A, Singh T and Choudhary O P (2023) Way forward to adopt agricultural practices for paddy straw management based on carbon sequestration and GHG emissions. <i>Pad Wat Env</i> . https://doi.org/10.1007/s10333-023-00931-z .	7.55
2846	Singh M, Nara U, Rani N, Pathak D, Sangha M K and Kaur K (2023) Mineral content variation in leaves, stalks, and seeds of celery (<i>Apium graveolens</i> L.) genotypes. <i>Biol Trace Elem Res</i> 201(5) : 2665-73. https://doi.org/10.1007/s12011-022-03359-4	9.74
2847	Singh N K, Narang M K, Thakur S S, Singh M, Singh S K and Prakash A (2023) Influence of transplanting techniques and age of wash root type seedlings on planting attributes of paddy rice. <i>Cogent Food Agric</i> 9(1) : 1-21. https://doi.org/10.1080/23311932.2023.2176978	8.00
2848	Singh N, Taggar MS, Kaur J, Kalia A and Garg T (2023) Optimization of bioethanol production from corn cobs by simultaneous saccharification and fermentation using response surface methodology. <i>Cellu Chem Tech</i> 57 (4) : 359-68.	7.39
2849	Singh P and Sandhu A S (2023) Energy budgeting and economics of potato (<i>Solanum tuberosum</i> L.) cultivation under different sowing methods in north-western India. <i>Energy</i> 269 : 126755. https://doi.org/10.1016/j.energy.2023.126755	14.86
2850	Singh P, Arora K, Kumar S, Gohain N and Sharma R K (2023) Indian millets trade potential-cum-performance: Economic perspective. <i>Indian J Agric Sci</i> 93 (2) : 200-04.	6.37
2851	Singh P, Kaur G and Singh A (2023) Physical, morphological and storage stability of Clove oil nanoemulsion based delivery system. <i>Food Sci Technol Int</i> 29(2) : 156-67.	8.64
2852	Singh P, Kaur G, Singh A and Dar B N (2023) Effect of montmorillonite and starch nanocrystals based biodegradable films loaded with lemongrass oil nanoemulsion on quality, enzymatic activity and shelf life of strawberry. <i>Food Chem Adv</i> https://doi.org/10.1016/j.focha.2023.100343	15.23
2853	Singh P, Kaur G, Singh A and Kaur P (2023). Starch based bio-nanocomposite films reinforced with montmorillonite and lemongrass oil nanoemulsion: development, characterization and biodegradability. <i>J Food Meas Charact</i> 17 : 527-45.	9.01
2854	Singh P, Kumar P and Kaur L (2023) Comparative analysis of plant protection measures in conventionally planted and high density planted Kinnow. <i>J Community Mobilize Sustain Dev</i> 18(1) :309-19.	5.67
2855	Singh P, Zhawar VK and Pannu P P S (2023) Effect of gamma-aminobutyric acid on resistance against stripe rust (caused by <i>Puccinia striiformis</i> f. sp. tritici) in wheat cultivars. <i>J Environ Biol</i> 44 : 159-66. http://doi.org/10.22438/jeb/44/2/MRN-5027 .	5.57
2856	Singh R and Dhillon B S (2023) Evaluation of different weed management strategies in clusterbean [<i>Cyamopsis tetragonoloba</i> (L.) Taub] under rainfed conditions of Punjab. <i>Legume Res</i> 46 (1) : 112-18.	6.67
2857	Singh R, Mahajan M, Das S and Kumar V (2023). Protein SUMOylation: Current updates and insights to elucidate potential roles of SUMO in plants. <i>South African J Bot</i> 157 : 398-08.	9.11
2858	Singh S (2023) Biorational management of gram caterpillar, <i>Helicoverpa armigera</i> (Hubner) in chickpea under organic farming. <i>Indian J Entomol</i> . https://doi.org/10.55446/IJE.2023.884	5.08
2859	Singh S and Singh MC (2023) Performance of colored capsicums as affected by plant training systems in a naturally ventilated polyhouse, <i>Intl J Veg Sci</i> , 29 (4) : 303-312, https://doi.org/10.1080/19315260.2023.2215760	7.11
2860	Singh S, Dhaliwal NK, Pathania P C and Sandhu R K (2023) Record of ber butterfly, <i>Leptotus Plinius</i> Fabricius, 1793 (Lycaenidae: Lepidoptera) on ber and its population dynamics in Punjab, India. <i>Agric Res J</i> 60 : 217-24.	5.44



2861	Singh S, Dhat, K K and Kumar P (2023) Exploring the genetic diversity of Dahlia (<i>Dahlia variabilis</i> Desf.) germplasm using multivariate statistics. <i>J Hort Sci</i> 50(1) : 51-55.	5.08
2862	Singh S, Gupta M, Rattanpal H S, Singh G and Kaur N (2023) Studies on fruit pedicel concerning fruitlet abscission in Kinnow mandarin. <i>Indian J Hort</i> 80 : 80-85.	6.00
2863	Singh S, Kaur J, Ram H, Singh J and Kaur S (2023) Agronomic bio-fortification of wheat (<i>Triticum aestivum</i> L.) to alleviate zinc deficiency in human being. <i>Rev Env Sci Bio-Tech</i> . https://doi.org/10.1007/s11157-023-09653-4	20.00
2864	Singh S, Sharma R K and Kumar D (2023) Variation in the in vitro Dry matter digestibility of different paddy straw varieties of Jammu region before and after treatment with 4 % urea solution. <i>Vet Pract</i> 24(1). https://www.researchgate.net/publication/373335144	5.10
2865	Singh S, Singh I, Miller C T, Dhath K K and Dubey R K (2023) Increasing basal dose of Indole-3-butyric acid improve rooting and growth of different cutting types in dahlia. <i>Rhizosphere</i> 27 : 100729.	9.44
2866	Singh T, Verma A, Singh M and Kaur P (2023) Multi-sensor data fusion for precise measurement of a tractor implement performance in the field. <i>Current Sci</i> 124(9) : 1082-87.	7.17
2867	Singh V, Chahal T S, Gill P P S, Jawandha S K, Singh Vikramjit (2023) Fruit colour progression in grapefruit with relation to carotenoid and Brix-acid ratio. <i>Indian J Hort</i> 80 :184-89.	6.00
2868	Singh V, Kunal, Kaur J, Bhatt R, Kaur S, Dhillon B S., Singh K B, Singh S, Sharma S and Singh B (2023) Site-Specific Fertilizer Nitrogen Management in Less and High N Responsive Basmati Rice Varieties Using Newly Developed PAU-Leaf Colour Chart. <i>Communic Soil Sci Plant Anal</i> . 54(10) : 1334-49.	7.58
2869	Singla A, Sharma R, Chhabra R, Vij L and Singh P (2023) Influence of varying shade intensities of green net on physiological and biochemical components of different <i>Ocimum</i> species. <i>Russ J Plant Physiol</i> 70 : 1-10	7.47
2870	Singla C, Aggarwal R, Kaur S and Sharma R (2023) Analysis of meteorological parameter changes using Mann-Kendall statistical tests in Indian Punjab. <i>Mausam</i> 74(1) : 207-13.	6.91
2871	Singla N, Bakhetia P, Jain R and Aggarwal R (2023) Efficacy of region-specific dietary intervention on the nutritional status of undernourished farm women. <i>Sci Nutr Health</i> 7 : 77-84. https://doi.org/10.31080/ASNH.2023.07.1209	7.31
2872	Sodhi G P S, Singh R K, Dhillon G S, Ahuja S, Kaur A P et al. (2023) Adoption behaviour of climate resilient agricultural practices in Punjab under NICRA project. <i>Indian J Ext Edu</i> 59(2) : 46-50.	5.95
2873	Sran T S, Jindal S K, Sharma A and Bhatia D (2023) LCVD resistance breeding in heat tolerant bell pepper: Combined phenotypic and marker-assisted backcrossing for introgression of LCVD resistance from hot pepper. <i>Euphytica</i> 219 : 50. https://doi.org/10.1007/s10681-023-03182-5	8.19
2874	Sran TS, Jindal SK, Sharma A and Chawla N (2023) Genetics of novel leaf curl virus disease resistant pepper genotypes and antioxidative profile analysis of their progenies. <i>Scientia Hort</i> 308 : 111563 (1-13)	9.46
2875	Suma M, Buttar N S, Singh D and Hunjan M S (2023) Management of damping off disease in tomato (<i>Solanum lycopersicum</i>) using potential biocontrol agent <i>Pseudomonas fluorescens</i> . <i>Indian J Agri Sci</i> 92(9) : 1148-52.	6.37
2876	Sunidhi, Singh D, Kaur M and Kaur L (2023) Entrepreneurial behaviour of chilli growers in Punjab state. <i>J Community Mobilize Sustain Dev</i> 18(1) :71-78.	5.67

2877	Tanin M J, Sharma A, Ram H, Singh S, Srivastava P, Mavi G S, Saini D K, Gudi S, Kumar P, Goyal P and Sohu V S (2023) Application of potassium nitrate and salicylic acid improves grain yield and related traits by delaying leaf senescence in Gpc-B1 carrying advanced wheat genotypes. <i>Front Plant Sci</i> 14 : 1107705 https://doi.org/10.3389/fpls.2023.1107705 .	12.63
2878	Tejinder Preet, Ghai N, Jindal S K and Sangha M K (2023) Salicylic acid and 24-epibrassinolide induced thermotolerance in bell pepper through enhanced antioxidant enzyme system and heat shock proteins. <i>J Agric Sci Tech</i> 25 (1): 171-83.	7.10
2879	Tejukumar B K, Singh P, Hiremath V, Jhanji S, Dubey R K and Pooja A (2023) Influence of shade levels on morpo-physiological characteristics of potted spathiphyllum. <i>Indian J Hort</i> 80 (2): 171-76.	6.00
2880	Thakur K, Kapoor S, Kapoor A, Aggarwal P, Kumar V and Tyagi S K (2023) Tomato seed oil enriched mayonnaise: structural, rheological, and biochemical characterization. <i>IntJ Food Sci Technol</i> 58 :1-11.	9.12
2881	Thakur K, Sharma S, Sharma R, Bhardwaj R, Sohu R S, and Singh B (2023) Characterization of ozonated pearl millet and sorghum starches: pasting profile, functional properties, in vitro-digestibility, molecular interactions and morphology. <i>Starch-Stärke</i> : 2300020.	8.69
2882	Thakur M, Kumar R, Parul Sharma, P and Sharma R (2023) Assessment of genetic purity and earliness in F1 and F2 population of cucumber (<i>Cucumis sativus</i> L.) using SSR markers. <i>Genetika</i> 55 : 33-44.	6.75
2883	Thakur R, Devi R, Lal MK, Tiwari RK, Sharma S and Kumar R (2023) Morphological, ultra-structural and molecular variations in susceptible and resistant genotypes of chickpea infected with botrytis grey mould. <i>Peer J</i> 11 :e15134 DOI 10.7717/peerj.1513	9.06
2884	Thakur R, Sharma S, Devi R, Sirari A, Tiwari R K, Lal M K and Kumar R (2023) Exploring the molecular basis of resistance to Botrytis cinerea in chickpea genotypes through biochemical and morphological markers. <i>Peer J</i> : 11 (8), e15560. DOI: 10.7717 /peerj.15560	9.06
2885	Thakur S, Gautam K, Chauhan S K and Sharma J P (2023) Tailoring tree ideotypes for multiple purposes in agroforestry. <i>Forst Chronicle</i> 98 (1): 1-7.	7.17
2886	Thakur T and Dhatt K K (2023) Evaluation of genotypes and correlation studies in Marigold (<i>Tagetes</i> spp.) for growth and yield attributes. <i>Environ. Conserv J</i> 24 (1): 198–03.	5.66
2887	Thesiya M R, Lore J S, Bhatia D, Kalia A S, Hunjan M S and Kaur R (2023) Histopathological patterns and differential behavioural of Rhizoctonia solani causing sheath blight in rice (<i>Oryza sativa</i> L.). <i>J Phytopath.</i> https://doi.org/10.1111/jph.13194 .	7.83
2888	Tumasyan A, Adam W, Andrejkovic J W, Bergauer T, Chatterjee S, Kalsi A K (2023) Search for CP violation using $t\bar{t}$ events in the lepton+jets channel in pp collisions at $\sqrt{s}=13$ TeV. <i>J High Energy Physics</i> 6 :081.	12.38
2889	Tumasyan A, Adam W, Andrejkovic J W, Kalsi A K et al., (2023) Strange hadron collectivity in pPb and PbPb collisions. <i>J High Energy Physics</i> 5 : 007	12.38
2890	Tumasyan A, Adam W, AndrejkovicJW, Kalsi A K et al., (2023) Search for Higgs boson decays to a Z boson and a photon in proton-proton collisions at $\sqrt{s}=13$ TeV. <i>J High Energy Physics</i> 5 : 223	12.38
2891	Ubhi M K, Kaur M, Singh D and Sharma V K (2023) Structural and adsorptive properties of boron- and phosphorous-doped graphene oxide: Insight into effective removal of Pb(II) and As(III). <i>J Water Process Eng</i> 52 (6): 103539.	13.34



2892	Verma A, Khurana R and Dixit A (2023) Performance indices of a combined tillage machine for the incorporation of leguminous green manure at appropriate depth. <i>Legume Res</i> 46(4) : 453-62.	6.67
2893	Verma J, Singh P and Sharma R (2023) Evaluation of air pollution tolerance index and anticipated performance index of selected roadside tree species in Ludhiana. <i>Environ Monit Assess</i> 195 : 240.	8.51
2894	Verma M, Pandove G, Oberoi H K, Kaur S, Kalia A, Singh D P and Kaur J (2023) Quality of forage oats (L.) as <i>Avena Sativa</i> affected by seed biopriming with liquid bacterial inoculants. <i>Indian J Agri Sci</i> 93 (5) : 576-78.	6.37
2895	Verma M, Singla N, Aulakh C S and Jain R (2023) Influence of organic, integrated and conventional production systems on concentration of phytonutrients in cereals and legumes. <i>Agri Res J</i> 60 : 113-20.	5.44
2896	Verma N, Garcha K S, Sharma A, Sharma M, Bhatia D, Khosa J S, Kaur B, Chuuneja P and Dhatt AS (2023) Identification of a major-effect QTL associated with begomoviruses resistance in <i>Cucurbita moschata</i> Duchesne. <i>Phytopath</i> https://doi.org/10.1094/PHYTO-07-22-0240-FI	10.01
2897	Vijayan V D, Madane D A and Haldar D (2023) Monsoon paddy crop discrimination using machine learning algorithms to multi-temporal Sentinel-1A (C-band) data in Alathur block of Palakkad district of Kerala state, India. <i>Pad Wat Env.</i> https://doi.org/10.1007/s10333-023-00934-w .	7.55
2898	Wagh M D, Alam M S and Aslam R (2023) Vacuum Impregnation of Ascorbic Acid and Calcium Lactate Improves Quality Attributes and Functionality of White Button Mushrooms. <i>J Food Process Preserv</i> https://doi.org/10.1155/2023/6728630	8.61
2899	Wajhat U N, S Sandhu, R Ranjan and R Sharda (2023) Root plasticity: an effective selection technique for identification of drought tolerant maize (<i>Zea mays</i> L.) inbred lines. <i>Scient Rep</i> https://doi.org/10.1038/s41598-023-31523	11.00
2900	Walia S S, Kaur T, Gupta R K, Siddiqui MH and Rahman M A (2023) Long-term impact of the continuous use of organic manures on crop and soil productivity under maize–potato–onion cropping systems. <i>Sustainability</i> 15(10) : 8254 https://doi.org/10.3390/su15108254	9.89
2901	Zalpouri R, Singh M, Kaur P, Kaur A and Gaikwad K K (2023) Drying Kinetics, Physicochemical and Thermal Analysis of Onion Puree Dried Using a Refractance Window Dryer. <i>Process</i> 11 : 700. https://doi.org/10.3390/pr11030700	9.35

LIST OF TESTING SCHEMES

2018-19		
Sr. No.	Name of the Project	Department
1	Conduct of adaptive research trials of ACM-9 in wheat crop	Agronomy
2	Bioefficacy and phytotoxicity evaluation of BAS 781 02 H in sugarcane and succeeding crop	Agronomy
3	Bioefficacy and phytotoxicity of BAS 822 01H in sugarcane and succeeding crop	Agronomy
4	Evaluation of F4257 2.5 % GR (beflubutamid) in transplanted rice	Agronomy
5	Bioefficacy and phytotoxicity of Actonifen 600 SC against grasses and broad-leaf weeds in wheat and its effect on succeeding crop	Agronomy
6	Evaluation of herbicide carfentrazone ethyl 40% Df in wheat and its effect on succeeding crop	Agronomy
7	Conduct of adaptive research Trials of Pyroxasulfone in wheat	Agronomy
8	Evaluation of the effect of Soligro GR on growth and yield of paddy	Agronomy
9	Evaluation of Plant growth regulator zintara in rice	Agronomy
10	Trail on bio-efficacy evaluation of Glufosinate ammonium 13.5% SL against weed flora in grapes	Agronomy
11	Evaluation of Maize Hybrids during Spring 2018 Misc-67	Agronomy
12	Evaluation of Maize hybrids developed by private sector during Kharif ,Misc.-121	Agronomy
13	Evaluation of Pearl millet hybrid for fodder purpose during <i>kharif</i> 2018, Misc.-122	Agronomy
14	Bioefficacy of Beta-Cyfluthrin 8.91% + Imidacloprid 19.81% w/w OD (Solomon 300 OD) against black bug in sugarcane Misc. 53	Entomology
15	Evaluation of bioefficacy and phytotoxicity of broflanilide 30% SC (BAS 450 011 300 SC) against stemborers in rice MISC-148	Entomology
16	Study on resurgence in whitefly, jassid and thrips due to repeated application of flipronil 5 SC in cotton MISC-69	Entomology
17	Evaluation of bioefficacy of Spinetoram 0.8% GR against rice stemborers and leaf folder in basmati rice and its effect on natural enemies MISC-130	Entomology
18	Bioefficacy of insecticide, Dinotefuran 20% SG (Osheen) against planthoppers in rice MISC-134	Entomology
19	Evaluation of bioefficacy and phytotoxicity of Broflanilide 30% SC (BAS 450 011 300 SC) against leaffolder in rice MISC-135	Entomology
20	Supervised field trial on residues and dissipation of Flubendiamide 240 + ThiaclopridSc (Belt Expert) on Bengal gram ICAR-68	Entomology
21	Supervised field trial on residues and dissipation of Flubendiamide 90 + Del-tamethrin 60 SC (Fame Quick) on tomato ICAR-70	Entomology



22	Evaluation and bioefficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1.0%) against rice stem borers and leaf folder in rice	Entomology
23	Evaluation of BAS 306 021-240 SC (Chorfenapyr 240 SC) in Cotton against Spodopteralitura and thrips sponsored by BASF	Entomology
24	Evaluation of jump start in wheat	Plant Breeding & Genetics
25	Field trial on residues and persistence of Forchlorfenuron 0.12% EC w/w in basmati rice	Plant Breeding & Genetics
26	Field trial on residues and persistence of Propiconazole 10.7% w/w + Tricyclazole 34.2 % w/w SE in Rice	Plant Breeding & Genetics
27	Field trial on residue and persistence (dissipation) of Tebuconazole 50% + Trifloxystrobin 25% WG (Nativo) on green peas	Plant Breeding & Genetics
28	Evaluation of bioefficacy and phytotoxicity of Elicitomone (ETM) the foliar nitrogen biofertilizers in rice crop	Plant Breeding & Genetics
29	Nutritional evaluation of fodder hybrids for silage purpose during 2018-19	Plant Breeding & Genetics
30	Evaluation of GEAC recommended Bt Cotton hybrids in North India during Kharif 2018-19 at Bathinda	Plant Breeding & Genetics
31	Bio efficacy evaluation and phyto-toxicity evaluation of UPH 2616 against complex weed flora of Potato and its effect on succeeding crop	Plant Pathology
32	Evaluation of F9600 4% GR (Clamazone) in transplanted rice and its effect on succeeding crop	Plant Pathology
33	Evaluatio of bioefficacy and phytotoxicity of a product IHC013 in wheat and its effect on succeeding crop	Plant Pathology
34	Evaluation of Aclonifen 500+ Diflufenican 600 SC in wheat and its effect on succeeding crop	Plant Pathology
35	Studies on Bioefficacy and phytotoxicity of pyroxasulfone 50+ Aclonifen 450+ Diflufenican 75(575) SC against grasses, sedges and broadleaf weeds in Wheat and its effect on succeeding crop-2 season	Plant Pathology
36	Evaluation of bioefficacy and phytotoxicity of metiram 70% WG against alter-naria leaf spot disease of cotton for two seasons	Plant Pathology
37	Bio-efficacy evaluation of fungicide UPF 1317 on grapes against anthracnose and powdery mildew in grapes	Plant Pathology
38	Bioefficacy testing of Amistar top on cotton against leaf spot & grey mildew	Plant Pathology
39	Bioefficacy evaluation of luna sensation (fluopyram 250+ trifloxystrobin 250 SC) against sheath blight and dirty panicle of rice	Plant Pathology
40	Bioefficacy evaluation of luna sensation (fluopyram 250+ trifloxystrobin 250 SC) against leaf and neck blast of rice	Plant Pathology
41	Evaluation of bioefficacy of picoxystrolin 7.05% + Propiconazole 11.71% w/w SC against purple blotch in onion	Plant Pathology
42	Evaluation of BCS-CS55621-20 against late blight of tomato	Plant Pathology
43	Evaluation of Nativo Super against early blight of Tomato	Plant Pathology
44	Evaluation of BCS-CS55621-20 SC against downy midlew of cucumber	Plant Pathology
45	Evaluation of Penflufen 240 FS (Emesto Prime) against Black scurf of Potato	Plant Pathology

46	Bioefficacy and phytotoxicity of evaluation of fungicide UPF-116 for early blight disease on Potato	Plant Pathology
47	Bioefficacy and phytotoxicity of evaluation of fungicide UPF-116 for late blight disease on Potato	Plant Pathology
48	Evaluation of Oxathiapiprolin 0.6% +Mancozeb 60% (R2Y13) WG against late blight disease of potato	Plant Pathology
49	Evaluation of fungicide UPF-116 against Anthracnose of grapes	Plant Pathology
50	Evaluation of fungicide UPF-116 against powdery mildew of grapes	Plant Pathology
51	Field trial on residues and persistence of Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC on citrus	Plant Pathology
52	Field trial on residues Flupyrimin (ME 5352, 2% GR) on rice	Plant Pathology
53	Field trial on residues Flupyrimin (ME 5382, 10% SC) on rice	Plant Pathology
54	Field trial on residue and persistence (dissipation) of beta cyfluthrin 90 + Imidacloprid 210 OD (Solomon) on onion	Plant Pathology
55	Field trial on residue and persistence (dissipation) of Tebuconazole 50% + Trifloxystrobin 25 WG (Nativo 75 WG) on okra	Plant Pathology
56	The residues and persistence of Fosetyl AI (Aliette 80 WP) on citrus-2 nd season	Plant Pathology
57	Field trial on residue and dissipation of Imidacloprid (Gaucho 600 FS) on green peas	Plant Pathology
58	Generation of Bio-efficacy and Phytotoxicity data on PGR Procorfenuron (TradenameSitifex) in Transplanted rice	Plant Pathology
59	Evaluation of bio-efficacy trial of KAYAKALP (soil Conditioner) for two consecutive seasons paddy followed by wheat in same plot	Soil Science
60	Evaluation of bioefficacy of Speed Compost in paddy stubble decomposting	Soil Science

2019-20

61	Evaluation of maize hybrids during <i>spring</i> season	Plant Breeding & Genetics
62	Evaluation of maize hybrids during <i>kharif</i> season	Plant Breeding & Genetics
63	Nutritional Evaluation of sorghum hybrids for forage purpose – Rassi Seeds Pvt Ltd.	Plant Breeding & Genetics
64	Bioefficacy and phytotoxicity of BAS 752 00 F against sheath blight and dirty panicle of rice	Plant Pathology
65	Bioefficacy and phytotoxicity of BAS 752 60 F against blast of rice	Plant Pathology
66	Evaluation of efficacy of NF-171 10% SC formulation on late blight of potato	Plant Pathology
67	Bioefficacy and residue evaluation of tricyclazole 75% WP project on basmati rice	Plant Pathology
68	Evaluation of TPM 70%WP on blast disease of paddy	Plant Pathology
69	Evaluation of TPM 41.7% SC on blast disease of paddy	Plant Pathology



70	Evaluation of Azoxystrobin 7.5% + propiconazole 12.5% SE against yellow rust disease of wheat	Plant Pathology
71	Evaluation of efficacy of Thifluzamide 24% SC in paddy against sheath blight disease	Plant Pathology
72	Bioefficacy and phytotoxicity of BAS 752 01 F against sheath blight and dirty panicle of rice	Plant Pathology
73	Evaluation of bio-efficacy of metiram 70 % WG against alternaria leaf spot disease of cotton	Plant Pathology
74	Bioefficacy evaluation of amistar top on cotton against leaf spot and powdery mildew	Plant Pathology
75	Bioefficacy evaluation of Luna sensation against sheath blight and dirty panicle of rice	Plant Pathology
76	Bioefficacy evaluation of Luna sensation against leaf and neck blast of rice	Plant Pathology
77	Evaluation and bioefficacy of picoxystrobin 7.05% + propiconazole 11.71% w/w SC (galileo way) against purple blotch in onion	Plant Pathology
78	Development validation and Dissemination of Bio-Intensive Integrated Pest Management Technologies in organic basmati rice	Plant Pathology
79	Management of foot rot of basmati rice, pea wilt and black scurf of potato through use of biopesticides	Plant Pathology
80	Addressing food security concerns nutritionally enriched improved cultivar technologies for SWASTH bharaat under PURSE Programme	Plant Pathology
81	Bio-efficacy evaluation of Prosulfocarb 80 EC against weeds of wheat especially Phalaris minor.	Agronomy
82	Bioefficacy evaluation of herbicide of UPH 616 against weed flora of transplanted rice and its effect on succeeding crop.	Agronomy
83	Evaluation of bioefficacy and Phytotoxicity of Fenoxaprop-p-ethyl 69 EC against weeds in transplanted rice and its effect on succeeding crop	Agronomy
84	Bioefficacy evaluation of Florpyrauxifen-benzyl 20g/L+ Cyhalofop Butyl 100g/L EC (w/v) herbicide for weed control in Direct Seeded Rice	Agronomy
85	Evaluation of bioefficacy of PIX-10006 43% WG against weeds of transplanted rice	Agronomy
86	Evaluation of bioefficacy of PIX-10006 43% WG against weeds of direct seeded rice	Agronomy
87	To Evaluate the season bio efficacy and phytotoxicity study with Ambition (Bio Stimulant) in Transplanted rice	Agronomy
88	To Evaluate the bio efficacy and phytotoxicity of Fenoxaprop-p-ethyl 69EC against weeds in Direct Seeded rice and effect on succeeding crop	Agronomy
89	Evaluation of herbicide TVE29 40 SC as early pre emergence in wet direct seeded rice and its effect on succeeding crop	Agronomy
90	Evaluation of herbicide TVE29 40 SC as early pre emergence in transplanted rice and its effect on succeeding crop	Agronomy
91	Bioefficacy evaluation herbicide tank mix axial (pinoxaden) plus Adrino (Mertibuzin) on wheat against phalaris & other weeds	Agronomy
92	Evaluation of herbicide TVE29 40 SC as pre emergence in transplanted Rice and its effect on succeeding crop.	Agronomy

93	Evaluation of herbicide TVE29 40 SC as early post emergence in wet Direct Seeded Rice and its effect on succeeding crop	Agronomy
94	Comparative performance of herbicide VPlant Pathology72 60% WG with other recommended herbicides for weed control in wheat	Agronomy
95	Sulphur Nutrition of Potato	Soil Science
96	Detection of water and nutrient stresses in crops using remote and proximal sensing	Soil Science
97	Use of industrial product as synthetic conditioner in sodic and Sulphur deficient soils of Punjab	Soil Science
98	Brand evaluation of Daita 10 EC (pyriproxyfen) on Bt cotton	Entomology
99	Efficacy of Coragen 18.5 SC (chlorantraniliprole) against spotted bollworms in Okra	Entomology
100	Efficacy of Chlorantraniliprole 625g/L FS (Lumivia) as seed treatment for Control of Stemborer in Direct Seeded Rice	Entomology
101	Evaluation of efficacy of Takumi 20% WG (flubendiamide) against rice stemborers and leaffolder in rice	Entomology
102	Brand evaluation of Celcron 50 EC (profenophos) against thrips on cotton	Entomology
103	Evaluation of Ulala 50 WG (Flonicamid) as foliar spray against sucking insect pests in potato	Entomology
104	Evaluation of Sulfoxaflor 12% SC as foliar spray against aphids in potato	Entomology
105	Flubendiamide 90 g/L + Deltamethrin 60 g/L SC (Fenos Quick) on Maize	Entomology
106	Flupyrimin 2% Granular (ME5382 2% Granular) on Rice 2 nd year	Entomology
107	Flupyrimin 10% SC (ME5382 10% SC) on Rice 2 nd year	Entomology
108	Spinetoram 6% w/v (5.66%w/w) + Methoxyfenozide 30% w/v (28.3%w/w) SC on Red gram and Green gram	Entomology
109	Fluopyram 400 g/L SC (Velum Prime) 2 Seasons on Cucumber	Entomology
110	Fluopyram 400 g/L SC (Velum Prime), 2 Seasons on Tomato	Entomology
111	Fluoxapiprolin 20 g/L SC on Cucumber	Entomology
112	Fluoxapiprolin 20 g/L SC on Tomato	Entomology
113	Tetraniliprole 120 g/L + Thiacloprid 360 g/L SC (Vayego Quantum) on Brinjal	Entomology
114	Fluoxapiprolin 30 g/L + Fluopicolide 200 G/L SC on Potato	Entomology
115	Iprovalicarb 8.4% + CoPlant Pathologyer Oxy Chloride 40.6% WG on Cucumber	Entomology
116	Tetraniliprole 240 g/L + Fipronil 240 g/L FS (Reatis Plus) on Rice	Entomology
117	Spirotetramat 30 g/L + Diafenthiuron 120 g/L SC on Chilli	Entomology
118	Tetraniliprole 240 g/L + Fipronil 240 g/L FS (Reatis Plus) on Maize	Entomology

2020-21		
119	Evaluation of maize hybrids during <i>spring</i> season developed by private companies at PAU, Ludhiana	Plant Breeding & Genetics
120	Evaluation of maize hybrids during <i>kharif</i> season developed by private companies at PAU, Ludhiana	Plant Breeding & Genetics
121	Nutritional Evaluation of sorghum hybrids for forage purpose – Rassi Seeds Pvt Ltd.	Plant Breeding & Genetics
122	Evaluation of Pvt Sector hybrid/varieties of fodder maize, sorghum and pearl millet	Plant Breeding & Genetics
123	Testing of hybrids of Indian Mustard	Plant Breeding & Genetics
124	Evaluation of Neonix 20FS on Groundnut	Plant Breeding & Genetics
125	Evaluation of Entries from Private Sector under AICRP-RM	Plant Breeding & Genetics
126	Testing of rice hybrids under direct seeding (Bayer Crop Science Limited)	Plant Breeding & Genetics
127	Evaluation of herbicide tolerant hybrids under direct seeding (Savanah Seeds Limited)	Plant Breeding & Genetics
128	Evaluation of the bio-efficacy of FYTOVITA on Paddy crop (T. Stanes and Company Limited, Coimbatore, TN)	Plant Breeding & Genetics
129	Evaluation of efficacy of Biozyme Power Plus-G in Paddy (BioStadt India Pvt. Ltd., Worli, Mumbai)	Plant Breeding & Genetics
130	Evaluation of efficacy of Amaze-X G in Paddy (BioStadt India Pvt. Ltd., Worli, Mumbai)	Plant Breeding & Genetics
131	Evaluation of Pvt Sector hybrid/varieties of fodder maize, sorghum and pearl Millet	Plant Breeding & Genetics
132	Evaluation of herbicide Sewep Power (Glufosinate Ammonium 13.5% SL) against weed spectrum in cotton	Agronomy
133	Bioefficacy of Momiji 85 WG (pyroxasulfone) against various weeds in wheat	Agronomy
134	Evaluation of herbicide council Active 30 WG in DSR	Agronomy
135	Bioefficacy evaluation of GPH 1120 against weed flora in wheat	Agronomy
136	Bioefficacy evaluation of herbicide of UPH 616 against weed flora of Direct Seeded Rice	Agronomy
137	Evaluation of Glufosinate Ammonium 13.5% SL for weed control in non crop Pathology area	Agronomy
138	Efficacy evaluation of floryprauxifen benzyl 20g/l + cyhalofopbutyl 100g/l EC, floryprauxifen benzyl 2.5% EC and floryprauxifen benzyl 12.5 g/l + penoxsulam 20g/l OD for weed control in transplanted rice	Agronomy
139	Evaluation of BCS-CS55621-20 against late blight of tomato	Plant Pathology
140	Evaluation of against early blight of Tomato	Plant Pathology

141	Evaluation of BCS-CS55621-20 against downy mildew of cucumber	Plant Pathology
142	Evaluation of fungicide UPF-116 for early blight disease on Potato	Plant Pathology
143	Evaluation of fungicide UPF-116 for late blight disease on Potato	Plant Pathology
144	Residue trial of Oxathiapiprolin 0.6% + mancozeb 60% w/w wg in potato	Plant Pathology
145	Evaluation of fungicide UPF-116 against anthracnose of grapes	Plant Pathology
146	Evaluation of fungicide UPF-116 against powdery mildew of grapes	Plant Pathology
147	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on cucumber	Plant Pathology
148	Bioefficacy evaluation of Epic 75% WG (hexaconazole 75% WG) against sheath blight of rice	Plant Pathology
149	Bioefficacy evaluation of Epic 75% WG (hexaconazole 75% WG) against sheath rot of rice	Plant Pathology
150	Evaluation of Fluensulfone 2% GR (NIMITZ) against nematodes in Wheat	Plant Pathology
151	Evaluation of fluensulfone against nematodes in carrot	Plant Pathology
152	Adaptive research trial of fungicide custodia against yellow rust of wheat	Plant Pathology
153	Evaluation of Fluoxapiprolin 30g/L + fluopicolide 200 g/L SC on Tomato	Plant Pathology
154	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on Tomato	Plant Pathology
155	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on Potato	Plant Pathology
156	Evaluation of Fluoxapiprolin 30 + fluopicolide 200 (230) SC on Potato	Plant Pathology
157	Residue trial of Picoxystrobin 7.05% + propiconazole 11.71% w/w SC in onion	Plant Pathology
158	Evaluation of Oxathiapiprolin 0.6% +mancozeb 60% WG against late blight of Potato	Plant Pathology
159	Evaluation of Avancer glow on rice	Plant Pathology
160	Evaluation of bioefficacy and phytotoxicity of Metiram 70% WG against alternaria leaf spot disease of cotton	Plant Pathology
161	Evaluation of Galileo way for rice diseases	Plant Pathology
162	Evaluation of Ampact Extra against yellow rust of wheat	Plant Pathology
163	Evaluation of efficacy of Thifluzamide 24% sc (pulsor fungicide) in paddy crop against sheath blight disease	Plant Pathology
164	Testing of Iglare 24 Sc against sheath blight of rice	Plant Pathology
165	Bioefficacy study of velum prime against tomato root knt nematodes	Plant Pathology
166	Bioefficacy of nativo against early blight of tomato	Plant Pathology
167	Adaptive Research trials (Arts) for systiva (Fluoxapyroxad) 333g/L FS	Plant Pathology
168	Evaluation of biofungicide bacillus subtilis NBRI-W9 against fusarium yellows & corn rot pathogens in gladiolous	Plant Pathology
169	Evaluation of bio-efficacy of Infinito (Fluopicolide 62.5 + propamocarb Hydrochloride 625 SC against Late Blight of potato	Plant Pathology



170	Evaluation of the efficacy of Oxathiapiprolin 48 + Amisulbrom 240 g/L SE against late blight of potato	Plant Pathology
171	Management of foot rot of basmati rice, Pea wilt and Black scurf of potato through use of bio-pesticides	Plant Pathology
172	Monitoring of emerging viral diseases and their vector population for virus free potato seed production in different agro climatic zones of Punjab	Plant Pathology
173	Survey and Indexing of citrus nurseries (NHM rated) and orchards to estimate possible threat against virus and virus like organisms causing diseases of citrus in Punjab	Plant Pathology
174	Addressing Food security through Nutritionally Enriched Improved Cultivars and Technologies for Swasth Bharat under Purse Programme	Plant Pathology
175	Bioefficacy evaluation of herbal formulations against leaf curl diseases its vector & other major insect pests of chilli	Plant Pathology
176	Towards the development of Monitoring & forewarning system for late blight disease of Potato by Integrating epidemeology	Plant Pathology
177	Strengthening and Development of Higher Agricultural Education in India, ICAR-1 (Part-E) under sub-head 9.2.2 Tutorial classes for SC students by inviting eminent experts for preparing students for National/ International competitions(3 rd Instalment)	Plant Pathology
178	Entrepreneurship Development programme for SC Beneficiaries through online/ Virtual mode etc. Development and Strengthening of state Agricultural Universities ICAR-1 sub head 9.2.3(2 nd Instalment)	Plant Pathology
179	Paddy straw residues management through in-situ microbial decomposition with mechanical interventions	Soil Science
180	Evaluation of IFFCO nano formulation of Nitrogen, Zinc and CoPlant Pathologyer on rice-wheat croPlant Pathologying system	Soil Science
181	Water quality status of Satluj and Beas: past and present trend analysis for future prediction	Soil Science
182	Evaluation of bioefficacy and phytotoxicity of ME 5382 2% GR against rice Planthoppers	Entomology
183	Evaluation of bioefficacy and phytotoxicity of ME 5382 2% GR against rice stem-borers in rice	Entomology
184	Evaluation of bioefficacy and phytotoxicity of ME 5382 10 SC against rice planthoppers	Entomology
185	Brand Evaluation of Neon 5 EC (fenpyroximate) against jassid on Bt cotton	Entomology
186	Brand Evaluation of Delegate 11.7SC (Spinetoram) against thrips on Bt cotton	Entomology
187	Brand Evaluation of Sefina 50 DC (afidopyropen) against whitefly on Bt cotton	Entomology
188	Evaluation of bioefficacy and phytotoxicity of Broflanilide 30% SC (BAS 450 011 300 SC) against leaf folder in rice	Entomology
189	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against rice stem-borers and leaf folders in non-basmati rice under DSR system	Entomology
190	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against rice stem-borers and leaffolders in non-basmati rice	Entomology
191	Bioefficacy and phytotoxicity studies with tetraniliprole 200 SC (Vayego 200 SC) against pod borer complex in red gram	Entomology

192	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against fruit borer in chilli	Entomology
193	Evaluation of bio-efficacy and phytotoxicity of Ulala 50 WG (Flonicamid) against rice planthoppers	Entomology
194	Evaluation of bio-efficacy and phytotoxicity of Token 20 SG (Dinotefuran) against rice planthoppers	Entomology
195	Adaptive research trails for efficacy of Osheen 20 SG (Dinotefuran) against planthoppers in rice	Entomology
196	Evaluation of bio-efficacy and phytotoxicity of BAS 560 00 I {(3R-3-(2-chlorothiazol-5-yl)-8-methyl-7-oxo-6-phenyl-2,3-dihydro thiazolo[3.2-a] pyrimidin-4-ium-5-olate} against rice planthoppers	Entomology
197	Evaluation of Mortel 0.3 G (fipronil) against termites in wheat	Entomology
198	Evaluation of bio-efficacy and phytotoxicity of Afidopyropene 50g/L DC against aphids on wheat	Entomology
199	Evaluation of Mortel 0.3 G (Fipronil) against pink stemborer in wheat	Entomology
200	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against pink stemborer infesting wheat sown in paddy straw managed fields	Entomology
201	Evaluation of efficacy of Ecotin (Azadirachtin 5% against rice stemborer and leaf folder in basmati and non-basmati transplanted rice under normal and organic conditions	Entomology
202	Residue studies of Trinexapac ethyl 25%EC on rice	Entomology
203	Residue studies of Zineb on grapes	Entomology
204	Residue studies of Zineb on rice	Entomology
205	Residue studies of betacyfluthrin and imidacloprid on maize	Entomology
206	Residue studies of tetraniliprole on red gram	Entomology
207	Residue studies of tetraniliprole on maize	Entomology
208	Residue studies of fluopyram on potato	Entomology
209	Residue studies of isoxaflutole + thiencazone methyl on maize	Entomology
210	Residue studies of fludioxonil on citrus	Entomology
211	Residue studies of isocycloseram on tomato	Entomology
2021-22		
212	Evaluation of Vivaya 6 OD for weed control in direct seeded rice	Agronomy
213	Evaluation of herbicide PEPE 25% SE (Penoxsulam 1% + Pendimethanlin 24%) for weed management in Direct Seed Rice	Agronomy
214	Field efficacy of sulfosulfuron 75% WG on resistant Phalaris minor in wheat	Agronomy
215	Evaluation of herbicide TVE29 400 g/l SC (tetflupyrolimet) as early post application in wet DSR	Agronomy
216	Evaluation of Flufosinate Ammonium 13.5% SL (Sweep Power) for weed control in cotton	Agronomy
217	Evaluation of Axial EC (pinoxaden) in wheat through Drone application	Agronomy



218	Evaluation of herbicide 2,4-D ethyl easter 38% EX in wheat	Agronomy
219	Evaluation of herbicide 2,4-D sodium salt 95% SP against weed flora in sugarcane	Agronomy
220	Evaluation of bioefficacy and phytotoxicity of Epivio energy in wheat crop	Agronomy
221	Evaluation of post-emergent herbicide Ril-301/401 for bioefficacy and phytotoxicity in wheat	Agronomy
222	Evaluation of herbicide TVE29 400 g/l SC (tetflupyrolimet) in wet transplanted rice	Agronomy
223	Bioefficacy phytotoxicity and succeeding crops studies with flufenacet 24% + Metribuzin 17.5% WG (Artist) in potato	Agronomy
224	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on cucumber	Plant Pathology
225	Bioefficacy evaluation of Epic 75% WG (hexaconazole 75% WG) against sheath rot of rice	Plant Pathology
226	Bioefficacy evaluation of Epic 75% WG (hexaconazole 75% WG) against sheath blight of rice	Plant Pathology
227	Evaluation of Fluensulfone 2% GR (NIMITZ) against nematodes in Wheat	Plant Pathology
228	Evaluation of Fluoxapiprolin 30g/L + fluopolicide 200 g/L SC on Tomato	Plant Pathology
229	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on Tomato	Plant Pathology
230	Evaluation of Iprovalicarb 8.4%+ coPlant Pathologyer oxychloride 40.6% WG on Potato	Plant Pathology
231	Evaluation of Fluoxapiprolin 30 + fluopolicide 200 (230) SC on late blight of potato	Plant Pathology
232	Bioefficacy evaluation of Avancer glow on rice	Plant Pathology
233	Bioefficacy testing of Fluoxapyroxad 167 g/L+ Pyrocolostrobin 333g/l against alternaria leaf spot disease of cotton	Plant Pathology
234	Evaluation of Galileo way for rice diseases	Plant Pathology
235	Evaluation of Ampact Extra against yellow rust of wheat	Plant Pathology
236	Evaluation of efficacy of Thifluzamide 24% sc (pulsor fungicide) in paddy crop against sheath blight disease Multilocation/adaptive trails	Plant Pathology
237	Testing of Iglare 24 Sc against sheath blight of rice	Plant Pathology
238	Bioefficacy study of velum prime against tomato root knot nematodes to include in package of practices	Plant Pathology
239	Evaluation of bioefficacy of nativo(Trifloxystrobin 25+ Tebuconazole 50 WG) against early blight of tomato	Plant Pathology
240	Adaptive Research trials (Arts) for systiva (Fluoxapyroxad) 333g/l FS	Plant Pathology
241	Evaluation of biofungicide bacillus subtilis NBRI-W9 against fusarium yellows & corn rot pathogens in gladiolous	Plant Pathology
242	Evaluation of bio-efficacy of Infinito (Fluopicolide 62.5 + propamocarb Hydrochloride 625 SC against Late Blight of potato	Plant Pathology
243	Evaluation of the efficacy of Oxathiapiprolin 48 + Amisulbrom 240 g/L SE against late blight of potato	Plant Pathology

244	Adaptive Resaerch Trials on EPIC 75 WG (hexaconazole) for the management of sheath blight and sheath rot of rice	Plant Pathology
245	Evaluation of AmpactXtra 280 against Yellow Rust of Wheat through drone appli- cation	Plant Pathology
246	Bio-efficacy evaluation of bio-fungicide formulation Bacillus subtilusZB87-1/2 against sheath blight of rice	Plant Pathology
247	Evaluation of bio-efficacy of fungicide UPF 108 against late blight of potato	Plant Pathology
248	“Bio-efficacy evaluation of Rallis RIL-236/CF(30% OD) against early blight of tomato”	Plant Pathology
249	“Bio-efficacy evaluation of Rallis RIL-236/CF(30% OD) against anthracanose and leaf spot of chilli”	Plant Pathology
250	“Bio-efficacy evaluation of BIOMYCIN (Kasugamycin 3% SL) against early blight of Potato”	Plant Pathology
251	Multi location Adaptive Research Trails for evaluation of bio-efficacy of Iglare (Thi fluzamide (24 % SC) against sheath blight of paddy	Plant Pathology
252	Bio-efficacy evaluation of IIF-1516 againt sheath blight, false smut and blast disease of rice for two seasons	Plant Pathology
253	Bio-efficaccay evaluation of Provax (carboxin 17.5% + Thiram 17.5 % FF) against Loose smut of wheat	Plant Pathology
254	Bio-efficacy evaluation of UPST-220 against loos smut and karnal bunt of wheat	Plant Pathology
255	Bio-efficacy evaluation of Nematofree Plus againstRoot knot nematodes in capsicum under protected cultivation	Plant Pathology
256	Bio-efficacy evaluation of PaecilomyceslilacinusagainstRoot knot nematodes in cucumber under protected cultivation	Plant Pathology
257	Bio-efficacy evaluation of Pseudomonas fluorescens 1.0% WP (Strain no. IPL/ PS/01) against Pokkahboeng of sugarcane	Plant Pathology
258	Bio-efficacy evaluation of Trichoderma viride 1.0% WP (Strain no. IPL/VT/101) against red rot of sugarcane	Plant Pathology
259	Bio-efficacy evaluation of Vibrance Integral and Tymirium against Bakane disease of rice	Plant Pathology
260	“Bio-efficacy evaluation of Mildown 2% AS against late blight (Phytopathorain- festants (Mont.) of potato ”	Plant Pathology
261	“Bioefficacy evaluation of fungicide Opera 183 SE against yellow rust of wheat through drone application”	Plant Pathology
262	Bioefficacy evaluation of seed treatment fungicide Saaf-WS (Carbendazim 12%+ Mancozep 63% WS) against diseases of Pea	Plant Pathology
263	Strengthening of Plant Bacteriology laboratory for high -throughput detection and screening of quarantine bacterial pathogens	Plant Pathology
264	Survey and Surveillance for the maintenance of pest free areas for brown rot to facilitate export of potato to European and other countries	Plant Pathology
265	Management of Foot rot of basmati rice, Pea wilt and Black Scurf of potato through use of biopesticides	Plant Pathology
266	Monitoring of emerging viral diseases and their vector population for virus free seed potato production in different Agro-climatic zones of Punjab	Plant Pathology
267	Survey and Indexing of citrus nurseries (NHM rated) and orchards to estimate possi- ble threat against virus and virus like organisms causing diseases of citrus in Punjab	Plant Pathology



268	Diagnostic, Laboratory for Apical leaf curl virus of potato, Badna viruses and Citrus greening of citrus, other viral diseases and phytoplasmas	Plant Pathology
269	Addressing Food security through Nutritionally Enriched Improved Cultivars and Technologies for Swasth Bharat under Purse Programme	Plant Pathology
270	Towards the development of Monitoring & forewarning system for late blight disease of Potato by Integrating epidemeology	Plant Pathology
271	Human Resource Development Need Based Interventions for livelihood, upliftment and awareness programme on Government policies and plans in SC Clusters through online/ Virtual Mode under the scheme Strengthening and Development of Higher Agricultural Education in India, ICAR-1 (Part-E) sub-head 9.2.1 (1 st Instalment)	Plant Pathology
272	Human Resource Development Need Based Interventions for livelihood, upliftment and awareness programme on Government policies and plans in SC Clusters through online/ Virtual Mode under the scheme Strengthening and Development of Higher Agricultural Education in India, ICAR-1 (Part-E) sub-head 9.2.1 (3 rd Instalment)	Plant Pathology
273	Strengthening and Development of Higher Agricultural Education in India, ICAR-1 (Part-E) under sub-head 9.2.2 Tutorial classes for SC students by inviting eminent experts for preparing students for National/ International competitions (2 nd Instalment)	Plant Pathology
274	Entrepreneurship Development programme for SC Beneficiaries through online/ Virtual mode etc. Development and Strengthening of state Agricultural Universities ICAR-1 sub head 9.2.3 (2 nd Instalment)	Plant Pathology
275	Evaluation of efficacy of Chlorantraniliprole 0.4% GR (Ferterra/ E2Y45 0.4%GR) against Fall Armyworm, <i>Spodoptera frugiperda</i> , Corn stem borer, <i>Chilo partellus</i> and Pink stem borer <i>Sesamia inferens</i> on maize	Entomology
276	Residue studies of fluopyram and tebuconazole on okra	Entomology
277	Residue studies of tebuconazole and trifloxystrobin on chickpea	Entomology
278	Residue studies of flupyradifurone on chilli	Entomology
279	Residue studies of flupyradifurone on tomato	Entomology
280	Residue studies of betacyfluthrin and imidacloprid on rice	Entomology
281	Residue studies of tetraniliprole and spirotetramat on okra	Entomology
282	Residue studies of flonicamid and fipronil on okra	Entomology
283	Residue studies of tolfenpyrad and emamectin benzoate on cauliflower	Entomology
284	Residue studies of tolfenpyrad and emamectin benzoate on brinjal	Entomology
285	Residue studies of Spiromesifen 240 g/L SC Rice	Entomology
2022-23		
286	Bioefficacy evaluation of Avancer glow on rice	Plant Pathology
287	Bioefficacy testing of Fluoxapyroxad 167 g/L+ Pyrocolostrobin 333g/L against alternaria leaf spot disease of cotton	Plant Pathology
288	Testing of Iglare 24 Sc against sheath blight of rice	Plant Pathology
289	Bioefficacy study of velum prime against tomato root knot nematodes to include in package of practices	Plant Pathology

290	Evaluation of bioefficacy of nativo(Trifloxystrobin 25+ Tebuconazole 50 WG) against early blight of tomato	Plant Pathology
291	Evaluation of biofungicide bacillus subtilis NBRI-W9 against fusarium yellows & corn rot pathogens in gladiolous	Plant Pathology
292	Evaluation of bio-efficacy of Infinito (Fluopicolide 62.5 + propamocarb Hydrochloride 625 SC against Late Blight of potato	Plant Pathology
293	Adaptive Resaerch Trials on EPIC 75 WG (hexaconazole) for the management of sheath blight and sheath rot of rice	Plant Pathology
294	Evaluation of AmpactXtra 280 against Yellow Rust of Wheat through drone application	Plant Pathology
295	Bio-efficacy evaluation of bio-fungicide formulation Bacillus subtilusZB87-1/2 against sheath blight of rice	Plant Pathology
296	Evaluation of bio-efficacy of fungicide UPF 108 against late blight of potato	Plant Pathology
297	Bio-efficacy evaluation of Rallis RIL-236/CF(30% OD) against early blight of tomato	Plant Pathology
298	Bio-efficacy evaluation of Rallis RIL-236/CF(30% OD) against anthracanose and leaf spot of chilli	Plant Pathology
299	Bio-efficacy evaluation of BIOMYCIN (Kasugamycin 3% SL) against early blight of Potato	Plant Pathology
300	Multi location Adaptive Research Trails for evaluation of bio-efficacy of Iglare (Thifluzamide (24 % SC) against sheath blight of paddy	Plant Pathology
301	Bio-efficacy evaluation of IIF-1516 againt sheath blight, false smut and blast disease of rice for two seasons	Plant Pathology
302	Bio-efficaccay evaluation of Provax (carboxin 17.5% + Thiram 17.5 % FF) against Loose smut of wheat	Plant Pathology
303	Bio-efficacy evaluation of UPST-220 against loos smut and karnal bunt of wheat	Plant Pathology
304	Bio-efficacy evaluation of Nematofree Plus againstRoot knot nematodes in capsicum under protected cultivation	Plant Pathology
305	Bio-efficacy evaluation of PaecilomyceslilacinusagainstRoot knot nematodes in cucumber under protected cultivation	Plant Pathology
306	Bio-efficacy evaluation of Pseudomonas fluorescens 1.0% WP (Strain no. IPL/PS/01) against Pokkahboeng of sugarcane	Plant Pathology
307	Bio-efficacy evaluation of Trichoderma viride 1.0% WP (Strain no. IPL/VT/101) against red rot of sugarcane	Plant Pathology
308	Bio-efficacy evaluation of Vibrance Integral and Tymirium against Bakane disease of rice	Plant Pathology
309	“Bio-efficacy evaluation of Mildown 2% AS against late blight (Phytopathorainfestants (Mont.) of potato ”	Plant Pathology
310	“Bioefficacy evaluation of fungicide Opera 183 SE against yellow rust of wheat through drone application”	Plant Pathology
311	Bioefficacy evaluation of biopesticide bacillus amiloliquefaciens against sheath blight of rice	Plant Pathology
312	Bioefficacy evaluation of biofungicidesagainst different wilt and cercospora leaf spot of Okra	Plant Pathology



313	Bioefficacy evaluation of biofungicide IPF-FC-005 (Trichoderma viride + Trichoderma Harzanium) against wilt of Okra	Plant Pathology
314	Bio-efficacy evaluation of Fluopyram 400g/L (Velum Prime) SC against root knot nematodes of rice	Plant Pathology
315	Bio-efficacy evaluation of Isotianil 200G/L + Trifloxystrobin 80 G/L FS (routine start) against leaf blast of Rice	Plant Pathology
316	Bio-efficacy evaluation of Isotianil 120G/L + Trifloxystrobin 100 G/L SC against bacterial leaf blight & leaf/neck blast of Rice	Plant Pathology
317	Bio-efficacy evaluation of Propineb 70% WG against leaf/neck blast and brown leaf spot disease of Rice	Plant Pathology
318	Bio-efficacy evaluation of Tebuconazole 430 G/L SC against leaf/neck blast of rice	Plant Pathology
319	Bio-efficacy evaluation of Trifloxystrobin 500 G/L SC against dirty panicle of rice	Plant Pathology
320	Bio-efficacy and phytotoxicity evaluation of Kocide 3000 (copper hydroxide 46.1%) on potato through drone application	Plant Pathology
321	Bio-efficacy and phytotoxicity evaluation of fungicides against Yellow Rust, Rust and powdery mildew of Wheat	Plant Pathology
322	Bio-efficacy evaluation of IIF-222 against sheath blight, brown spot, false smut and grain discoloration of rice	Plant Pathology
323	Bio-efficacy and Phytotoxicity evaluation of Amistar OLD 250 sc against Yellow Rust, Brown Rust and powdery mildew of wheat	Plant Pathology
324	Bio-efficacy and phytotoxicity evaluation of Sarthak (Kresox+Chloroth) on potato for inclusion in POP	Plant Pathology
325	Bio-efficacy and phytotoxicity evaluation of fungicides against diseases of chilli and cucumber	Plant Pathology
326	Bio-efficacy evaluation of Bio-fungicides against Sclerotium rot of sugarbeet	Plant Pathology
327	Bio-efficacy and phytotoxicity evaluation of fungicides against diseases of wheat	Plant Pathology
328	Adaptive Research Trial on Taqat (Hexa+ captan) for the management of powdery mildew of wheat	Plant Pathology
329	Bio-efficacy and phytotoxicity evaluation of UPST 222 against black scurf of potato	Plant Pathology
330	Strengthening of Plant Bacteriology Laboratory for high throughput detection and screening of quarantine bacterial pathogens	Plant Pathology
331	Survey and Surveillance of maintenance of pest free areas for brown rot to facilitate export of potato to European and other countries	Plant Pathology
332	Management of foot rot of basmati rice, Pea wilt and black scurf of potato through use of pesticides	Plant Pathology
333	Monitoring of emerging viral diseases and their vector population for virus free seed production in different agro climatic zones of Punjab	Plant Pathology
334	Towards the development of Monitoring & forewarning system for late blight disease of Potato by Integrating epidemiology Development and Strengthening of State Agricultural Universities, ICAR-01.5 Scheduled Caste- Sub Plan (SC-SP)" (1st Installment) "Research and Operational Expenses, 9" 2022-23	Plant Pathology

335	Residue and persistence study of spiromesifen and its metabolites in rice plant (without roots and without panicle) whole rice grain (with husk) polished rice grain, husk, straw and soil after application of Oberon (spiromesifen 240 g/L SC) on rice crop as foliar spray, ICAR-83	Entomology
336	Brand testing of Danitol 10EC (fapropathrin) against pink bollworm in Bt cotton	Entomology
337	Residue and persistence of isoxaflutole, thien carbazone-methyl and their metabolites in maize leaves, immature cob, mature grains, Stover and soil after application of adengo (Isoxaflutole 225 g/L+ Thien carbazone-methyl 90 g/L SC) in maize crop (Two season study)	Entomology
338	Residue and persistence of betacyfluthrin and imidacloprid in maize, immature cob, mature grains, stover and soil after application of Solomon (Betacyfluthrin 90 g/L+ Imidacloprid 210 g/L OD) on maize crop as foliar spray (Two season study)	Entomology
339	Evaluation of crop safety of pyriproxyfen 10 EC in cotton through drone application	Entomology
340	Evaluation of crop safety of Fenpropathrin 10 EC in cotton through drone application	Entomology
341	Evaluation of efficacy of E2Y45-828-R120 5% tablet (chlorantraniliprole 5% DT) against rice stem borers and leaffolder in rice	Entomology
342	Evaluation of Mortel 0.3G (Fipronil) against pink stem borer in wheat	Entomology
343	Evaluation of bio-efficacy of Token 20SG (Dinotefuran) against riceplanthoppers	Entomology
344	Bioefficacy of Kalichakra L and Daman L against Fall armyworm (<i>Spodoptera frugiperda</i>) in maize	Entomology
345	Residue and persistence of tetraniliprole its metabolite and fipronil in maize after application of Reatis Plus (Tetraniliprole 240 g/L+Fipronil 240 g/L FS) in Maize Crop as seed treatment	Entomology
346	Bio-efficacy evaluation of Spinetoram (GF-4867-0.1%, w/w RB (Ready-to-use Bait) against fall armyworm (<i>Spodoptera frugiperda</i>) in maize	Entomology
347	PB Knot-An innovative approach to manage pink bollworm in cotton	Entomology
348	Evaluation of efficacy of Ecotin (Azadirachtin 5%) against rice stemborers and leaffolder in basmati and non-basmati transplanted rice under normal and organic conditions	Entomology
349	Evaluation of bioefficacy and phytotoxicity of afidopyropene 50 g/L DC against aphids on wheat	Entomology
350	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against pink stem-borer infesting wheat sown in paddy straw management fields	Entomology
351	Evaluation of efficacy of Coragen 18.5 SC (Chlorantraniliprole) against rice stem-borers and leaffolders in non-basmati transplanted rice	Entomology
352	Evaluation of efficacy of a new insecticide, Orchestra 10 SC (benzpyrimoxan 10% SC) against planthoppers in rice in the adaptive research trials	Entomology
353	Evaluation of efficacy of Marktera 0.4 GR (Chlorantraniliprole 0.4 GR) against rice stemborers and leaffolder in basmati rice	Entomology
354	Evaluation of efficacy of Supremo 50 SP (thiocyclam hydrogen oxalate 50 SP) against rice stemborers and leaffolder in rice	Entomology
355	Evaluation of efficacy of Markgen 18.5 SC (Chlorantraniliprole 18.5 SC) against early shoot borer in sugarcane	Entomology



356	Evaluation of efficacy of Chlorantraniliprole 0.4% GR) against fall armyworm, Spodoptera frugiperda, Corn stem borer, Chilo partellus and pink stem borer Sesamia inferens on maize	Entomology
357	Efficacy evaluation of Sulfoxaflor 12% SC w/v against aphids in French bean	Entomology
358	Evaluation of BAS 550 011 against mustard aphid on mustard crop	Entomology
359	Conservation of Lac Insect Genetic Resources (Network Project)	Entomology
360	Bio efficacy and phytotoxicity study of IPL-IC-007 (<i>Beauveria bassiana</i> + <i>verticillium lecanii</i> 2% AS) on okra crop against Jassids, Thrips and whitefly	Entomology
361	Evaluation of BAS 550 011 against mustard aphid on potato	Entomology
362	Bio-efficacy and phytotoxicity study of IPL-IC-006 (<i>Metarhizium anisopliae</i> 2% + <i>Beauveria bassiana</i> 2% AS) on okra crop against spotted bollworm and american bollworm	Entomology
363	Bio-efficacy and phytotoxicity study of IPL-F-001 (<i>Bacillus thuringiensis</i> 5% WSP) on okra crop against Lepidopteran pests (shoot and fruit borer)	Entomology
364	Efficacy evaluation of Fipronil 0.6% GR (Regent Ultra) against termite in chilli	Entomology
365	Bioagents	Entomology
366	Residue and persistence of chlorantraniliprole and abamectin in watermelon fruit, and soil after foliar spray of chlorantraniliprole 4.3% w/w Abamectin 1.7% w/w SC	Entomology
367	Residue and persistence of chlorantraniliprole and abamectin in pomegranate whole fruit, juice and soil after foliar spray of chlorantraniliprole 4.3% w/w Abamectin 1.7% w/w SC	Entomology
368	Residue and persistence of chlorantraniliprole and abamectin in cotton seed, lint, oil, cake and soil after foliar spray of chlorantraniliprole 4.3% w/w Abamectin 1.7% w/w SC	Entomology
369	Residue and persistence of chlorantraniliprole and abamectin in grapes fruit, ripe fruits and soil after foliar spray of chlorantraniliprole 4.3% w/w Abamectin 1.7% w/w SC	Entomology
370	Evaluation of efficacy of a new insecticide, dominant 20 SG (dinotefuran) against planthoppers in rice in the adaptive research trials	Entomology
371	Evaluation of efficacy of a new insecticide, imagine 10 SC (flupyrimin 10% SC) against planthoppers in rice in the adaptive research trials	Entomology
372	Residue and persistence study of fluopyram in rice plant (without roots and without panicle) whole rice grain (with husk) polished rice grain, husk, straw and soil after application of Velume Prime (Fluopyram 400 G/L SC) on rice crop as soil drenching	Entomology
373	Residue and persistence study of penflufen in rice plant (without roots and without panicle) whole rice grain (with husk) polished rice grain, husk, straw and soil after a Plant Pathology of Emesto Prime (Penflupen 240 g/L SC) on rice crop as seed treatment	Entomology
374	Residue study of tetraniliprole and its metabolite in mature pods with seed, mature seed (dry) and soil after application of Vayego (Tetraniliprole 200 g/L SC) on black gram as foliar spray	Entomology
375	Residue study of tetraniliprole and its metabolite in groundnut mature pods, seed (dry), oil, cake and soil after application of Vayego (Tetraniliprole 200 g/L SC) on groundnut crop as foliar spray	Entomology

376	Residue and persistence study of fluopyram in immature guava fruits, mature guava fruits and soil by LCMS/MS after application of velum prime (Fluopyram 400 g/L SC) as soil drenching around guava trees	Entomology
377	Residue and persistence study of Alconifen, its metabolites, diflufenican and its metabolites in sugarcane leaves, sugarcane setts, juice and soil after application of aconifen 500 g/l + Diflufenican 100 g/l in sugarcane crop as a herbicide	Entomology
378	Residue and persistence study of fluopyram in immature citrus fruits (without peel), mature citrus fruits (with peel), citrus juice and soil by LCMS/MS after application of velum prime (Fluopyram 400 g/L SC) as soil drenching around citrus trees	Entomology
379	Residue and persistence of paclobutrazol in onion and soil after foliar spray of paclobutrazol 23% SC	Entomology
380	Residue and persistence study of Spirotetramat and its metabolites by LCMS/MS in cucumber fruits and soil after application of Movento (Spirotetramat 150 g/l OD) as foliar spray on cucumber plants	Entomology
381	Residue and persistence study of Propineb in whole rice grain (with husk), polished rice grain, husk, straw and soil after application of Propineb 70% WG on rice crop as foliar spray	Entomology
382	Residue study of Isotianil, its metabolite, trifloxystrobin and its metabolite in whole rice grain (with husk) 120 G/L + Trifloxystrobitrobin 100 G/L SC on rice crop as foliar spray	Entomology
383	Residue and persistence study of flufenacet, its metabolites, metribuzin and its metabolites in tomato leaves, fruits and soil after application of Flufenacet 24% + Metribuzin 1.75% WG (Artist) in tomato crops as a herbicide	Entomology
384	Residue study of trifloxystrobin and its metabolite (CGA 321113) in whole rice grain (with husk), polished rice grain, husk, straw and soil after application of Trifloxystrobin 500 G/L SC on rice crop as foliar spray	Entomology
385	Evaluation of afidopyropen 50 DC against mustard aphid on mustard crop	Entomology
386	Bioefficacy and phytotoxicity of A3R-I 19% w/v SC (triflumezopyrim + benzpyrimoxan) against rice planthoppers	Entomology
387	PB knot-an innovative approach to manage pink bollworm in cotton	Entomology
388	Residue and persistence study of flubendiamide and deltamethrin in immature mango fruits (with peel), mature mango fruits (with peel, mango pulp (with peel) and soil after application of Fenos Quick (Flubendiamide 90 g/L + Deltamethrin 60 g/L SC) on mango plants as foliar spray	Entomology
389	Residue and persistence study of tetraniliprole and its metabolite in chickpea succulent seed (with peel), dry seed (without pod) and soil after application of Vayego (Tetraniliprole 200 g/L SC) on chickpea crop as foliar spray	Entomology
390	Residue and persistence study of flupicolide, its metabolite and propamocarb hydrochloride in green chilli fruits, red chilli fruits (dry) and soil after application of Infinito (flupicolide 62.5 g/l + propamocarb hydrochloride 625 g/l SC) chilli crop as foliar spray	Entomology
391	Residue and persistence study of flupyram and difenoconazole in green chilli fruits, red chilli fruits (dry) and soil after application of Flupyram 250 g/l + difenoconazole 125 g/L SC chilli as foliar spray	Entomology
392	Residue and persistence study of trifloxystrobin and its metabolite in green chilli fruits, red chilli fruits (dry) and soil after application of trifloxystrobin 500 g/l SC chilli as foliar spray for the session 2022-23, ICAR-188 (PC-2671)	Entomology
393	Residue and persistence study of Fluopyram and Tebuconazole by LC/MS/MS in cucumber fruits and soil after application of Luna experience (Flupyram 200 g/L + Tebuconazole 200 g/L SC) as foliar spray on cucumber plants	Entomology



394	Residue and persistence study of trifloxystrobin its metabolite and tebuconazole in wheat leaves, wheat grain and soil after application of trifloxystrobin 100 g/l + tebuconazole 200 g/L SC in wheat crop on cucumber plants	Entomology
395	Residue and persistence study of Penflufen, Trifloxystrobin and its metabolite in wheat leaves, wheat grain and soil after application of EverGoXtend (Penflufen 154 g/L + Trifloxystrobin 154 g/l + tebuconazole 200 g/L FS) in wheat crop as seed treatment	Entomology
396	Residue and persistence study of streptomycin sulphate and tetracycline hydrochloride in tomato after application of Streptomycin Sulphate 9% + Tetracycline hydrochloride 1% SP as foliar spray	Entomology
397	Adaptive trial of RIL 066 wheat herbicide	Agronomy
398	Evaluation of Rapigro Gr for growth, yield, quality and crop safety (phyto-toxicity) parameters of wheat	Agronomy
399	Evaluation of BiovityX (Gr) for growth & yield parameter of wheat,	Agronomy
400	Evaluation of herbicide FH2201 for control of weeds in transplanted rice	Agronomy
401	Evaluate the Bioefficacy of Pyroxasulfone 85% WG against various weeds in wheat	Agronomy
402	Evaluation of pretilachlor 37% E.W. and Butachlor 50% E.W. against various weeds in rice	Agronomy
403	Evaluation of herbicide 2, 4-D sodium salt 44% + Metribuzin 35% + pyrazosulfuron Ethyl 1.0% WDG sold as brand name "Triskele" by UPL	Agronomy
404	Evaluation of efficacy of Harvest + Cytonutri Zinc 12% SA-Gro Bloom, SA SARAS NUTRI SA SARAS POWER and SA PYROLL (Organic potash 14%) in paddy	Agronomy
405	Evaluation of herbicide 2,4-D ethyl ester 38% EX in wheat	Agronomy
406	Evaluation of herbicide 2, 4-D sodium salt 44% + Metribuzin 35% + pyrazosulfuron Ethyl 1.0% WDG (Trishuk) in sugarcane	Agronomy
407	Field efficacy at sulfosulfuron 75% WG on resistant Phalaris minor in wheat, (second season)	Agronomy
408	Evaluation of Rapigro Gr and Rapigro L for growth & yield parameter of Rice	Agronomy
409	Bio-efficacy evaluation of herbicide pre-mixture, RIL-261/CF, in Sugarcane	Agronomy
410	Efficacy of premix of VPP72 60% and its comparison with market standards for control of Phalaris minor and Broad leaf weeds in wheat	Agronomy
411	Evaluation of pretilachlor 30% w/v + florpyrauxifen-Benzyl 1% w/v (31% EC) for total weed control in transplanted rice	Agronomy
412	Evaluation of herbicide VPP72 60 WG for control of Phalaris minor and broad leaf weeds (BLW's) in wheat for third season	Agronomy
413	Evaluation of herbicides triafamone 37.5 + fentrazamide 300 g/L SC and triafamone 37.5 g/L + oxidiazon 240 g/L SC for weed control in transplanted rice and direct seeded rice	Agronomy
414	Evaluation of AWKIRA (pyroxasulfone 85 WG) for phototoxicity crop safety when applied through Drone in wheat	Agronomy
415	Efficacy evaluation of EMEK (colodinafop propargyl 9% + Metribuzin 20% WP) for weed management in wheat	Agronomy
416	Evaluation of herbicide ADM.05001 H.1.A against weed complex in wheat	Agronomy
417	Evaluation of herbicide VPP72 60 WG for baseline susceptibility	Agronomy

Annexure V

FACULTY PARTICIPATION IN TRAININGS AND INTERNATIONAL VISITS

A. INTERNATIONAL VISITS

Sr. No.	Scientist (Department)	Institute/ Organization visited	Remarks	Period
2018-19				
1	Dr Ritu Rani (Plant Pathology)	The Ohio State University's Ohio Agricultural Research and Development Centre (OARDC), Wooster, USA,	Training programme on "Coupling Spore Traps and Quantitative (q) <i>Polymerase Chain Reaction</i> (PCR) Assays for Quantification and Detection of the <i>Botrytis cinerea</i> Spores collected in Tomato Production Greenhouses, Storage and Handling Areas"	May 5 to August 4, 2018
2	Dr Sandeep Singh (Fruit Science)	Michigan State University, East Lansing, USA	Advance training on "Spotted Wing Drosophila Trapping and Attract and Kill Technology"	June 1 to September 5, 2018
3	Dr Navneet Kaur (Forestry and Natural Resources)	Wageningen University and Research, The Netherlands	Training in "Resilient and Sustainable Food Systems for a Food Secure Future"	April 1-11, 2019
4	Dr Shivani Sharma (Microbiology)	Centre for Development Innovation, Wageningen University and Research, The Netherlands	Training programme on "Global One Health Towards Animals, Plants and Human Health"	November 5 -16, 2018
5	Dr Priya Katyal (Microbiology)	Centre for Development Innovation, Wageningen University and Research, The Netherlands	Training programme on "Market Access for Food and Nutrition Security"	November 26 to December 12, 2018
6	Dr Sangeet Ranguwal (Economics and Sociology)	Aeres Training Centre International, Barneveld, The Netherlands	Training programme on "Agricultural Training and Extension"	June 6 to July 4, 2019
7	Dr Rimaljeet Kaur (Biochemistry)	Biotechnology and Biological Sciences Research Council, London	Training programme on "Genomics Led Improvement of Biotic and Abiotic Stress Tolerance in Mustard Rape for Economic and Environmental Sustainability" under Newton Bhabha Project "Genomics Led Improvement of Biotic and Abiotic Stress Tolerance in Mustard Rape for Economic and Environmental Sustainability - Joint Call of (BBSRC)"	June 17 to July 15, 2019
2019-20				
8	Er Shiv Kumar Lohan (Farm Machinery & Power Engineering)	Washington State University, USA	Training under Centre for Advanced Agricultural Science and Technology (CAAST)	March 15 to August 15, 2020



9	Dr Kamal Vatta (Agricultural Economics and Sociology)	Centre for Southeast Asian Studies, Kyoto University, Japan	In International Seminar on "Rural Finance and Economy in South Asian and Land Tenancy Development in South Asia"	November 3-5, 2019
10	Dr Kamal Vatta (Agricultural Economics and Sociology)	University of Cambridge, United Kingdom	Exchange programme as a part of the TIGR2ESS (Transforming India's Green Revolution by Research and Empowerment for Sustainable Food Supplies) project	November 9-19, 2019
11	Dr Priya Katyul (Microbiology)	Agricultural Technology Research Institute, Taiwan	Training on "Syntrophic Microbes for Accelerated Paddy Straw Decomposition"	November 18 to December 15, 2019
12	Ms Renuka Aggarwal (Food and Nutrition)	The Riddet Institute, Massey University, Palmerston North, New Zealand	Visiting scientist	July 24 to August 23, 2019
13	Dr Ranjit Singh (Floriculture and Landscaping)	The Netherlands	PUM, Netherlands programme for business linkage in flower cultivation	November 11-21, 2019
14	Dr. GS Dheri (Soil Science)	Dr Rattan Lal, Professor, The Ohio State University, Columbus, USA	International training programme under the Centre of Advanced Agricultural Science and Technology (CAAST) project	March 16, 2020 to September 13, 2020
2021-22				
15	Dr Manjeet Singh (Farm Machinery and Power Engineering)	University of Guelph, Canada	Training programme under Centre of Advanced Agricultural Science and Technology (CAAST) project of ICAR	December 1, 2021 to January 31, 2022
16	Dr Manjeet Singh (Farm Machinery & Power Engineering)	University of Florida, USA		January 10 to March 31, 2022
17	Dr Samanpreet Kaur (Soil and Water Engineering)	University of Guelph, Canada	Training course on "Earth Observation for Water Management."	December 17 to March 16, 2022
18	Dr Varinderpal Singh (Soil Science)	University of California, Davis	Training programme under Centre of Advanced Agricultural Science and Technology (CAAST) project of ICAR	January 7 to March 25, 2022
19	Dr Varinderpal Singh (Soil Science)	California State University, Fresno		
20	Dr Varinderpal Singh (Soil Science)	Texas A&M University, USA		
21	Dr BB Vashisht (Soil Science)	Department of Soil, Water and Climate, College of Food, Agricultural and Natural Resource Sciences, University of Minnesota, Twin Cities Campus, St Paul, Minnesota, USA	International training programme under the Centre of Advanced Agricultural Science and Technology (CAAST) project	February 16 to March 24, 2022
22	Dr. Simerjeet Kaur (Agronomy)	Dr Mithila Jugulam, Kansas State University, Manhattan, USA		December 5, 2021 to February 4, 2022
23	Dr. Ajmer Singh Brar	Engineering Systems and Environment, University of Virginia, Charlottesville		March 12 - 28, 2022

2022-23				
24	Dr Surinder K Sandhu (Plant Breeding and Genetics)	Tribhuvan University, Campus, Pokhara, Nepal	Chairman (Technical Session-Innovations in Agriculture) in 4th International Conference on Global Efforts on Agriculture, Forestry, Environment and Food Security in Institute of Forestry	September 07-19, 2022
25	Dr Renu Khanna (Plant Breeding and Genetics)	International Rice Research Institute (IRRI), Philippines	HRDC Annual Meeting, from September 21-23, 2022 and interaction with Dr Shalabh Dixit team on DSR phenotyping, RGA facility and other breeding program activities	September 21 to October 07, 2022
26	Dr Makhan Singh Bhullar (Agronomy)	Bangkok, Thailand	8 th International Weed Science Congress	December 04-09, 2022
27	Dr Priti Sharma (Biotechnology)	University of Missouri, USA	Six months training on "Development of haploid inducer stock through gene- editing of PLA1 and DMP genes in maize" under SERB International Research Experience Award supported by DST, Govt. Of India	September, 2022 to February 2023
28	Dr O P Choudhary (Soil Science)	University of California, USA	International training under ICAR-NAHEP- CAAST SNRM project	July 04, 2022 to August 21, 2022
29	Dr Manpreet Singh Mavi (Soil Science)	IOWA State University, Ames, USA	International training under ICAR-NAHEP- CAAST SNRM project	June 15, 2022 September 14, 2022
30	Dr Sandeep Sharma (Soil Science)	University of Nebraska-Lincoln, Lincoln NE, USA	Training on Micro plate method for nitrification and soil enzyme assay.	September 12, 2022 to November 13, 2022
31	Dr Varinderpal Singh (Soil Science)	International Centre for Biosaline	Workshop on 'Agriculture Environment, Social and Governance (ESG) nexus with Agriculture under climate change'	March 13-14, 2023
32	Dr Neena Singla, (Zoology)	Africa Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development (ACE II- IRPM & BTM) and the Institute of Pest Management	7th International Conference on Rodent Biology and Management (ICRBM7) in Arusha, Tanzania, Africa	July 05-08, 2022
33	Dr Kamal Vatta, (Economics and Sociology)	Research Institute for Humanity and Nature (RIHN), Kyoto, Japan	To deliver a Lecture	July 30, 2022
34	Dr Kamal Vatta, (Economics and Sociology)	Research Institute for Humanity and Nature (RIHN), Kyoto, Japan	To participate as a Panelist	September 06, 2022
35	Dr Kamal Vatta, (Economics and Sociology)	Research Institute for Humanity and Nature (RIHN), Japan and Research Institute for Business and Economics (RIEB), Kobe University, Japan	To attend Seminars and Meetings	November 02-09, 2022



36	Dr Kamal Vatta, (Economics and Sociology)	University of Economics, Ho Chi Minh City, Vietnam	To Chair a Session and as a Discussant	August 19-20, 2022
37	Dr Kamal Vatta, (Economics and Sociology)	University of Cambridge, UK	To deliver a Lecture	March 10-16, 2023
38	Dr Narinderpal Singh (Economics and Sociology)	Langkawi, Malaysia	To attend and present Paper in International Conference on Science, Computing, Chemistry and Management	July 07-08, 2022
39	Dr Manpreet Singh	Farm Machinery & Power Engineering	Attended International Training for 2 months at IFAS, University of Florida and South West Florida Research and Education Centre, Immokalee, Florida	February 2022 to March 2022
40	Dr Kiran Bains (Food and Nutrition)	International Union of Nutritional Sciences (IUNS), International Life Sciences Institute (ILSI), Tokyo	To attend and deliver talk on "Digestibility of amino acids in foods of India" at 22nd IUNS—International Congress of Nutrition	December 06-11, 2022
41	Dr Sandeep Singh (Fruit Science)	Macquarie University, Sydney, Australia	Training on Australian National Action Plan of Exotic Fruit Flies (as an expert)	November 22, 2022

FACULTY PARTICIPATION IN TRAININGS AND INTERNATIONAL VISITS

B. TRAININGS ATTENDED BY FACULTY

Sr.No.	Faculty	Department	Training attended	Date(s)	Venue
1	Dr Yadhu Suneja	Biochemistry	12 days "3rd National Training Workshop on Tilling and Genome Editing in crop plants"	January 22, 2018- February 2, 2018	University of Hyderabad
2	Dr Rimaljeet Kaur	Biochemistry	Induction trainings	3rd July 2018 to 1st August 2018	Regional Research Station
3	Dr Shivani Sharma Dr Keshani	Microbiology	21 day faculty development program under CBP (Capacity Building Program)	17th July-6th August, 2018	ICAR, SKUAST, Srinagar
4	Dr Amrit Kaur	Math Stat & Physics	Training programme: Artificial neural network and Fuzzy logic through ICT	July 23 –27, 2018	NITTTR, Chandigarh
5	Dr Mini Goyal	Economics & Sociology	3 months training course for young farmers	1st August-31st October, 2018	Directorate of Extension Education, PAU, Ludhiana
6	Dr Pooja	Microbiology	Training on Laboratory Management System and Internal Auditing	18th -21st Sept, 2018	NITTTR, Chandigarh
7	Dr Yadhu Suneja	Biochemistry	CAFT training "Recent Advances in Agricultural Bioinformatics:Big data analytics perspectives"	14.11.2018 to 4.12.2018	ICAR-IASRI, New Delhi
8	Dr Anjali	Chemistry	Recent advances in Agricultural Bioinformatics: Big Data Analytics perspective	November 14 to December 4, 2018	Indian Agricultural Statistics Research Institute, New Delhi
9	Dr Pooja	Microbiology	Training on Measurement Uncertainty and Decision	17th -18th Nov, 2018	NITTTR, Chandigarh
10	Dr Sonia Kaushal	Chemistry	21 day Refresher course in Research Methodology	Decemeber 1-21, 2018	UGC-Human Resource Development Centre, Punjabi University, Patiala
11	Drs Anita Kochhar, Kiran Grover, Kiran Bains, Sonika Sharma, Neerja Singla, Navjot Kaur and Mrs Poonam Bakheta	Food and Nutrition	CNE on latest advances in Renal Nutrition	December 15, 2018	Dayanand Medical College & Hospital, Ludhiana
12	Dr. Neerja Singla and Mrs.Poonam Bakheta	Food and Nutrition	Unit Meeting of All India Coordinated Research Project on Home Science	December 19-20, 2018	Assam Agriculture University, Assam



13	Dr. Arashdeep Singh	Food Science & Technology	Winter School training programme on significance of bioactive ingredients and supplements in health foods	01-21.01.2019	MPUAT, Udaipur
14	Dr LM Kathuria	Business Studies	Management Development Program on 'Secrets of increasing Market Share'	January 23rd, 2019	Ludhiana Management Association
15	Dr RIS Gill, Pr. Sc. Agroforestry	Forestry & NR	Three-week Leadership for Academicians Programme (LeAP)	11.02.2019 to 3.03.2019	University of Hyderabad, India Melbourne, Australia
16	Dr N K Chhuneja	Farm Machinery & Power Engineering	Training on ISO certification "QMS internal auditor (system controller) on ISO 9001: 2015	Feb, 11-12, 2019	PAU, Ludhiana
17	Mrs. Poonam Bakheta	Food and Nutrition	23rd Biennial Workshop of AICRP on Home Science	February 15-16, 2019	Maharana Pratap University of Agri & Techn, Udaipur
18	Dr Santosh Kumar	Farm Machinery & Power Engineering	Application of Advanced Instrumentation and Hydraulic Systems in Precision Agriculture for Crop and Environmental Sustainability"	February 15 to March 07, 2019	CIAE, Bhopal
19	Er Satinder Kaur Khattria	Civil Engineering	QIP sponsored Short Term Training Programme on Analysis and Design of RC Buildings: Concepts and Practice	Feb 19-23, 2019	Civil Engineering Department, Guru Nanak Dev Engineering College, Ludhiana
20	Dr Laishram Priscilla	Economics & Sociology	ICAR sponsored CAFT programme on "Recent Advances in Statistical Modeling and Forecasting for Agricultural Data Analysis	23rd February – 15th March, 2019	ICAR-IASRI, New Delhi
21	Dr Navneet Kaur, Pr. Agronomist	Forestry & NR	Attended training on "Resilient and sustainable food systems for a food secure future"	1.4.19 to 11.4.19	Wageningen University & Research, Netherlands
22	Drs Kiran Bains and Sonika Sharma	Food and Nutrition	CME on Diabetic diet- From class room to clinic	May 26, 2019	RSSDI and IDA Punjab Chapter Diabetes symposium at Nirvana club, Ludhiana
23	Dr. H K Mavi	Economics & Sociology	Training cum workshop course on Formation of FPO and use of soft skill for Transfer of Technology in Agriculture	13-14 th June, 2019	Skill Development Centre, Punjab Agricultural University, Ludhiana

24	Dr. Surabhi Mahajan	Apparel & Textile Science	Inter-disciplinary Summer School	June 18 – July 8, 2019	Human Resource Development Centre, Guru Nanak Dev University (GNDU), Amritsar.
25	Dr. Varinderpal Singh,	Soil Science	Improving crop production skills and knowledge with ARTIS (Agri-tech Register and Training for Innovation and Skills)	June 24-25, 2019	National Institute of Agricultural Botany, UK
26	Dr Aseem Verma Dr Manpreet Singh	Farm Machinery & Power Engineering	Two weeks training programme on 'Image Processing and Signal Processing using Scilab'	July 8-19, 2019	National Institute of Technical Teachers' Training & Research, Chandigarh
27	Dr. Sumeet Grewal and Ms. Rajdeep Kaur Mrs. Ritu Mahal	Apparel & Textile Science Human Development & Family Studies	Refresher Course on Research Methodology in Social Sciences	Aug 20 – Sep 2, 2019	UGC – Human Resource Development Centre, Punjab University, Chandigarh.
28	Dr. Neerja Singla	Food and Nutrition	Brainstorming session for project planning	August 30-31, 2019	CIWA Bhubaneswar
29	Dr Yadhu Suneja	Biochemistry	21 days training at Next Generation Sequencing and its Application in Plant Sciences	3rd September, 2019 to 23rd September, 2019	National Institute for Plant Biotechnology (NIPB), New Delhi
30	Dr Manjeet Kaur	Economics & Sociology	Training on 'Agri Export Management'	3-6 September, 2019	MANAGE, Hyderabad
31	Dr Sandhya	Processing & Food Engineering	Training course on 'Bio processing/ Food Processing/ Packaging/ Product/ Marketing/ Export in reference to food processing	Sept 05-25, 2019	BHU, Varanasi
32	Dr Sonia Kaushal	Chemistry	14 day Refresher course in Research Methodology in Sciences	September 17-30, 2019	UGC-Human Resource Development Centre, Panjab University, Chandigarh
33	Dr. Jaspreet Kaur, Swati Kapoor	Post Harvest Technology	Summer School entitled: "Cutting Edge Epitome of Processing, Value Addition and Waste Utilization of Horticultural Crops for Augmenting Farmers Income"	01-21.10.2019	ICAR-CIPHET, Ludhiana
34	Dr Iqbal Singh	Processing & Food Engineering	summer school on "Cutting edge epitome of processing, value addition and waste utilization of horticultural crops for augmenting farmers' income"	Oct, 01-21, 2019	CIPHET, Ludhiana



35	Dr. Ashok K. Dhakad,	Tree Breeder	ICAR sponsored Winter School Training Programme on "Advances in designing and analysis of field crop experiments"	October 14 - November, 2019	ICAR-Indian Agricultural Statistics Research Institute, New
36	Dr Hira Singh	Vegetable Science	Breeding and Genomic Tools for Stress Resistance in Vegetable Crops	23.10.2019 to 12.11.2019	ICAR-Indian Agricultural Research Institute, New Delhi
37	Dr. Kamal Vatta Dr. Jatinder Sachdeva Dr Baljinder Kaur Sidana Dr Sangeet Ranguwal	Economics & Sociology	Three-day North Zone Regional Training of Assistant Statisticians and Field Supervisors of Cost of Cultivation scheme on Data Validation	29th-31st October, 2019	Department of Economics and Sociology, PAU
38	Drs Jaswinder Kaur Brar, Kiran Bains, Harpreet Kaur and Ms. Renuka Aggarwal	Food and Nutrition	Stakeholder Convening on Dietary diversification by Nestle India Limited, Gurgaon	October 30, 2019	Ludhiana
39	Dr S. K. Singh	Renewable Energy Engineering	Training cum interaction programme on "Sampling, design and finalized schedules for implementation of energy audit survey"	Nov, 01-02, 2019	Indian Agricultural Statistics Research Institute, New Delhi
40	Dr Santosh Kumar	Farm Machinery & Power Engineering	"Emerging & Innovative Technologies in Agricultural & Food Engineering"	November 01 to 21, 2019	GBPUAT, Pant Nagar. US Nagar
41	Drs. Surabhi Mahajan and Sumeet Grewal	Apparel & Textile Science	Short Course on Clothing Comfort	November 2 -6, 2019	Dept of Textile Technology, Dr B R Ambedkar National Institute of Technology, Jalandhar
42	Dr Harpreet Kaur Oberoi	Plant Breeding & Genetics	ICAR-Winter School on "Design, innovations and applications of Plastics technologies in Agriculture, Horticulture and Pisciculture production and post-harvest management for doubling the farmer's income"	05.11.2019 to 25.11.2019	ICAR-CIPHET, Ludhiana
43	Dr Manveen Kaur Batth	Fruit Science	21 days CAFT training programme on "Hi-tech approaches and value addition of horticultural crops in arid and semi-arid region"	7.11.2019-27.11.2019	SKRAU, Bikaner
44	Dr Mamta Pathak	Vegetable Science	Developing winning research proposals	November 19-23, 2019	ICAR-NAARM, Hyderabad

45	Dr Manpreet Singh	Farm Machinery & Power Engineering	Short term course on “Internet of Things: Application Development using Raspberry Pi and Aurdino Boards”	Nov, 25- 29, 2019	NITTTR, Chandigarh
46	Dr. Swati Kapoor	Post Harvest Technology	3 day training programme on Packhouse worker	02-04.12.2019	Agricultural Skill Council of India, New Delhi at ICAR-ATARI, Ludhiana
47	Sapna Thakur	Forestry & N R	Agroforestry for Climate Change Mitigation, Biodiversity Conservation and Resilience in Agro-ecological Systems: Current Trends and Future Strategies	03.12.2019 to 23.12.2019	College of Forestry, Kerala Agricultural University, Thrisuur, Kerala
48	Dr. Sukhpreet Kaur	Food Science & Technology	Human Resource Development Training on Advances in Food Packaging and its future research prospects	06-19.12.2019	ICAR-Central Institute of Post Harvest Engineering & Technology, Ludhiana
49	Dr Rachana D. Bhardwaj	Biochemistry	Refresher course in Bio-Sciences	18.12.2019 to 31.12.2019	UGC-HRDC, Panjab University, Chandigarh
50	Dr N K Chhuneja	Farm Machinery & Power Engineering	Training of purchase through GeM Portal	Dec 24,2019	PAU, Ludhiana
51	Dr Rupinderjit Kaur Dhanoa	Math Stat & Physics	One Week Online Short Term Training Program on Applications of Mathematical Sciences	July 13-18 2020	K.D.K. College of Engineering, Nagpur
52	Dr Shayla Bindra	Plant Breeding & Genetics	Physiological and biotechnological interventions towards climate resilient agriculture	3-23 January, 2020	Rajasthan Agricultural Research Institute (RARI), Durgapura, Jaipur
53	Dr Monika Gupta Dr Gagandeep Kaur	Fruit Science	Training course on “Flow cytogenetics and molecular techniques for improvement of horticulture crops”	10.2.2020 -19.2.2020	CPRI- Shimla
54	Dr. Gazala Nazir	Soil Science	Training Program on “Assessment Methods for Soil Carbon and Greenhouse Gas Emissions in 20Agriculture	February 12 to 19, 2020	ICAR NAHEP-CAAST, Ludhiana
55	Dr Santosh Kumar	Farm Machinery & Power Engineering	Two days training on “Fodder Chain Management”	Feb 24 - 25, 2020	Claas Agricultural Machinery Pvt. Ltd.
56	Dr Sumedha Bhandari	Agricultural Journalism	Faculty Development Programme	Feb. 24 to April 17, 2020	IIT Madras for NPTEL-AICTE under SWAYAM



57	Dr. Swati Kapoor	Post Harvest Technology	Training programme on Understanding & Implementing ISO/IEC 17025-2017 including Management system documentation & internal auditing	03-04.03.2020	NITTR, Sec-26, Chandigarh
58	Dr. Vandana Kanwar, Drs. Ritu Mittal Gupta, Preeti Sharma and Sukhdeep Kaur	Human Development & Family Studies. Extension Education and Communication Management	Massive open online course (MOOC) on Psychology of learning.	May 1-15, 2020	Online organized by ICAR-NAARM, Hyderabad
59	Drs Ritu Mittal Gupta, Preeti Sharma and Sukhdeep Kaur	Extension Education and Communication Management	Examination and Internal assessment Management tools: a platform for teachers	May 8, 2020	GSB's Smt Surajba College of Education
60	Dr Apoorv Prakash	Farm Machinery & Power Engineering	One month online ETDC training programme on 'Tractor and Implements'	14.05.20 -11.06.20	Escotrs Ltd. at Web-based (coordination base at PAU, Ludhiana)
61	Drs Ritu Mittal Gupta, Preeti Sharma, Manjot Kaur	Extension Education and Communication Management	Faculty Development Programme on 'Project Proposals for funding agencies (UGC STRIDE and ICSSR IMPRESS) : Preparation and submission protocol'	May 16-17, 2020	Online organized by Patricon College Research Committee, Patricon College of Art and Science, Chennai
62	Dr. Vandana Kanwar Drs Ritu Mittal Gupta and Preeti Sharma	Human Development & Family Studies Extension Education and Communication Management	Faculty Awareness Programme on 'Online teaching pedagogy in Higher education' organised by Department of Agriculture and Environmental Sciences, NIFTEM under Ministry of Food Processing Industries, GOI	June 11-14, 2020	Online organized by National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonapat, Haryana
63	Dr. Jaspreet Kaur	Food Science & Technology	Faculty Awareness Programme on Online Teaching Pedagogy in Higher Education	11-14.06.2020	Department of Agriculture and Environmental Sciences, NIFTEM, Kundli, Sonapat
64	Dr H K Mavi	Economics & Sociology	Training on Formation of FPO and use of soft skill for Transfer of Technology in Agriculture	11th – 12th June, 2020	Skill Development Centre, Punjab Agricultural University, Ludhiana
65	Dr Sukhdeep Kaur	Extension Education and Communication Management	Faculty Development Programme on "ICT tools for Online Teaching and Assessment"	June 24-27, 2020	Online organized by Research Culture Society, Pipariya, Gujarat

66	Dr Manpreet Singh	Processing & Food Engineering	Online International Students and Faculty Development Programme on "Innovation food processing technologies, value addition, food safety and security"	29 Jun - 1 July, 2020	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (MP)
67	Dr Sumedha Bhandari Dr AshooToor	Agricultural Journalism	Massive Open Online Training Course on Designing E-Learning Content	July 01-31, 2020	National Academy of Agricultural Research Management (NAARM), Hyderabad
68	Dr Pratibha Vyas	Microbiology	Training on "Designing E-learning Content"	1st-31st July, 2020	ICAR-NAARM, Hyderabad
69	Dr H K Mavi	Economics & Sociology	Refresher Course on Statistical Tools and Techniques for Analysis of Agricultural Data	8th -28th July, 2020	CCS Haryana Agricultural University, Hisar
70	Dr R K Aulakh	Microbiology	Refresher Course on "Statistical Tools and Techniques for Analysis of Agricultural Data"	July 8-28, 2020	Academy of Agricultural Research & Education Management, CCSHAU, Hisar
71	Dr AshooToor	Agricultural Journalism	Online Faculty Development Programme on Impact of Literature on Youth in Current Situation	July 24-30, 2020	UGC- Human Resource Development Centre, Savitribai Phule Pune University
72	Dr Anoop Kumar Dixit Dr Varinder Singh Saimbhi	Farm Machinery & Power Engineering	International Training on 'Automation and Robotics in Agriculture	July 22-31,2020	Online
73	Dr Urmila Gupta Dr Monica Sachdeva Taggar	Renewable Energy Engineering	IGFE certified Online Training on Biowaste to Bioenergy	July 29-30, 2020	Agrovision Foundation and Punjab Renewable Energy Ltd.
74	Dr Priya Katyal	Microbiology	Training on "Bio-waste to Bio-energy"	30th July, 2020	IFGE
75	Dr Manpreet Singh	Processing & Food Engineering	Two Week National e-Training on "Indian Agricultural Education System and Entrepreneurship Scope in 21st Century"	Aug, 05-14, 2020	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
76	Dr Sandhya	Processing & Food Engineering	One day online training on 'Process optimization techniques and texture profile analysis'	05-08-2020	Department of Food Plant Operations, College of Food Technology, SDAU, Banaskantha, Gujarat



77	Dr. Sharanbir Kaur Bal, Dr. Ritu Gupta and Dr. Deepika Bisht	Family Resource Management	Training on Ergonomics Methodologies for Designing and Assessing Women Friendly Agriculture Tools and Technologies organized by Department of Resource Management and Consumer Sciences, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan.	August 17-21, 2020.	Online platform
78	Drs. KK Dhatt, Shalini Jhanji, Rishu Sharma,	Floriculture and Landscaping	Online national training on CAD for landscaping (AutoCAD, Archi CAD, 3D Max and Photoshop)	August 31- September 09, 2020	Department of Floriculture and Landscape Architecture, UHS, Bagalkot, Karnataka and Image computers, Gokak, Belagavi (Online)
79	Dr KS Gill, Gagandeep Kaur	Fruit Science	Attended training on Anti-plagiarism software 'Turnitin'	09.09.2020	PAU Ludhiana
80	Er Tarandeep Singh	Farm Machinery & Power Engineering	STC on GNSS and Space Weather	14.09.2020 to 19.09.2020	IIT Indore (Online Mode)
81	Dr Manpreet Singh	Farm Machinery & Power Engineering	One week training on "Internet of Things using Raspberry Pi	14.09.2020 to 18.09.2020	National Institute of Technical Teachers' Training & Research, Chandigarh
82	Dr Manpreet Singh	Processing & Food Engineering	Online training programme on "Incident response system for northern states"	Sept, 16-18, 2020	Mahatma Gandhi State Institute of Public Administration, Punjab & National Institute of Disaster Management
83	Dr Aseem Verma Er Tarandeep Singh	Farm Machinery & Power Engineering	One-week online international training on 'Agriculture 4.0: Precision and Automated Ag Technologies'	Sept 28- Oct 02, 2020	MPKV, Rahuri under NAHEP, CAAST-CSAWM (online)
84	Dr Jaspal Singh Dr Varinder Singh Saimbhi	College of Agricultural Engineering & Technology	Training Programme on Farmers distress management - Empowering Extension Experts	Oct, 05- 07, 2020	National Institute of Agricultural Extension Management
85	Dr Manpreet Kaur Saini	Processing & Food Engineering	Training on Stored Grain Pest Detection: Identification and Management (Virtual mode)	Oct 05- 09, 2020	National Institute of Plant Health Management, Department of Agriculture, Cooperation & Family welfare

86	Dr Navneet Kaur, Pr. Agronomist	Forestry & NR	Twenty-one days National Training Programme "Technology interventions towards transformation of agriculture, sericulture, animal husbandry and allied sectors into sustainable enterprises for Atmanirbhar Bharat"	October 11-31, 2020	Online Mode (Agro Environmental Development Society in collaboration with Central Sericulture Research & Training Institute, Pondicherry
87	Dr Jaspal Singh	Civil Engineering	International Online Short term Course on Sustainable, Resilient and Smart Built Infrastructure in Developing Countries	Oct, 20- 24, 2020	DR BR Ambedkar National Institute of Technology, Jalandhar
88	Dr. Harpreet Kaur Dr. Renuka Aggarwal	Food and Nutrition	Training programme on 'Analysis of experimental data using SAS by ICAR-NAARM, Hyderabad	November 9-17, 2020	Online
89	Dr Manpreet Kaur Saini Dr Maninder Kaur Dr Gurveer Kaur	Processing & Food Engineering	Long Term Training Course (LTTC) on Scientific Methods of Storage and Inspection of Foodgrains"	Nov, 23- 18, 2020	IGMRI, Ludhiana
90	Dr. Deepika Bisht	Family Resource Management	Five days, DST sponsored, online training programme on "Community Resource Management for Women Scientists" organized by Indian Institute of Forest Management, Bhopal.	November 23- 27, 2020	Online
91	Drs. Surabhi Mahajan, Sumeet Grewal and Ms. Rajdeep Kaur	Apparel & Textile Science	Textile Testing and Analytical Techniques in Textiles and Fashion organized by Dept. of Textile Technology, Dr. B. R. Ambedkar National Institute of Technology (NIT), Jalandhar	November 27 - December 1, 2020	Online
92	Dr Ritesh Jain	Civil Engineering	Training on "Addressing Climate and Disaster stress in Agriculture: S & T, Innovations and extension"	Dec. 9-11, 2020	NIDM, Delhi and PAU Ludhiana
93	Dr Santosh Kumar	Farm Machinery & Power Engineering	Three days programme on Addressing climate & disaster stresses in Agriculture	09.12.2020	S & T Innovation & Extension in Collaboration with NIDM, Ministry of Home Affairs Govt. of India.
94	Dr Aseem Verma	Farm Machinery & Power Engineering	Three days training on 'Addressing Climate and Disaster Stresses in Agriculture: S&T, Innovation and Extension'	Dec 9-11, 2020	National Institute of Disaster Management, New Delhi & DEE, PAU Ludhiana



95	Dr Harpreet Kaur Oberoi	Plant Breeding & Genetics	Refresher Course on “Recent Advances in Millets Research”	10 - 31st December 2020.	ICAR-Indian Institute of Millets Research (IIMR), Rajendranagar, Hyderabad
96	Dr. Deepika Bisht	Family Resource Management	Training programme on “Integrating gender concerns in agricultural research and extension for improving livelihood of farm women” organized by ICAR-CIWA	December 15 to 19, 2020	Online
97	Drs. Surabhi Mahajan and Sumeet Grewal	Apparel & Textile Science	Short term training course of 5 days duration on ‘Characterization Techniques in Textiles and Polymers’ organized by Dept. of Textile Technology, Dr. B. R. Ambedkar National Institute of Technology (NIT), Jalandhar	December 15 to 19, 2020	Online
98	Er Tarandeep Singh	Farm Machinery & Power Engineering	E-training programme on integrating gender concerns in agricultural research and extension for improving livelihood of farmwomen	15-19 December 2020	ICAR-CIWA, Bhubaneswar (Online Mode)
99	Dr. Jaspreet Kaur	Food Science & Technology	Training on Grain Processing for Master Trainer under PM FME scheme	21-23 and 28-29.12.2020	CSIR-Central Food Technological Research Institute, Mysuru, Karnataka (online)
100	Dr Jagdish Singh	Soil Science	6 days online training programme on Satellite Remote Sensing for Air Pollution Studies	August 05- 08, 2019	IIRS, Dehradun, PAU-RRS, Gurdaspur, MPKV Rahuri
101	Dr Jaspreet Kaur	Microbiology	National level training programme on “Climate Change, impact, assessment and mitigation in Agriculture”	4th-6th Jan, 2021	PAU and funded by SERB, Delhi
102	Dr Urvashi Dr Ramandeep Kaur	Chemistry	Orientation Programme on Effective Teaching, Research and Extension	January 5-15, 2021	Department of Extension Education and Communication Management, COCS, PAU, Ludhiana
103	Sapna Thakur	Forestry & N R	Sustainable Development of Secondary Agriculture: Economical, Food-Nutritional and Livelihood Perspective	16.01.2021 to 05.02.2021	Navsari Agricultural University, Navsari, Gujarat (Virtual mode)
104	Dr Renu Khanna	Plant Breeding & Genetics	Training programme on ‘Application of Geospatial Technology in Agriculture’	19th January 2021 to 8 th February 2021	Punjab Remote Sensing Centre, Ludhiana

105	Dr Rupinder Pal Singh	Mechanical Engineering	Three day training on “Data Analysis”	20-22 Jan 2021	GNDU Amritsar under Pandit Madan Mohan Malviya National mission on teachers and teaching
106	Dr Rakesh Rathore	Business Studies	Three Days Online Workshop on “Data Analysis”	20-22 Jan 2021	Guru Nanak Dev University Amritsar
107	Dr H K Mavi	Economics & Sociology	Online training course organized	27th -29th Jan 2021	National Institute on Plant Health Management, Hyderabad & PAMETI
108	Er Tarandeep Singh	Farm Machinery & Power Engineering	Training Workshop on Smart Farming using Internet of Things	08.02.2021 - 12.02.2021	Department of Soil and Water Engineering, PAU, Ludhiana
109	Dr Anju Sharma Dr Rimaljeet Kaur	Biochemistry	Two months training on protein purification and learned basic techniques related to data analysis in bioinformatics	11 Feb 2021- 9 April 2021	IISER, Mohali
110	Dr Khushdeep Dharni	Business Studies	Online training program on “Transforming Agribusiness with Artificial Intelligence, Machine Learning and Block Chain Technologies”	15th -16th February, 2021	National Institute of Agricultural Extension Management (MANAGE), Hyderabad
111	Dr Shivani Sharma	Microbiology	21 days online training program on Mushroom Production and Processing Technologies	2nd-22nd Mar, 2021	IGKV, Raipur and NADC, Baramula
112	Dr. Deepika Bisht	Family Resource Management	Three days online training on “Leadership Development for Women Scientists” organized by NAARM, Hyderabad	March 8-10, 2021	Online
113	Dr Namami Gohain	Economics & Sociology	Structural Equation Modelling using Smart PLS	27 April, 2021	Numerical Analytics Instruments Pvt. Ltd
114	Drs Sharanbir Kaur Bal, Ritu Gupta and Deepika Bisht	Family Resource Management	One day training on AgriDiksha, NAHEP organized by ICAR, IASRI, New Delhi	May 15, 2021	Online
115	Dr Shiwani Guleria	Microbiology	Online training courses: ROLE OF INTERNET OF THINGS (IoT) in Transfer of Agricultural Technologies	20th -21st May, 2021	Skill Development Centre, PAU, Ludhiana
116	Dr Kashish Arora	Economics & Sociology	Training of Trainers Programme on “Rural Development Project Management”	24th – 28th May 2021	National Institute of Rural Development and Panchayati Raj, NE Regional Centre, Guwahati



117	Dr T C Mittal Dr M S Alam Dr Preetinder Kaur Dr Sandhya	Processing & Food Engineering	Attended training program of 40 hrs duration for training of Masters Trainer for Food Micro & Small Enterprises	6 days - 2021	IIFPT
118	Dr. H K Mavi	Economics & Sociology	Training cum workshop course on Formation and Management of Farmer Producers Organisation	10th -11th June 2021	Skill Development Centre, PAU, Ludhiana
119	Drs Sharanbir Kaur Bal, Ritu Gupta and Deepika Bisht	Family Resource Management	Three days International Training Series on "Healthy Workplace Initiative in Ergonomics." Organized by Directorate of Research and AICRP on Home Science , College of Community and Applied Sciences, MPUA&T, Udaipur	June 21, 28 and July 5, 2021	Online
120	Dr Hira Singh	Vegetable Science	Completed online course on "Innovations and Sustainability in Food Processing as value added"	June 21 to 29, 2021.	Amity University, Noida
121	Dr Khushdeep Dharni	Business Studies	Master Trainer training program on EDP	June 28 to July 02, 2021	NIFTEM and assessed by FICSI (Food Processing Sector Skill Council), New Delhi
122	Dr. Jagbir Rehal	Food Science & Technology	Master trainers training program on Spices and Plantation Crops Processing	23-27.07.2021	ICAR -CPCRI Kasaragod
123	Dr Santosh Kumar	Farm Machinery & Power Engineering	Five days online Faculty Development Programme on "Recent Innovations and Challenges in Mechanical engineering"	July 26 – July 30, 2021	Department of Mechanical Engineering, with The Institutions of Engineers (India), Bareilly
124	Dr Shiv Kumar Lohan	Farm Machinery & Power Engineering	Five days online training on 'Ergonomical Design Guidelines for Agricultural Tools and Equipment	26.07.2021 to 30.07.2021	CIAE Bhopal
125	Dr Baljinder Kaur Sidana Dr Sangeet Ranguwal	Economics & Sociology	Capacity building programme for social sciences faculty	9th to 21st August, 2021	ICSSR, New Delhi and Central University of Punjab, Bathinda
126	Dr Priya Katyal	Microbiology	Online Training on "Design thinking for research project formulation and Implementation"	24th-28th Aug, 2021	NAARM, Hyderabad

127	Drs. Surabhi Mahajan and Sumeet Grewal	Apparel and Textile Science	Short Term Training Course on 'Natural Fibre Engineering and Technology, Fibre Production, Processing and Evaluation of Value Added Products' organized by ICAR-NINFET (National Institute of Natural Fibre Engineering and Technology) Kolkata	September 13-22, 2021	Online
128	Dr. Shivani Rana	Family Resource Management	Online training on promoting women Agri-preneurship through crop- livestock- fisheries technologies organized by ICAR-CIWA, Bhubaneshwar and MANAGE, Hyderabad.	September 14-18, 2021	Online
129	Dr. Gagandeep Kaur Chahal Dr Prinka Goyal	Botany	Refresher Course on "Educational Technology" Academy of Agricultural Research & Education Management	September 21 to Oct 11, 2021	CCSHAU, Hisar Directorate of Human Resource Management
130	Dr Baljinder Kaur Sidana	Economics & Sociology	International Statistical Data Analysis Using SPSS	21-27th September, 2021	Science Tech Institute, Lucknow
131	Dr Amit Guleria Dr Sanjeev Kumar Dr Pradip Kumar Adhale	Economics & Sociology	Ten days training programme on "Statistical Techniques for Data Analysis in Agriculture"	October 4, 2021, to October 13, 2021	ICAR-IASRI, New Delhi
132	Dr. Shivani Rana	Family Resource Management	Refresher Course on Educational Technologies.	October 21-November 11, 2021	Academy of Agricultural Research and Education Management, Directorate of Human Resource Management, CCS, Hisar.
133	Dr. Hanuman Bobade	Food Science & Technology	Training on Bakery and Confectionery	25-29.10.2021	Skill Development Centre, PAU, Ludhiana
134	Dr Kamaljit Kaur	Biochemistry	National Training on "On farm and mass production protocols of bioagents and microbial agents for Fall armyworm management"	28-10-21 to 30-10-21	Online
135	Dr. Aman Sharma	Floriculture and Landscaping	Plant Health Management Strategies in Different crops" by ICAR AND NIPHM	November 10-30, 2021	NIPHM, Rajendranagar, Hyderabad, Telangana



136	Drs. K.K. Dhatt and Shalini Jhanji	Floriculture and Landscaping	National Online Training Programme for "Conservation, Management and Utilization of Horticultural Genetic Resources for Livelihood and Nutritional Security"	November 22-26, 2021	IIHR
137	Dr Rashmi Arora	Mechanical Engineering	AICTE sponsored QIP Short Term Course on "Industrial Internet of Things (IIOT) and Robotics"	Nov. 22-27, 2021	NITTTR Chandigarh
138	Dr Jyoti Gaba Dr Shivali Sharma	Botany	Attended Orientation Programme on Effective Teaching, Research and Extension	November 23 to December 3, 2021	Department of Extension Education and Communication Management, COCS, PAU, Ludhiana
139	Dr. Madhu Bala	Floriculture and Landscaping	14 days training course on "Molecular biology tools and its Application in Agriculture & Allied Sciences"	December 01 to 14, 2021	CST, UP Centre of Excellence in Agriculture Biotechnology Online
140	Dr Harpreet Singh	Fruit Science	21 days training programme on "Plant Protection Techniques for plant health Management"	03.12.2021 - 23.12.2021	G.B. Pant University of Agriculture and Technology, Pantnagar
141	Dr. Manmohan Dhkal	Plant Pathology	21 days training on Plant Protection Techniques for Plant Health management	03.12.2021 to 25.12.2021	National institute for Plant Health Management, Hyderabad
142	Drs. Madhu Bala, Simrat Singh	Floriculture and Landscaping	One Week Online Training Program on Statistical Data Analysis using "R" Software	December 21-27, 2021	Science Tech Institute, Lucknow online
143	Dr Shiv Kumar Lohan	Farm Machinery & Power Engineering	Online one-week short term course on "Machine learning and applied optimization applications in Engineering"	21.12.2021 to 25.12.2021	NIT, Jalandhar
144	Dr Sandhya	Processing & Food Engineering	Two day online training program for BIS Technical Committee Members,	23- 24.12.2021	National Institute of Training for Standardization, BIS Noida
145	Dr Shiv Kumar Lohan	Farm Machinery & Power Engineering	One day capacity building programme on energy efficiency and conservation	27.12.2021	Mahatma Gandhi State Institute of Public Administration, Chandigarh
146	Dr Ashwani Kumar Soni	Renewable Energy Engineering	Webinar training: How to be an effective peer reviewer	April 29,2020	Taylor and Francis group
147	Dr Pratibha Vyas	Microbiology	Online certificate course on "Bioinformatics: Its Application in Life Sciences"	1-30th January, 2022	Microbiologists Society, India

148	Dr Simrat Singh	Floriculture and Landscaping	ICAR sponsored Winter school on 'Crop Diversification with low volume high value seed spices and horticultural crops for doubling farmer's income'	January 11-31, 2022	ICAR-NRC Seed Spices, Tabiji, Ajmer
149	Sapna Thakur	Forestry & N R	Recent Development in Agroforestry & NR Dimensions for Managing Salt Affected Ecologies	22 Feb-03 March, 2022	ICAR-CSSRI Virtual mode
150	Dr Yadhu Suneja	Biochemistry	Two days Virtual Faculty Development Program on Statistical Data Analysis using R-Studio	5th February to 6th February, 2022	Sri Sri University, Cuttak, Odisha
151	Dr H K Mavi	Economics & Sociology	Winter School 21 days online training program under SC-SP scheme on "Analytical Techniques for Decision making in Agriculture"	05-25 Feb 2022	ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi
152	Dr Jupinder Kaur Dr Pratibha Vyas	Microbiology	Winter school on "Crop Residues Utilization and Management for Clean Energy and Environment"	8th -28th Feb, 2022	ICAR-CIAE, Bhopal
153	Dr Sanjeev Kumar	Economics & Sociology	Winter School on "Artificial Intelligence in Agriculture"	15th February 2022 to 7th March 2022	ICAR- Indian Agricultural Statistics Research Institute, Library Avenue, Pusa, New Delhi
154	Dr Rimaljeet Kaur	Biochemistry	Online Refresher Course for two weeks on Research Methodology	20 Feb 2022- 6 March 2022	Teaching Learning Centre, Ramanujan College, New Delhi.
155	Dr Rimaljeet Kaur	Biochemistry	Online Refresher Course for two weeks on Research Methodology conducted by Teaching Learning Centre	20 Feb 2022- 6 March 2022	Ramanujan College, New Delhi
156	Dr. Tanya Thakur	Floriculture and Landscaping	Three weeks training programme on "Application of remote sensing and GIS with special reference to agriculture"	February 23- March 15, 2022	Punjab Remote Sensing Centre, Punjab Agriculture University, Ludhiana
157	Dr. Shehnaz	Soil Science	Application of remote sensing and geographic information system with special reference to agriculture	23rd Feb, - 15th March, 2022	PRSC, PAU, Ludhiana
158	Drs. Yesmin Kaur, Rajnish Kumar Verma, Yesmin Kaur, Yogita Bohra, Ambika Rautela, Manmohan Dhkal	Plant Pathology	Attended three weeks training programme on 'Application of Remote Sensing and GIS with Special Reference to Agriculture'	23.02.2022 to 15.03.2022	Punjab Remote Sensing Centre



159	Dr Pooja	Microbiology	Winter school training programme on “Recent innovations in stored product protection for food and nutritional security: A gateway of green agriculture technology”	24th February to 16th Mar, 2022	Bihar Agricultural University
160	Dr. Vivek Sharma	Soil Science	Winter School on Application of Remote Sensing and GIS in Land Resource Management for Sustainable Agriculture	2nd to 22nd March, 2022	ICAR–NBSSLUP, Regional Centre, Kolkata
161	Er Tarandeep Singh	Farm Machinery & Power Engineering	Online AR-VR Training	01.04.2022 to 06.04.2022	NAHEP, Component-2, IASRI, New Delhi
162	Dr Prinka Goyal	Botany	Science Academies’ Virtual Refresher course on ‘Plant Taxonomy, Ecology and Biodiversity Conservation	April 2-18, 2022 (virtual)	Punjab University, Chandigarh
163	Dr. Baljinder Kaur Sidana	Economics & Sociology	International Training Programme on Computable General Equilibrium(CGE) Modelling for Policy Analysis	April 4 to May 18, 2022	International Food Policy Research Institute, South Asia Regional Office, NASC Complex, PUSA, New Delhi
164	Dr. Harsimran Kaur, Dr Jeevanjot Dhaliwal		21-day DST sponsored capacity building training program PRSC	April 21st to May 11th, 2022	PRSC, Ludhiana
165	Dr. Mandeep Sharma	Extension Education and Communication Management	Training on waste management strategies in agriculture and allied sectors	May 10 to 13, 2022	PAMETI, Ludhiana
166	Dr Yadhu Suneja	Biochemistry	Genome editing in agriculture: Science, Potential and Policies	11th May, 2022	PAU, Ludhiana in association with NABI, Mohali and BCIL, New Delhi
167	Dr Yadhu Suneja	Biochemistry	Genome editing in agriculture: Science, Potential and Policies	11th May, 2022	PAU, Ludhiana in association with NABI, Mohali
168	Dr. Mandeep Singh Hunjan	Plant Pathology	Training course on application of Advanced Analytical Instruments in Agriculture (Workshop on Analytical Methods)	17th May to 24th May 2022	Synergetic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI) held at PAU
169	Shahida Nisar	Soil Science	Training on “Climate Information for Resilient Agriculture	18-20 May 2022	ICAR-Indian Institute of Soil Science and NIDM and IMD-Bhopal

170	Dr Sangeet Ranguwal Dr Harsimranjeet Kaur Mavi	Economics & Sociology	Training program on Integrated Village Development Education and Educational Management	23 to 27 May 2022	NITTR, Chandigarh
171	Dr. Tanya Thakur	Floriculture and Landscaping	21 Days Summer School On "Recent Trends in Sustainable Livestock and Crop Production Technologies vis-à-vis Climate Change"	June 18-July 8, 2022	ICAR-Indian Grassland and Fodder Research Institute, Regional Research Station, Srinagar, J & K Online
172	Dr. Jagbir Rehal	Food Science & Technology	Training-cum-awareness workshop on Prime Minister Formalization of Micro Food Processing Enterprises Scheme	28.06.2022	Punjab Agro Industries Corporation and Processing and Food Engineering Department, PAU
173	Dr Yadhu Suneja	Biochemistry	Online workshop on "Intellectual Property Rights (IPR) especially patents and design filing"	8th July, 2022	Rajiv Gandhi International Institute of Intellectual Property Management and PAU, Ludhiana
174	Dr Aseem Verma Dr. Iqbal Singh Dr Manpreet Singh Dr Apoorv Prakash	College of Agricultural Engineering & Technology	Two-week training programme on 'Monitoring of Environmental Hazards using Geospatial Technology'	July 13-26, 2022	PRSC, Ludhiana
175	Dr Jupinder Kaur Dr Pratibha Vyas	Microbiology	Two weeks (15 days) online Interdisciplinary Refresher Course in "Advanced Research Methodology"	22nd July to 05th Aug, 2022	Ramanujan College, University of Delhi
176	Dr Sukhmani	Business Studies	CBP on Quantitative and Quantitative Methods for Research in Social Sciences 2020'	July 25-August 5, 2022	Department of Humanities and Social Sciences, IIT Roorkee
177	Dr Yadhu Suneja	Biochemistry	Online Summer School Workshop on "Genome editing for food security and environmental sustainability"	4th August, 2022 to 5th August, 2022	Plant Science Department, McGill University Canada
178	Dr Bikramjit Singh	Mechanical Engineering	Faculty Development Programme on Disaster Management	22.08.2022 to 26.08.2022	Mahatma Gandhi State Institute of Public Administration Chandigarh
179	Dr Preeti Goyal	Biochemistry	Two months of training in biochemistry and nanotechnology	23/08/2022 to 22/10/2022	ICAR-Central Institute of cotton technology, Mumbai



180	Dr. Prachi Bisht Dr. Rashmi Upreti	Human Development & Family Studies	Orientation Course on Effective Teaching, Research and Extension	August 23 -September 2, 2022	Department of Extension Education and Communication Management, PAU, Ludhiana
181	Dr Rashmi Arora	Mechanical Engineering	Orientation Course on "Effective Teaching, Research and Extension"	August 23 to September 2, 2022	Department of Extension Education and Communication Management, PAU Ludhiana
182	Dr Preeti Goyal	Biochemistry	Two months of training in biochemistry and nanotechnology	23/08/2022 to 22/10/2022	ICAR-Central Institute of cotton technology, Mumbai
183	Dr. Kamaljit Kaur, Dr. Jagbir Rehal	Food Science & Technology	Seven Days Faculty Development Programme on Adopting Computational Methodology as a vital Research and Teaching Tool	20-26.09.2022	UGC- HRDC, Panjab University, Chandigarh
184	Dr Monica Sachdeva Taggar	Renewable Energy Engineering	Training on 'Adopting Computational Methodology as Vital Research and Training tools'	September 20, 2022 to September 26, 2022	Panjab University, Chandigarh
185	Dr Kamaljit Kaur Dr Rachana D. Bhardwaj	Biochemistry	FDP on 'adopting computational methodology as a vital research and teaching tool: Preparing the future generation'	20-9-2022 to 26 -9-2022	Department of Chemistry, Panjab University, Chandigarh
186	Dr Sunny Kumar	Economics & Sociology	Attended two-day training programme on contemporary challenges faced by the global and regional agricultural trade sector	29 and 30 September 2022	Centre for Research in Rural and Industrial Development (CRRID), International Food Policy Research Institute and Research & Information System (RIS)
187	Dr. Arashdeep Singh	Food Science & Technology	CAFT training on Food Processing Technologies: Developing Smart Food for Boosting Human Health and Agripreneurship	1-21.11. 2022	Division of Biochemistry, ICAR-IARI, New Delhi
188	Dr Anju Sharma Dr Rimaljeet Kaur	Biochemistry	CAFT Training on "Food Processing Technologies: Developing Smart Food for Boosting Human Health and Agripreneurship"	1 Nov-21 Nov 2022	Division of Biochemistry, ICAR-IARI, New Delhi
189	Dr Anju Sharma Dr Rimaljeet Kaur	Biochemistry	CAFT Training on "Food Processing Technologies: Developing Smart Food for Boosting Human Health and Agripreneurship"	1 Nov-21 Nov 2022	Division of Biochemistry, ICAR-IARI, New Delhi

190	Dr Pooja	Microbiology	21 days winter school training programme on “Food Processing Technologies: Developing Smart Food for Boosting Human Health and Agripreneurship”	1st-21st Nov, 2022	IARI, New Delhi
191	Dr Amit Guleria Dr Shaikh Mohd Mouzam Dr Laishram Priscilla	Economics & Sociology	21 days ICAR-Centre for Advanced Faculty Training on “Concepts and Methods for Sustainable Food System Analysis”	2- 22 November, 2022	Division of Agricultural Economics, ICAR-IARI, New Delhi
192	Dr. Vikas Kumar	Food Science & Technology	CAFT training on Innovations in Processing and Packaging of Dairy and Food Products and Opportunities for Entrepreneurship Development and Start-ups	07-27.11.2022	NDRI Karnal
193	Dr Priya Katyal	Microbiology	21 days CAFT Programme on “Innovations in Processing and Packaging of Dairy and Food Products and Opportunities for Entrepreneurship Development and Start-ups”	7th-27th Nov. 2022	Dairy Technology Division, NDRI, Karnal
194	Dilpreet Talwar	Vegetable Science	21 days CAFT training on Prominent Statistical Tools for Data Science in Agriculture using R and Python	9-29 November, 2022	IASRI, New Delhi
195	Dr. Monika Choudhary Dr. Amarjeet Kaur	Food and Nutrition	Attended ICAR sponsored 21 days winter school on “Innovative Storage Solutions: The Best Way Forward for Reducing Post-Harvest Losses, and Doubling Farmers’ Income”	November 18-December 8, 2022	ICAR-CIPHET, Ludhiana, Punjab
196	Dr. Shalini Jhanji	Floriculture and Landscaping	Winter School on “Innovative Storage Solutions: The Best Way Forward for Reducing Post-Harvest Losses, and Doubling Farmers’ Income	November 18 –December 08, 2022	ICAR-CIPHET Ludhiana.
197	Dr. Hanuman Bobade	Food Science & Technology	Winter School training programme on Innovative storage solutions: The best way forward for reducing post-harvest losses, and doubling farmers’ income	18.11.2022-08.12.2022	ICAR-CIPHET, Ludhiana
198	Dr Rupinder Pal Singh Dr Saurabh Ratra	College of Agricultural Engineering & Technology	Winter school on Innovative storage solutions	ICAR-CIPHET, Ludhiana	18 Nov to 08 Dec 2022



199	Dr Urvashi	Chemistry	ICAR Sponsored Winter School on "Innovative Storage Solutions: The Best Way Forward for Reducing Post-Harvest Losses, and Doubling Farmers' Income"	November 18-December 8, 2022	ICAR-CIPHET Ludhiana
200	Dr Harpreet Singh	Fruit Science	21 days CAFT training programme on "Advances in Plant Disease Diagnostic and Forecasting Tools"	29.11.2022 - 19.12.2022	G.B. Pant University of Agriculture and Technology, Pantnagar
201	Dr Santosh Kumar	Farm Machinery & Power Engineering	Training "Remote Pilot Instructors" of drone	12.12.2022 to 14.12.2022	online
202	Dr Santosh Kumar Er Tarandeep Singh	Farm Machinery & Power Engineering	Drone Instructor training	16.12.2022 to 19.12.2022	IGRUA New Delhi
203	Dr Mahesh Narang	Farm Machinery & Power Engineering	Capacity building for air pollution challenges	19.12.22	CSTEP (Centre for study of Science, Tech and Policy) at PAU, Ludhiana
204	Dr. Mandeep Sharma	Extension Education and Communication Management	ICT led Extension content and delivery mechanism	January 12 to February 1, 2023	Division of Agricultural Extension, ICAR, IARI, New Delhi
205	Dilpreet Talwar	Vegetable Science	21 days Winter School on Artificial intelligence for water resource management in agriculture	18 January to 7 February, 2023	Department of Soil and Water Engineering, PAU, Ludhiana
206	Dr. Neha Babbar	Food Science & Technology	21 days CAFT Training	26.01.2023-17.02.2023	PJTSAU, Hyderabad
207	Dr Ankit Sharma	Farm Machinery & Power Engineering	21 day Winter school in Geospatial Science and Technology'	30.01.23 to 22.02.23	University of North Bengal, Siliguri, Darjeeling
208	Dr Rachana D. Bhardwaj	Biochemistry	UGC-Approved Refresher Programme: Design, Development and Delivery of MOOCs	06.02.2023 to 17.02.2023	(Online mode)
209	Dr Preeti Goyal	Biochemistry	UGC-approved refresher programme: Design, Development, and Delivery of MOOCs	06.02.2023 to 17.02.2023	(Online mode)
210	Dr Shivali Sharma	Chemistry	Participated in online training "UGC-Approved Refresher Programme: Design, Development and Delivery of MOOCs"	February 6-17, 2023	STRIDE, Indira Gandhi National Open University, New Delhi
211	Dr Manpreet Kaur Saini	Processing & Food Engineering	STC on "Internet of things"	Feb 20-24, 2023	NITTTR Chandigarh

212	Dr Hira Singh	Vegetable Science	CAFT training course on "Computational Biology and its Applications in Agriculture"	Feb 21 to March 02, 2023.	ICAR-Indian Agricultural Statistics Research Institute, New Delhi
213	Dr Shalini Jhanji	Floriculture and Landscaping	Five days training programme on "Post Harvest Management and Storage Techniques"	March 20-24, 2023	NIPHM, Hyderabad
214	Dr. Prachi Bisht	Human Development & Family Studies	National Orientation course on "Teaching Learning Evaluation Technology Programme (TLETP-2023)"	April 5-25, 2023	Online ICAR - ATARI Ludhiana
215	Dr Rashmi Arora Dr Saurabh Ratra	College of Agricultural Engineering & Technology	21 Days Training on "Basics of Remote Sensing, GIS & GNSS Technology, and their Applications"	19 April to 9 May 2023	Punjab Remote Sensing Centre, Ludhiana
216	Dr Bikramjit Singh	Mechanical Engineering	Two weeks training on Digital Image Processing techniques	15.05.2023 to 27.05.2023	NITTR, Chandigarh
217	Dr. Deepika Bisht	Resource Management And Consumer Science	UGC-Approved Short Term Professional Development Programme on "NEP 2020 & Higher Education: e-Content Development for Online and Blended Programmes" organized by Indira Gandhi National Open University.	May 22-27, 2023	Online
218	Dr Priya Katyal	Microbiology	"Operationalization and usage of Agri-diksha web education channel"	29th - 31st May, 2023	NAHEP (online)
219	Dr Priya Katyal	Microbiology	Certificate course on New Education Policy "IGNOU NEP-PDP: Swayam Prabha"	12th – 16th June 2023	(online)
220	Dr. Prachi Bisht Dr. Rashmi Upreti	Human Development & Family Studies	UGC sponsored Refresher course in Research Methodology in Social Sciences	July 1-14, 2023	Punjab University, Chandigarh
221	Dr. Shivani Rana	Resource Management And Consumer Science	Virtual "collaborative online training programme on Agri-Exports" organized by Dr.Rajindra Prasad Central Agricultural University, Pusa, Samastipur, Bihar and MANAGE, Hyderabad.	July 12-14, 2023	Online platform
222	Dr. Ambika Rautela Dr. Rajnish Kumar Verma	Plant Pathology	Attended 11 days Induction training program	August 19-23, 2023	Department of Extension education & Communication Management, COCS, PAU
223	Barinder Kaur	Vegetable Science	Geospatial Technologies for Agriculture and Life Sciences	27 Sept- 10 Oct, 2023	Punjab Remote Sensing Centre, Ludhiana



IMPORTANT EVENTS ORGANIZED AT PAU (2018-19 TO 2022-23)

Sr. No.	Event	Date/ Period	Organizing/Sponsoring Agency
1	Training programme on "Seed Processing and Seed Quality Maintenance"	February 22, 2018	PAU's University Seed Farm, Naraingarh, Fatehgarh Sahib
2	Er Umesh Jhamb, Mentor and Advisor, GS Auto International Limited, on "Planning - Mantra of Success"	August 10, 2018	College of Agricultural Engineering and Technology, PAU
3	Training programme on "In-situ Crop Residue Management"	August 13-14, 2018	DEE, PAU, Ludhiana
4	Orientation course on "Effective Teaching, Research and Extension" for newly recruited faculty of PAU	August 21-31, 2018	Department of Extension Education and Communication Management, PAU
5	Orientation of Trainers of KVKs/SAUs/ICAR Institutes for conducting skill development programme	September 2-3, 2018	DEE, PAU, Ludhiana
6	Winter School on "Proteomics and its Application in Agriculture"	September 5-14, 2018	Department of Biochemistry, PAU and ICAR, New Delhi
7	Brainstorming Workshop on "Crop Residue Management"	September 6, 2018	DEE, PAU, Ludhiana
8	5th Rabi Group Meet of All India Coordinated Research Network (AICRN) on "Potential Crops"	September 9, 2018	Pulses Section, PAU
9	Workshop on "Impending Insect Threats"	September 14, 2018	DEE, PAU, Ludhiana
10	Convergence Meet of Stakeholders on "Crop Residue Management"	October 8, 2018	ICAR- Agricultural Technology Application Research Institute (ATARI), PAU Campus, Ludhiana
11	Training programme on "Natural Resource Management for Doubling Farmers' Income"	October 10-30, 2018	ICAR/Centre of Advanced Faculty Training (CAFT) in Soil Science, PAU
12	Workshops on "3-D Mural Making" and "Clay Modelling"	October 17-18, 2018	Department of Family Resource Management, PAU
13	Broad Subject Matter Area (BSMA) Committee Workshop for restructuring of Masters' and Ph.D. curriculum, syllabi and academic regulations for the disciplines of Agricultural Engineering by ICAR	October 22, 2018	College of Agricultural Engineering and Technology, PAU
14	Training programme "Development and Markers Aided Identification of Hybrids in Citrus"	October 29 to November 4, 2018	Dr JC Bakshi Regional Research Station, Abohar
15	Food Industry and Craft Mela	October 30, 2018	Department of Processing and Food Engineering in association with Department of Food Science and Technology, and Department of Food and Nutrition, PAU
16	Farmer-Scientist Interface Meeting	October 30, 2018	College of Basic Sciences and Humanities, PAU.
17	Winter School on "Technological Advances to Minimize Wastage of Horticultural Produce"	November 1 -21, 2018	Department of Fruit Science, PAU
18	Extension and Research Council Meeting	November 5, 2018	DEE, PAU, Ludhiana
19	Winter School on "Recent Advances in Integrated Pest Management of Insects"	November 13 to December 3, 2018	Department of Entomology, PAU, under the aegis of ICAR
20	National Seminar on "Environmental Changes and its Impact on Faunal Diversity in Indian Agro-eco-systems"	November 19-20, 2018	Department of Zoology, PAU and Zoological Survey of India (ZSI)
21	Training programme on "Preparation of Natural Vinegar and Low Alcoholic Carbonated Beverages from Fruits"	November 19-20, 2018	Department of Microbiology in collaboration with Directorate of Extension Education, PAU

22	10th Annual Workshop of All India Coordinated Research Project on "Ergonomics and Safety in Agriculture"	November 27-28, 2018	Department of Farm Machinery and Power Engineering, PAU and ICAR, New Delhi
23	Guava Show-cum-Seminar	December 5, 2018	Department of Fruit Science, PAU and Regional Fruit Research Station, Bahadurgarh
24	Seminar on "Judicious Use of Agro-chemicals"	December 5, 2018	Krishi Vigyan Kendra, Bathinda
25	Training-cum-Workshop for PAU Crop Residue Managers' Association	December 20, 2018	DEE, PAU, Ludhiana
26	Farmer - Producer Organizations (FPOs): Awareness Campaign on Promotion in Punjab: State Level Launch Programme	December 27, 2018	DEE, PAU, Ludhiana
27	Workshop on "Recent Technologies to Maximize Sugar Recovery in Sugarcane through Agronomic and Plant Protection Manipulations"	January 2 -3, 2019	PAU's Regional Research Station, Kapurthala
28	Training programme "Use of Biotechnological and Pathogen Diagnostic Techniques in Citrus"	January 5-9, 2019	Dr JC Bakshi Regional Research Station, Abohar
29	Staff development programme "Sculpture Making"	January 17, 2019	Department of Family Resource Management, PAU
30	Workshop on "Varietal Selection, Production and Protection Practices for Quality Jaggery Production"	January 21, 2019	PAU's Regional Research Station, Kapurthala
31	Training course on "Genomics Assisted Crop Breeding Techniques"	January 22 to February 11, 2019	PAU, Ludhiana
32	Broad Subject Matter Area (BSMA) Committee Workshop for restructuring of Masters' and Ph.D. curriculum, syllabi and academic regulations for the disciplines of Agricultural Engineering by ICAR	February 4-5, 2019	College of Agricultural Engineering and Technology, PAU
33	Workshop on "Recent Technologies to Attain the Potential Yield of Sugarcane"	February 6-7, 2019	PAU's Regional Research Station, Kapurthala
34	The 43 rd Vice Chancellors' Convention on "Artificial Intelligence for Smart Agriculture"	February 11-12, 2019	Dean, Postgraduate Studies
35	Winter School on "Application of Molecular Epidemiology and Simulation Modeling for Plant Disease Management"	February 13-22, 2019	Department of Plant Pathology, PAU and ICAR, New Delhi
36	Workshop on "Role of Varietal Identification, Quality Seed Assurance, Recent Agronomical and Protection Technologies Toward Sustainable Sugarcane Production"	February 22-23, 2019	PAU's Regional Research Station, Kapurthala
37	Seminar on "Cultivation and Management of Horticultural Crops"	February 28, 2019	PAU, Ludhiana at MS Randhawa Fruit Research Station, Gangian
38	Workshop on "Recent Technology for Sustainable Sugarcane Production"	March 5, 2019	PAU's Regional Research Station, Kapurthala
39	Workshop on "Youth and Mental Health in Changing World"	March 11, 2019	Department of Extension Education and Communication Management, PAU
40	Programme on "Jaggery Processing"	March 11, 2019	DEE, PAU, Ludhiana
41	Workshop on "Nutritious Biscuits"	March 18, 2019	Experiential Learning Unit, Department of Food and Nutrition, PAU
42	Training programme "Hybrid Development in Citrus, their Molecular Identification and Screening against Phytophthora and Soil Salinity"	March 18-22, 2019	Dr JC Bakshi Regional Research Station, Abohar
43	Workshop on "Technologies for Production of Healthy Crop of Sugarcane in Reference to Jaggery Production"	March 22, 2019	PAU's Regional Research Station, Kapurthala
44	Workshop on "Innovative Bakery and Decorative Icings"	March 23-24, 2019	Experiential Learning Unit, Department of Food and Nutrition, PAU
45	Seminar on "Safe Processing of Sugarcane Juice into Jaggery"	March 25-26, 2019	DEE, PAU, Ludhiana
46	Invited lecture on "Status of Micro-irrigation and its Opportunity in India"	March 26, 2019	College of Agricultural Engineering and Technology, PAU



47	Invited lecture on "Scope of Agricultural Engineering in Irrigation Industry"	March 27, 2019	College of Agricultural Engineering and Technology, PAU
48	Research Scholars' Meet	March 27, 2019	Department of Zoology, PAU and Patiala Chapter of Indian Science Congress Association (ISCA Kolkata)
49	Invited lecture on "Marketing and Dealership Aspects associated with the Industry and Practical Aspects and Government Initiatives for Solar Projects"	March 28, 2019	College of Agricultural Engineering and Technology, PAU
50	Invited lecture on "Potential and Opportunities Associated with Organic Food, Food Processing Sector and Food Parks"	March 29, 2019	College of Agricultural Engineering and Technology, PAU
51	Invited lecture on "Opportunities Related to Establishment of Food Parks"	March 29, 2019	College of Agricultural Engineering and Technology, PAU
52	Invited lecture on "Micro-irrigation for Enhancing Agriculture Income"	March 29, 2019	College of Agricultural Engineering and Technology, PAU
53	Seminar on "Safe and Judicious Use of Agro-chemicals and Adoption of IPM Practices"	March 29, 2019	KVK, Bathinda, and Hindustan Insecticides Ltd
54	Seminar on "PM Kisan Samman Nidhi Scheme"	March 31, 2019	Ministry of Food Processing Industries, Govt of India
55	Talk on "Immersive Learning Experiences through Virtual Laboratories, Artificial Intelligence and Robotics using HoloSuit"	April 4, 2019	PAU Science Club
56	Talk on "Tips for Admission into Prestigious Management Institutions"	May 1, 2019	College of Agricultural Engineering and Technology, PAU
57	Staff development programme "Eco-friendly Cleansers"	May 10, 2019	Department of Family Resource Management, PAU
58	Workshop on Implementation of Demo Farms as a part of "Paani Bachao Paise Kamao"	May 14, 2019	DEE, PAU, Ludhiana
59	Hands-on-training on "Statistical Tools and Database Management in Agriculture"	June 10 -15, 2019	Department of Soil Science under ICAR's NAHEP - CAAST - School of Natural Resources Management for Sustainable Agriculture
60	Extension and Research Council Meeting	June 18, 2019	DEE, PAU, Ludhiana
61	Workshop on "Impending Insect Threats"	June 20, 2019	DEE, PAU, Ludhiana
62	Workshop on "Farmer Producer Organizations"	June 22, 2019	DEE, PAU, Ludhiana
63	Training programme on "Preparation of Natural Vinegar and Low Alcoholic Carbonated Beverages from Fruits"	June 25-26, 2019	Department of Microbiology in collaboration with Directorate of Extension Education, PAU
64	Training course on "Groundwater Recharge" for civic officials, Municipal Corporation, Ludhiana	July 24, 2019	Department of Soil and Water Engineering, PAU
65	Training course on the "Establishment of Agro Based Industries at Small Scale Level"	August 5-8, 2019	Department of Processing and Food Engineering and Directorate of Extension Education, PAU
66	Training programme on "Biotic and Abiotic Stress Tolerance in Plants under Changing Climatic Conditions"	August 6-26, 2019	Department of Plant Breeding and Genetics, PAU
67	Refresher course on "Identification, Bioecology, Monitoring and Management of Fall Armyworm in Punjab"	August 19, 2019	Department of Entomology, PAU
68	Training course on "Groundwater Recharge using Passive Technologies: Green Infrastructure Best Management Practices"	August 19, 2019	Department of Soil and Water Engineering, PAU
69	Regional Stakeholders' Workshop on "Alternate Agricultural Production Pathways in Changing Climates for North-Western Region"	September 4, 2019	PAU in association with Indian Agricultural Research Institute (IARI), New Delhi

70	Celebration of National Nutrition Month	September 5-6, 2019	Department of Food and Nutrition, PAU
71	Orientation programme of postgraduate students	September 10, 2019	PAU Science Club
72	Mock Campus Placement Drive in collaboration with experts from Bull's Eye, Ludhiana	September 26, 2019	Training and Placement, College of Agricultural Engineering and Technology, PAU and Bull's Eye, Punjab
73	Invited lecture on "Status of Micro Irrigation and Polyhouses and Its Opportunity in India, and Marketing and Dealership Aspects Associated with the Micro Irrigation Industry"	September 28, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
74	Training programme on "Assessing Soil Plant Atmosphere Continuum for Enhanced Input Use Efficiency"	October 1-21, 2019	Department of Soil Science, PAU under Centre of Advanced Faculty Training (CAFT) programme/ scheme
75	Invited lecture on "Production Technologies in Food Processing Industry and Decision Making"	October 1, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
76	National programme on "10 Years Nestle Healthy Kids Journey"	October 1, 2019	Department of Food and Nutrition, PAU
77	Lecture by Mr John Clohesy, lecturer from Leicester College, UK, on "Teaching, Methodologies - Some Tips for Effective Teaching"	October 3, 2019	PAU Science Club
78	Invited lecture on "International Job Opportunities for Agricultural Engineers and Career Planning"	October 3, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
79	Invited lecture on "Orientation for Tractor Marketing and Network Development"	October 3, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
80	Invited lecture on "Emerging Technologies in Tractor and Farm Machinery Industry and Serving in Corporate Sector"	October 3, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
81	8th Asian Australasian Conference on "Precision Agriculture"	October 14-17, 2019	PAU, Ludhiana
82	Food Industry and Craft Mela	October 20, 2019	Department of Processing and Food Engineering, PAU
83	One-day workshop on "Contemporary Social Issues and Punjab Agriculture"	October 22, 2019	CoBSH, PAU, Ludhiana
84	Training-cum-Workshop on "Online Data Management and Information Sharing by the KVKs through New PAU-KVK Portal"	October 24, 2019	DEE, PAU, Ludhiana
85	Workshop on "Photography"	October 29-31, 2019	Department of Extension Education and Communication Management, PAU
86	Regional study tour on "Integrated Straw Management"	November 8-9, 2019	Centre for Sustainable Agricultural Mechanization (CSAM) of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), Indian Council of Agricultural Research (ICAR), and PAU
87	World Diabetes Day	November 14, 2019	Department of Food and Nutrition, PAU
88	Invited lecture on "Career Options for Agrineers and Journey from CoAE&T to Corporate World"	November 18, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
89	Winter School on "Ecological Perspectives in Arthropod Pest Management for Sustainable Crop Production"	November 19 to December 9, 2019	Department of Entomology, PAU
90	Workshop on "Web Designing and Multimedia Production"	November 20-22, 2019	Department of Extension Education and Communication Management, PAU



91	Invited lecture on "Solid Waste Management - Landfill Construction, Operation and Maintenance"	November 26, 2019	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
92	Training course on "Safe Processing of Sugarcane Juice into Jaggery"	November 28, 2019	Department of Processing and Food Engineering, PAU and Department of Agriculture, Punjab
93	One-day training workshop on "Quantitative Techniques for Impact Assessment"	December 16, 2019	CoBSH, PAU, Ludhiana
94	Training course on "GeM (Government-e-Marketplace) Online Portal"	December 17, 2019	DEE, PAU, Ludhiana
95	Consultative workshop on "Academia - Industry - Government Linkages for Quality Agricultural Education"	January 28-29, 2020	PAU under NAHEP and NAARM, Hyderabad
96	Invited lecture on "Opportunities in Food and Retail Sector"	January 28, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
97	Training course on "Safe Processing of Sugarcane Juice into Jaggery"	January 28, 2020	Department of Processing and Food Engineering, PAU and Department of Agriculture, Punjab
98	Winter School on "ICT and Social Media Use"	January 30 to February 19, 2020	DEE, PAU, Ludhiana
99	Mr Naresh Kumar, Inspector, Income Tax, Jalandhar on "Preparations for Civil Services Examination"	February 4, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
100	Stakeholders' Workshop on "Assessment and Management of Groundwater Resources under Changing Climatic Conditions"	February 6, 2020	Departments of Climate Change and Agricultural Meteorology, Soil Science, and Soil and Water Engineering, PAU under the aegis of National Agricultural Higher Education project
101	National Seminar on "Maize for Crop Diversification under Changing Climatic Scenario"	February 9-10, 2020	Maize Technologists' Association of India, Indian Institute of Maize Research and PAU, Ludhiana
102	Training course on "Safe Processing of Sugarcane Juice into Jaggery"	February 11, 2020	Department of Processing and Food Engineering, PAU and Department of Agriculture, Punjab
103	Hands-on-Training Workshop on "Assessment Methods for Soil Carbon and Greenhouse Gas Emissions in Agriculture"	February 12 to 19, 2020	Department of Soil Science, PAU under World Bank sponsored National Agricultural Higher Education Project-Centre of Advanced Agricultural Science and Technology (NAHEP-CAAST) project
104	Technology and Machinery Demonstration Mela	February 14, 2020	Department of Farm Machinery and Power Engineering, PAU under the aegis of ICAR, New Delhi
105	Dr Prashant Garg, Assistant Professor, Department of Civil Engineering, Guru Nanak Dev Engineering College, Ludhiana on "Geotechnical Analysis"	February 14, 2020	Department of Civil Engineering, PAU
106	Dr Anil Nanda, Professor, Department of Civil Engineering, Regional Institute of Management of Technology (RIMT) University, Mandi Gobindgarh, on "Importance of Sites in Agricultural Engineering"	February 17, 2020	Department of Civil Engineering, PAU
107	Dr Jagbir Singh, Professor, Department of Civil Engineering, Guru Nanak Dev Engineering College, Ludhiana on "Design of a Low Cost Reinforced Cement Concrete Building"	February 18, 2020	Department of Civil Engineering, PAU
108	"Bigdata Natural Language Processing"	February 19, 2020	Department of Electrical Engineering and Information Technology, PAU under ICAR scheme Scheduled Caste-Sub Plan (SC-SP)

109	“Network Science: Cyber and Infrastructure Security”	February 20, 2020	Department of Electrical Engineering and Information Technology, PAU under ICAR scheme Scheduled Caste-Sub Plan (SC-SP)
110	“Image Processing, Artificial Intelligence and its Applications in Engineering”	February 20, 2020	Department of Electrical Engineering and Information Technology, PAU under ICAR scheme Scheduled Caste-Sub Plan (SC-SP)
111	Mr Sarang, Revenue Patwari, District Complex, Moga on “Advance Land Measurement Techniques”	February 24, 2020	Department of Civil Engineering, PAU
112	Mr Anil Menon, Head (Marketing), CLAAS Agricultural Machinery Private Limited, Faridabad on “Potential of Entrepreneurship in Fodder Chain Management and Advances in Grain Combine Harvesters”	February 26 & 27, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
113	Second Workshop on “Food Supply Chains: Improvement and Innovation through Collaboration and Launch of Food-SCAN Food Supply Chain Advancement Network”	February 27-28, 2020	Centre for Global Business, Monash University, Australia, in collaboration with PAU, Ludhiana; Newton Bhabha Fund and Global Value Chain Research Network, University of Lincoln, UK under the aegis of Punjab Chapter of the Indian Society of Agricultural Engineers
114	Er Ranveer Singh Malhotra, Director, General Manager (Sales), Jain Irrigation System Limited, Chandigarh on “Career Planning in Micro Irrigation and Polyhouse Sector, and Challenges Associated with Micro Irrigation and Polyhouse Industry”	February 28, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
115	Workshop on “Positive Approaches to Discipline Young Children for Parents”	February 28, 2020	Department of Human Development and Family Studies, PAU
116	Dr Anil Nanda, Professor, Department of Civil Engineering, Regional Institute of Management of Technology (RIMT) University, Mandi Gobindgarh, on “Uses of Retaining Wall in Construction”	March 2, 2020	Department of Civil Engineering, PAU
117	Seminar on “Paddy Straw Management Issues in Intensive Agriculture”	March 3-4, 2020	Directorate of Research, Department of Soil Science, and Department of Farm Machinery and Power Engineering, PAU under the auspices of ICAR- NAHEP-CAAST-SNRM project
118	Mr Amol Deshpande, Manager (HR) by Mahindra and Mahindra, Mumbai on “Career Prospects in Tractor and Farm Machinery Industry”	March 4, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
119	Er Deepak Patil, Alumnus of the CoAE&T and IIM (Ahmedabad) and Motivational Trainer on Soft Skills, Mumbai on “Communication and Organizational Skills and Personality Development of Budding Agricultural Engineers”	March 6, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
120	Dr RK Setia, Scientist, Punjab Remote Sensing Centre, Ludhiana on “Role of Geographic Information System (GIS) in Agricultural Engineering”	March 9, 2020	Department of Civil Engineering, PAU
121	Er Pradeep Chaudhary, Former Vice President, Omaxe Autos, Gurgaon on “Product Development and Management, and Organizational Skills Needed at Corporate Sector”	March 13, 2020	Training and Placement Cell, and Alumni Association, College of Agricultural Engineering and Technology
122	Er Manmeet Kaur Panesar, Assistant Professor, Department of Civil Engineering, Guru Nanak Dev Engineering College, Ludhiana on “Building Materials”	March 13, 2020	Department of Civil Engineering, PAU
123	Workshop on “Gender Sensitization” to celebrate International Women’s Day	March 13, 2020	Department of Extension Education and Communication Management, PAU
124	Webinar on “Desert Locust: Current Situation and Future Perspectives”	May 31, 2020	PAU, Ludhiana



125	Webinar on “Desert Locust in Indian Context - Retrospects, Current Status and Threat Imminence”	June 6, 2020	PAU, Ludhiana
126	Online national training programme on “Drip Irrigation and Management”	June 15-23, 2020	Department of Soil Science, and Department of Soil and Water Engineering, PAU under ICAR-NAHEP-CAAST-SNRM project
127	Orientation course on “Effective Teaching, Research and Extension” for newly recruited faculty of PAU	July 9-19, 2020	Department of Extension Education and Communication Management, PAU
128	Webinar on ‘Cultivation of guava fruits’ at PAU, Ludhiana	August 26, 2020	PAU Ludhiana
129	Webinar on ‘Cultivation of pear fruits’ at PAU, Ludhiana	September 2, 2020	PAU Ludhiana
130	Celebration of Breast feeding week	September 7, 2020	Department of Food and Nutrition
131	Webinar on ‘Citrus Cultivation’ at PAU, Ludhiana	September 30, 2020	PAU Ludhiana
132	Webinar on “Importance of Workplace Ergonomics in Today’s Scenario”	December 2, 2020	Department of Family Resource Management
133	“27th Annual Conference of Agricultural Economics Research Association”	December 17-19, 2020	CoBSH, PAU, Ludhiana
134	Virtual Research and Extension specialists workshop for Horticultural crops- winter	January 7, 2021	Punjab Agricultural University, Ludhiana
135	Research & Extension Specialists’ workshop on Horticultural Crops	January 7, 2021	PAU Ludhiana
136	FoSTaC training programme on ‘Food Safety and Supervisor-Advance Manufacturing’ under the purview of FSSAI	January 30-31, 2021	Dept. of Food Science and Technology, PAU, Ludhiana
137	Celebration of International Women’s Day	March 8, 2021	Department of Food and Nutrition
138	Webinar on ‘Scope and prospects of cultivation of grapes’ by Dr Ajay Sharma, ICAR, NRC, Nagpur	March 22, 2021	PAU Ludhiana
139	Webinar on ‘Nutritional management in citrus fruits’ by Dr AK Srivastava, ICAR, CCRI, Nagpur	March 23, 2021	PAU Ludhiana
140	Webinar on ‘Advances and prospects of Mango Breeding’ by Dr Manish Srivastava, IARI, New Delhi	March 30, 2021	PAU Ludhiana
141	Celebration of ‘World Health day’ for Anganwadi workers	April 7, 2021	Department of Food and Nutrition
142	Virtual Workshop for Soil and Water Conservation	April 28, 2021	Punjab Agricultural University, Ludhiana
143	Workshop on “Use of Potato Wild Relatives in Pre-Breeding for New Genetic Variability” by	June 23-24, 2021	Dept Of Veg. Sc., Pau, And International Potato Center, Lima, Peru
144	Research & Extension Specialists’ workshop on Horticultural Crops	July 6, 2021	PAU Ludhiana
145	“Inculcating Agripreneurship Behaviour among the Youth”	July 7, 2021	Directorate of Extension Education, Ludhiana
146	“Process and Outcome Evaluation of Agricultural Development Programmes”	July 9, 2021	Directorate of Extension Education, Ludhiana
147	Webinar on “Process and Outcome Evaluation of Agricultural Development Programmes”	July 9, 2021	Directorate of Extension Education and Communication Centre and Department of Extension Education, PAU, Ludhiana
148	National level workshops on “Bridging the Yield Gaps to enhance Foodgrain Production”	July 18, 2021	Directorate of Extension Education, PAU
149	“Tips to Write Articles and Success Stories of Farmers in Magazines and Newspapers”	July 23, 2021	Directorate of Extension Education, Ludhiana
150	Webinar on Protective Textiles	July 24, 2021	Department of Apparel and Textile science
151	Online Workshop on Integrating research and extension for KVK Scientists	July 29-30, 2021	Department of Extension Education and Communication Management

152	Online workshop on “Integrating Research and Extension” for KVK scientists	July 29-30, 2021	Department of Extension Education and Communication Management, PAU
153	Celebration of Breastfeeding Week at village Issewal Lecture-cum-Demonstration on “Nutritious Foods for Pregnant and Lactating Women”	August 5, 2021	Department of Food and Nutrition, PAU
154	Competition in “Millet Based Recipes”	August 7, 2021	Department of Food and Nutrition, PAU
155	“Role of Diet and Life Skills to Promote Organizational Efficiency”	August 8, 2021	Directorate of Extension Education, Ludhiana
156	“Programme Planning and Evaluation”	August 13, 2021	Directorate of Extension Education, Ludhiana
157	Five-day interactive training session in various villages of Malwa, Doaba and Majha region of Punjab under the project entitled “Socio-Emotional Empowerment of Adolescent of SC Adolescent Girls”	August 26 to September 22, 2021	College of Community Science, PAU
158	“Rural Tourism-Promotional Steps” by Dr Philip H, Former Director of Extension Education, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu	August 27, 2021	Directorate of Extension Education, Ludhiana
159	National webinar on “Post-harvest Technologies Utilization and Value Addition to Mustard Processing by Products”	August 27, 2021	ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET) and PAU, Ludhiana
160	Celebration of National Nutrition Month by holding an online panel discussion on “Personalize Your Plate”	September 3, 2021	College of Community Science, PAU
161	“Strategies for Entrepreneurship Development”	September 3, 2021	Directorate of Extension Education, Ludhiana
162	Integrated Pest Management of Wheat Insect-Pests training on “Good Agricultural Practices in Wheat”	September 15, 2021	School of Organic Farming, PAU
163	Training programme on “Varietal Development, Identification, Crop Production and Protection Technologies in Sugarcane for Higher Cane and Sugar Yield”	August 17, 2021	RRS, Kapurthala under the aegis of Sugarfed, Punjab
164	Celebration of World Heart Day by organizing a skit and recipe demonstration for the prevention and dietary management of CVD	September 30, 2021	College of Community Science, PAU
165	Training programme on “Crop Residue Management to control Crop Residue Burning” for KVKs/Allied Departments/NGOs/Extension Functionaries at field level	October 5, 2021	PAU, Ludhiana
166	Training course on “Entrepreneurship Development in Food Processing for Livelihood” for SC/ST under SCSP-7	October 8, 2021	Department of Processing and Food Engineering, PAU
167	National webinar on “Crop Residue Management”	October 8, 2021	PAU, Ludhiana in collaboration with ICAR-ATARI, Zone I, Ludhiana
168	Celebration of World Food Day by organizing exhibition and skit at the village Gagra, Ludhiana	October 14, 2021	College of Community Science, PAU
169	“Virtual PAU Food Industry and Craft Mela”	October 29, 2021	Department of Processing and Food Engineering, PAU
170	Online orientation for the newly admitted students	November 11, 2021	Department of Microbiology, PAU
171	Orientation course on “Teaching, Research and Extension” for the newly recruited faculty of PAU	November 23 to December 3, 2021	College of Community Science, PAU
172	Training programme on “Biocontrol of Insect-Pests”	November 30, 2021	Department of Entomology, PAU on “Training and Capacity Building through online/virtual mode under the scheme – Strengthening and Development of Higher Agricultural Education in India, ICAR-1”



173	Training programmes on “Varietal Identification, Planting and Spraying Techniques for the Management of Insect-Pests and Diseases”	December 22, 2021	RRS, Kapurthala under the auspices of the Department of Agriculture and Farmers’ Welfare, Taran Tarn and Amritsar
174	Training programmes on “Testing the Sugarcane Crop Maturity by using Portable Instruments to decide the Crop Harvesting for Quality Jaggery Production”	December 28, 2021	RRS, Kapurthala under the auspices of the Department of Agriculture and Farmers’ Welfare, Taran Tarn and Amritsar
175	Capacity building training courses on “Icing of Cakes”	January 1, 2022	Department of Food and Nutrition, PAU
176	FOSTAC “Food Safety and Supervisor Training”	January 4, 2022	Department of Food Science and Technology, PAU
177	Training programme on “Role of Intercropping in Sugarcane for Sustainable Cane Yield and Farm Income”	January 6, 2022	RRS, Kapurthala with the cooperation of the group of farmers from Nawanshaher; Sidhwan Dona of district, Kapurthala and Cooperative Sugar Mills, Bhogpur Mill Area
178	Training programme on “Judicious Use of Farm Inputs in Sugarcane for Production of Quality Jaggery”	January 17 and 20, 2022	RRS, Kapurthala with the cooperation of the group of farmers from Nawanshaher; Sidhwan Dona of district, Kapurthala and Cooperative Sugar Mills, Bhogpur Mill Area
179	Tutorial lectures for cracking NET exams , and	January 19-20, 2022	Department of Microbiology, PAU
180	Practical training in “Raising Healthy Sugarcane Crop by Using Biocontrol Agents for Jaggery”	January 24, 2022	RRS, Kapurthala and Bhagwanpura Sugar Mills Limited, Dhuri
181	Training course on “Integrated Approach for Management of Weeds, Insects-Pests in Sugarcane to Minimize the Pesticide Load on Soil”	January 27, 2022	RRS, Kapurthala under the aegis of The Cooperative Sugar Mills, Nako-dar
182	Training programme on “Integrated Approach for Management of Seed and Soil Born Disease and Insect-Pests in Sugarcane”	February 1, 2022	RRS, Kapurthala and facilitated by Golden Sandhar Sugar Limited, Phagwara
183	Entrepreneurship Development Programme for SC beneficiaries	February 3, 2022	Department of Food Science and Technology, PAU
184	Training course on “Important Tips for Safe Sugarcane Juice Processing to Make the Sugarcane Crop More Remunerative”	February 4, 2022	RRS, Kapurthala under the auspices of The Cooperative Sugar Mill, Ajnala
185	FOSTAC “Food Safety and Supervisor Training”	February 5, 2022	Department of Food Science and Technology, PAU
186	“Biochar Production: Scenario, Scope and Technologies;” “Binder Less Briquetting: Scope and Practical Experience in Relation to Crop Residues” and “Biochar from Agro-waste: Production and Application”	February 7, 2022)	Department of Renewable Energy Engineering, PAU
187	Capacity building training in “Generating Income through Bakery” for SC cluster – village Boparai	February 7-11, 2022	College of Community Science, PAU
188	Training course on “Improved Production and Protection Techniques of Raising Spring Sugarcane”	February 8 and 17, 2022	RRS, Kapurthala with the support of Indian Sucrose Limited, Mukerian and Nahar Sugar Mills Limited, Amloh
189	Agricultural workshop for farmers; supported by Petroleum Conservation Research Association, Ministry of Petroleum and Natural Gas, Government of India (9 workshops)	February 10 and 17; March 9, 16, 17, 22, 24 and 25; and June 17, 2022	PAU’s Department of Renewable Energy Engineering; Department of Processing and Food Engineering; Krishi Vigyan Kendras, Bahawal (Hoshiarpur), Rauni (Patiala) and Pathankot; village Nihal Singh Wala (Moga); and Training Institute, Soil Conservation Complex, Department of Soil Conservation, Mohali
190	FOSTAC “Food Safety and Supervisor Training”	February 11, 2022	Department of Food Science and Technology, PAU

191	Recent Advances in Synthesis and Characterization of High Value Organic Carbon from Agricultural Sources	February 11, 2022	Department of Renewable Energy Engineering, PAU
192	“Energy Conservation for Sustainable Living”	February 14, 2022	Department of Renewable Energy Engineering, PAU
193	“Fundamentals of Anaerobic Digestion Process and Basic Requirements”	February 17, 2022	Department of Renewable Energy Engineering, PAU
194	“Liquid Biofuels: Present Status, Future Prospects and Challenges Ahead”	February 18, 2022	Department of Renewable Energy Engineering, PAU
195	Practical training in “Varietal Identification, Planting and Spraying Techniques, Safe Juice Extraction and Processing”	February 21, 2022	RRS, Kapurthala and AB Sugar Limited, Dasuya
196	“Volarization of Agro-Industrial Waste for Value Addition”	February 22, 2022	Department of Renewable Energy Engineering, PAU
197	“Migration a Long Way to go: Trends and Challenges”	February 22, 2022	Department of Agricultural Economics and Sociology, PAU
198	“Understanding the Quality of Biogas-Basic Calculations”	February 23, 2022	Department of Renewable Energy Engineering, PAU
199	“Organic Decomposition for Energy Generation and Manure Production”	February 24, 2022	Department of Renewable Energy Engineering, PAU
200	Webinars on “Communication and Problem Solving;” and “Cognitive and Emotional Empathy” for students	February 24, 2022	Department of Human Development and Family Studies, PAU
201	Training programme on “Techniques of Planting Sugarcane at Wider Rows for Intercropping and Mechanical Harvesting”	February 24, 2022	RRS, Kapurthala under the aegis of The Cooperative Sugar Mills, Budhewal
202	“Solar Value Chain and Latest Industry Development”	February 25, 2022	Department of Renewable Energy Engineering, PAU
203	One-day training programme on “Safe Processing of Sugarcane Juice into Jaggery”	February 28, 2022	Department of Processing and Food Engineering, PAU
204	Online training programme on “Livelihood Upliftment for Setting up of Farm Creche” and awareness programme on “Government Schemes and Policies for the Upliftment of SCs of Punjab State”	February 9 to 14, 2022	Department of Human Development and Family Studies, PAU
205	Training course on “Safe and Judicious Use of Pesticides”	March 2, 2022	Department of Entomology, PAU at RRS, Kapurthala
206	Training course on “Entrepreneurship Development in Food Processing for Livelihood” for SC/ST under SCSP-7	March 3, 2022	Department of Processing and Food Engineering, PAU
207	“Healthy Salads, Sandwiches and Smoothies”	March 3, 2022	Department of Food and Nutrition, PAU
208	Training programme on “Varietal Identification, Planting and Spraying Techniques for Management of Insect-Pests and Diseases”	March 3, 2022	Department of Agriculture and Farmers’ Welfare, Jalandhar at RRS, Kapurthala
209	Entrepreneurship Development Programme for SC beneficiaries	March 4, 2022	Department of Food Science and Technology, PAU
210	One-day training programme on “Safe Processing of Sugarcane Juice into Jaggery”	March 4, 2022	Department of Processing and Food Engineering, PAU
211	Five-day training session on “Cognitive Behavioural Therapy (CBT)” for undergraduate and postgraduate students	March 7-11, 2022	Department of Human Development and Family Studies, PAU
212	National level workshops on “Management of Paddy Straw in North-Western India”	March 7, 2022	
213	Tutorial lectures for cracking NET exams	March 8 to 25, 2022	Department of Microbiology, PAU
214	Celebration of International Women’s Day by holding an online talk on “Health Behaviours for Wellbeing” and a panel discussion on “Planning Diets for Specific Health Issues”	March 8, 2022	College of Community Science, PAU
215	Training course on “Entrepreneurship Development in Food Processing for Livelihood” for SC/ST under SCSP-7	March 9, 2022	Department of Processing and Food Engineering, PAU



216	“Punjab Economy-Grand Challenges and Opportunities”	March 9, 2022	Department of Agricultural Economics and Sociology, PAU
217	“Ikigai: A Japanese Approach Towards Meaningful Life”	March 11, 2022	Department of Agricultural Economics and Sociology, PAU
218	One-day training programme on “Safe Processing of Sugarcane Juice into Jaggery”	March 14, 2022	Department of Processing and Food Engineering, PAU
219	Conduct of guest/expert lecture session for the beneficiary of undergraduate students	March 14 to 31, 2022	Training Unit and Placement Cell, and all Departments of the College of Agricultural Engineering and Technology
220	Training course (7) on “Entrepreneurship Development in Food Processing for Livelihood” for SC/ST under SCSP-7	March 16 to 31, 2022	Department of Processing and Food Engineering, PAU
221	First Annual Conference on “Indian Society for Agricultural Development and Policy (ISADP)”	March 21 - 22, 2022	Department of Agricultural Economics and Sociology, PAU
222	Training course on “Climate Smart Soil Test-Based Fertilization in Sugarcane”	March 29, 2022	RRS, Kapurthala with the cooperation of National Fertilizer Limited
223	“Changing Scenario of Agriculture”	March 30, 2022	Department of Agricultural Economics and Sociology, PAU
224	Two-day certified course of Internal Auditor (Food Safety and Management Systems) for SC beneficiaries under ICAR scheme	March 31, 2022	Department of Food Science and Technology, PAU
225	Webinar on “Driving Sustainability in Apparel and Textile Industry”	April 7, 2022	College of Community Science, PAU
226	Celebration of World Health Day by organizing a lecture on “Nutritional Anemia and Food Factors” and a programme in collaboration with Special Olympics Bharat (a national organization working for intellectually disabled persons) for the special olympics healthy athletes at PAU, Ludhiana and Guru Nanak Public School, Sarabha Nagar, Ludhiana, respectively	April 7, 2022	College of Community Science, PAU
227	Training programme on “Integrated Approach for Management of Weeds and Insect-Pests Diseases in Sugarcane”	April 7, 2022	RRS, Kapurthala at the Cooperative Sugar Mills, Fazilka
228	“Demonstration Method: Teaching a Skill through Experiential Learning Method” by Dr Seema Tyagi, Assistant Professor, Home Science Extension and Communication Management, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan	April 11, 2022	Department of Extension Education and Communication Management, PAU
229	Tutorial lectures for cracking NET exams	April 12 to May 2, 2022	Department of Microbiology, PAU
230	“Project Management Techniques” by Dr Seema Rani, Professor, CCS Haryana Agricultural University, Hisar, Haryana	April 22, 2022	Department of Extension Education and Communication Management, PAU
231	“Motivation Development among College Students” by Ms Anu K Manhotra, Leadership Coach and Trainer, Chandigarh	May 3, 2022	Department of Extension Education and Communication Management, PAU
232	Workshop on “Genome Editing in Agriculture: Science, Potential and Policies”	May 11, 2022	PAU, Ludhiana; Biotech Consortium India Limited (BCIL), New Delhi and National Agri- Food Biotechnology Institute (NABI), Mohali
233	Hands-on-training programme on “Application of Advanced Analytical Instruments in Agriculture (Workshop on Analytical Methods)”	May 17-24, 2022	Department of Food Science and Technology, PAU in association with Sophisticated Analytical Instrumentation Laboratory (SAIF), Panjab University, Chandigarh
234	Celebration of World Food Safety Day by organizing an exhibition and lecture on the “Importance of Tiffin Boxes in Context to Food Safety and Wholesomeness” counselling to food outlet owners and workers and consumers	May 30, 2022	College of Community Science, PAU

235	World Environment Day	June 9, 2022	College of Agriculture, PAU under National Agricultural Higher Education Project (NAHEP) - ICAR - Centre of Advanced Agricultural Science and Technology (CAAST) - Sustainable Natural Resource Management (SNRM)
236	Celebration of World Environment Day in collaboration with Punjab Pollution Control Board	June 10, 2022	Department of Family Resource Management, PAU
237	14th Indo-Japanese Dialogue on "Prospects of the Socio-economic Development in the Post-COVID India"	June 18, 2022	Department of Agricultural Economics and Sociology, PAU
238	Farmer awareness camp on "Efficient and Balanced Use of Fertilizer"	June 21, 2022	ICAR - All Indian Coordinated Research Project (AICRP) - Long Term Fertilizer Experiments (LTFE), PAU
239	Training-cum-awareness workshop on "Prime Minister Formalization of Micro Food Processing Enterprises Scheme"	June 28, 2022	Department of Processing and Food Engineering, PAU and Punjab Agro Industries Corporation, Chandigarh
240	Workshop on "Contemporary Challenges of Research and Extension in Human Development and Family Studies"	July 04, 2022	Department of Human Development & Family Studies, PAU, Ludhiana
241	Workshop on "Presentation for NICRA Action Plan"	July 13, 2022	Directorate of Extension Education, PAU, Ludhiana
242	Effective Communication Skills for Transfer of Technology	July 14, 2022	PAU, Ludhiana
243	Training on IPM of fruit-piercing moths in Citrus" at FRS Gangian, district Hoshiarpur	August 3, 2022	PAU Ludhiana
244	Webinar on "How to be more effective in life"	August 16, 2022	Online
245	Symposium on "Transforming the Green Revolution Hub of India: Innovations in Crop Breeding, Resource Management and Policy"	August 17-18, 2022	PAU, Ludhiana
246	Dr D S Brar Memorial Symposium	August 17, 2022)	PAU, Ludhiana
247	Workshop on "Preparedness for Crop Residue Management"	August 18, 2022	ATARI Zone-I, Ludhiana
248	Stakeholders Dialogue on "Mitigating the Severity of Heat Wave"	August 18, 2022	ATARI, PAU, Ludhiana
249	Research & Extension Specialists' Workshop for Rabi Crops	August 23-24, 2022	PAU, Ludhiana
250	Orientation Course on "Effective Teaching, Training and Extension"	August 23 to September 02, 2022	Dept of Extension Education and Communication Management, College of Community Science, PAU Ludhiana
251	Slogan Writing Competition on "Sanitation and Hygiene"	August 25, 2022	Department of Microbiology, PAU, Ludhiana
252	Workshop on "Food Supply Chains"	August 31, 2022	PAU, Ludhiana
253	Meeting of AICRP on ESA regarding new projects proposed	September 16, 2022	PAU, Ludhiana
254	Awareness programme on 'Fast food eating ill practice'	September 16, 2022	Department of Human Development and Family Studies, PAU, Ludhiana
255	Online Collaborative Training Programme on "Mainstreaming Gender Concerns in Agriculture & Allied Sector"	September 20-22, 2022	PAU, Ludhiana & MANAGE, Hyderabad
256	Training under the project "Socio-emotional Empowerment of SC Adolescent Girls"	September 29-October 18, 2022	Department of Human Development & Family Studies, PAU, & sponsored by RKVY (Rashtriya Krishi Vikas Yojana)



257	"Present Status, Challenges and Prospects of Small Ruminants Pastoralist"	October 08-09, 2022	ICAR-ATARI, Zone-1, PAU, Ludhiana in collaboration with Central Sheep and Wool Research Institute (CS-WRI), Avikanagar
258	PAU Food Industry and Craft Mela 2022	October 11, 2022	PAU Ludhiana
259	Online Workshop on Improving Research Writing using Grammarly	November 11, 2022	PAU, Ludhiana
260	"Entrepreneurship Development in Food processing for Livelihood" for SC/ST under SCSP	November 11, 2022	Department of Processing and Food Engineering, PAU, Ludhiana.
261	"End-user Training of Grammarly Tool"	November 11, 2022	MSR Library, PAU, Ludhiana
262	Grammarly Training	November 11, 2022	PAU, Ludhiana
263	Online Workshop on "Improving Research Writing using Grammarly"	November 11, 2022	PAU Ludhiana/ Online
264	Training-cum-Workshop on "How to make Posters and write Research Papers"	November 13, 2022	Society of Krishi Vigyan PAU, Ludhiana
265	Training Course (9) on "Entrepreneurship Development in Food Processing for Livelihood for SC/ST under SCSP Training"	November 30 to January 17, 2022	Department of Processing and Food Engineering, PAU, Ludhiana. (AICRP on PHET)
266	CAFT Programme "Soil and Water Management for Sustaining Intensive Agriculture"	December 1-21 2022	ICAR
267	Kisan Samman Samelan	December 02, 2022	PAU, Ludhiana
268	Chrysanthemum Show (Exhibition-cum-Competition)	December 06-07, 2022	Department of Floriculture & Landscaping, PAU, Ludhiana
269	Kisan Saarthi Workshop	every Friday	ATARI, PAU, Ludhiana
270	Workshop on "Biofuels from Lignocellulosic Waste"	January 11, 2023	Department of Microbiology, PAU, Ludhiana
271	Workshop on State level Training and Planning	January 17, 2023	PAU, Ludhiana
272	Research and Extension Specialist Workshop on "Horticultural Crops"	January 19-20, 2023	DEE, PAU, Ludhiana
273	Horticulture Workshop	January 19-20, 2023	PAU, Ludhiana
274	Research and Extension Specialists Workshop for Horticultural Crops (Winter)	January 20-21, 2023	PAU, Ludhiana
275	State Level Training Planning Workshop	January 27, 2023	PAU, Ludhiana
276	First Kisan Sarkar-Milni,	February 12, 2023	PAU, Ludhiana
277	Fifth Workshop on "Food Supply Chain Advancement Network"	February 14, 2023	PAU and Monash University, Australia
278	Workshop on "Food Supply Chain"	February 14, 2023	PAU, Ludhiana
279	State Level Action Plan Workshop	February 24, 2023	PAU, Ludhiana
280	Zonal Workshop on "Annual Action Plan of KVVs"	February 24, 2023	ATARI, PAU, Ludhiana
281	Dr MS Randhawa Diamond Jubilee Annual Flower Show	March 01-02, 2023	Department of Floriculture & Landscaping, PAU, Ludhiana
282	Tutorial classes for SC students on "Entrepreneurship development through on farm processing of Horticultural produce"	March 16, 2023	PAU Ludhiana
283	FOSTAC Training (Food Safety and Supervisor & Basic Manufacturing)	March 18, 2023	FSSAI
284	GBS Data Analysis, Linkage Map Construction and QTL Analysis	March 19-28, 2023	PAU, Ludhiana in collaboration with Washington State University, Pullman, USA funded by BIRAC, New Delhi
285	Tutorial classes for SC students on "Health immunity and sanitization"	March 20, 2023	PAU Ludhiana
286	Workshop on "Web Designing"	March 20-21, 2023	EECM, PAU, Ludhiana

287	Tutorial classes for SC students on “Postharvest management of horticultural crops”	March 21, 2023	PAU Ludhiana
288	Lecture on “Significance of Photosynthetic Pigments in Crop Production”	March 22, 2023	Under ICAR scheme “Strengthening and Development of Higher Agricultural Education in India for SC students”
289	Lectures under SC cluster programme on “Proteomic approaches for identification of differentially expressed Proteins”	March 27, 2023	Department of Biochemistry, PAU, Ludhiana
290	Workshop on “Photography and Video Production”	March 27-28, 2023	EECM , PAU, Ludhiana
291	Training on “Quality Assurance in Seed Production and Grading”	March 27, 2023	Director Seed PAU, Ludhiana
292	Two day Training to Schedule Caste students “Propagation of fruit plants” (25 participants) by PAU Ludhiana/ICAR	March 30 & 31, 2023	PAU Ludhiana
293	Training to SC students on “Propagation of Fruit Plants”	March 30-31, 2023	PAU Ludhiana/ICAR
294	World Health Day	April 06, 2023	Department of Food and Nutrition, PAU, Ludhiana
295	Training on “Cultivation of Rainy Season Vegetables”	April 09, 2023	PAU Ludhiana
296	Industry- Academia Interaction Workshop	April 12, 2023	Department of Food Science and Technology, PAU, Ludhiana
297	Capacity Building Training Programme for Extension Scientists	April 21, 2023	Directorate of Extension Education, PAU, Ludhiana
298	World Earth Day	April 24, 2023	Department of Soil and Water Engineering and Sponsored by PPCB, Punjab
299	Workshop on “Nutrition Entrepreneurship and Motivational Counseling”	April 24, 2023	COAET, PAU, Ludhiana
300	Field Day on ‘Nutrient Management in Citrus’ organized at Regional Research Station, Abohar/ Department of Fruit Science, ICAR- AICRP on Fruits	April 25, 2023	PAU Ludhiana
301	Career Guidance lecture for UG students	April 25, 2023	Department of Human Development & Family Studies in collaboration with PANACEA BHARTI institute
302	Maatr Bhasha Divas	April 28, 2023	Department of Agricultural Journalism, Languages & Culture, PAU, Ludhiana
303	Programme Planning Workshop for Extension Scientists working under FASC	April 28, 2023	PAU, Ludhiana
304	Workshop on “Dissemination of Importance and Use of Millets in Daily Diet”	May 05, 2023	Department of Food and Nutrition
305	Workshop on “Dissemination of Knowledge on Importance and Use of Millets in Daily Diet”	May 05, 2023	PAU, Ludhiana
306	“Entrepreneurship Development in Food processing for Livelihood” for SC/ST under SCSP	May 11, 2023	Department of Processing and Food Engineering, PAU, Ludhiana.
307	Second Kisan Milni	May 11, 2023	PAU, Ludhiana
308	Brain Storming Meeting: Enhancing Production and Value Addition of Millets	May 16, 2023	Forage, Millets and Nutrition Section, PAU, Ludhiana
309	International Biodiversity Day	May 22, 2023	Punjab Biodiversity Board
310	Training of the field staff working in the Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in Punjab.	May 24, 2023	Department of Economics and Sociology, Punjab Agricultural University, Ludhiana
311	Field Day on “Nutrient Management in Citrus”	May 25, 2023	Regional Research Station, Abohar/ Department of Fruit Science, ICAR- AICRP on Fruits
312	“Entrepreneurship Development in Food processing for Livelihood” for SC/ST under SCSP	June 01, 2023	Department of Processing and Food Engineering, PAU, Ludhiana.



313	Workshop on “Effective Communication Skills”	June 02, 2023	EECM , PAU, Ludhiana
314	Three-days training workshop on “Cognitive Therapies and its Integration with Mindfulness”	June 05-07, 2023	Department of Human Development and Family Studies, PAU, Ludhiana
315	World Environment Day	June 5, 2023	College of Horticulture & Forestry
316	Lecture on “Primarily findings of Akash Project on Paddy Stubble Management”	June 07, 2023	Under the Programme of Azadi ka Amrit Mahotsav
317	World Food Safety Day- ‘Safe Food and Healthy Diets - A Way Forward to Tandrusat Punjab”	June 07, 2023	Department of Food and Nutrition, PAU, Ludhiana, in collaboration with Food and Drug Administration (FDA), Department of Health and Family Welfare, Punjab
318	Guest lecture on ‘State violence and culture: Implications for future generations of Punjab’	June 8, 2023	SAASCA, PAU Ludhiana
319	Workshop on Paddy Straw Management and Action Plans	June 9, 2023	Ministry of Agriculture and Farmers’ Welfare, Government of India and state of Punjab
320	International Year of Millets-2023	June 09, 2023	Department of Food and Nutrition, PAU, Ludhiana
321	Inter-College Cooking Competition on Healthy Millet Recipes	June 09, 2023	Department of Food and Nutrition, PAU, Ludhiana
322	National Workshop on CRM	June 09, 2023	PAU, Ludhiana
323	Workshop on “Paddy Straw Management Strategies”	June 09, 2023	PAU Ludhiana
324	Guest lecture on ‘Political economy of economic development in India’	June 16, 2023	Under the Programme of Azadi ka Amrit Mahotsav
325	International Yoga Day	June 20, 2023	College of Community Science
326	Inter-class Quiz Competition on the theme ‘Inspiring Health and Well being: Environment, Food Safety & Yoga	June 21, 2023	Department of Food Science and Technology, PAU, Ludhiana
327	Workshop on “Contemporary Challenges of Research & Extension in HD & FS”	July 04, 2023	College of Community Science, PAU, Ludhiana
328	Orientation course on “Teaching, Research and Extension” for newly recruited faculty of PAU	August 23-September 02, 2023	PAU, Ludhiana

Annexure VII

LIST OF COMPETITIVE RESEARCH PROJECTS SANCTIONED DURING 2018-19 TO 2022-23

Sr. No.	Name of the project	Year of start	Funding agency	Sanctioned Amount (Rs.)
1	Whole genome sequence based SSR marker development and their utilization in mapping of bitterguard yellow mosaic virus resistance in bittergourd (<i>Momardica charanta</i> .L)	2018-19	DBT, New Delhi	55,00,000
2	Pyramiding of rust resistance genes into high grain quality wheat lines developed through marker assisted selection.	2018-19	DBT, New Delhi	60,01,200
3	Mutation assisted breeding for clove size & disease resistance in garlic (<i>Allium Sativum</i> L.).	2018-19	SERB New Delhi	29,79,240
4	Population of fold scope for pest diagnostic in Punjab.	2018-19	DBT, New Delhi	8,00,000
5	Identification & characterization of different pathotypes of yellow rust pathogen (<i>Puccinia Stril Formis</i> with Fold-scope.	2018-19	DBT, New Delhi	8,00,000
6	Participation in searches for new physics at the Belle II experiments.	2018-19	SERB, New Delhi	20,11,020
7	Identification of donors and QTLs for sheath blight resistance in collection of <i>Oryza nivara</i> (Sharma & Shastry) accessions.	2018-19	SERB, New Delhi	31,33,020
8	DST-ICRISAT Centre of Excellence on climate change research for plant protection (COE-CCRPP): Pest X Disease management for climate change adaption.	2018-19	ICRISAT, Hyderabad	16,42,300
9	Improving RNAi efficiency in songe lepidopteron insects through nanoparticles based as RNA delivery system.	2018-19	DST, New Delhi	24,98,000
10	Mapping and transfer of higher grain length and multiple rust resistance from <i>T. discocoides</i> to cultivated wheat.	2018-19	DST, New Delhi	19,24,500
11	Genome assisted mapping & introgression of root knot nematode resistance gene(s) from African Rice Species <i>Oryza glaberrima</i> to the Asian Rice <i>O. Sativa</i> .	2018-19	SERB, New Delhi	32,15,520
12	Whole genome and transcriptome sequence based SSR and SNP markers development in guava (<i>Psidium guajava</i> L.) for linkage mapping and trait association	2018-19	DBT, New Delhi	1,26,60,800
13	Molecular mapping of transfer of yellow mosaic virus resistance on Okra (<i>Abelmoschus esculentus</i> L.) moench	2018-19	DBT, New Delhi	58,95,000
14	Development of a haploid inducer stock through CRISPR/Cas 9 reibonucleoprotein complex mediated knock out of <i>ZmPLA1</i> gene and its orthogene in maize and rice.	2018-19	DBT, New Delhi	63,80,520
15	Development of indigenous tractor mounted spraying machine.	2018-19	CSIR, CMERI, Ludhiana	21,94,000
16	Refinement and multi location feasibility studies on straw management systems for combine harvester to evenly spread loose residue.	2018-19	CSIR, CMERI, Ludhiana	35.25,000
17	Design and development of variable rate fertilizer applicator.	2018-19	CSIR, CMERI, Ludhiana	33,94,000
18	Combining 'OMICS' & physiological studies to quantitative divergence b/w two predominant cryptic spices of cotton whitefly, <i>bemisia tabaci</i> in India.	2018-19	DST, New Delhi	20,50,000



19	Genetic Enhancement of minor pulses characterization, evaluation, genetics, enhancement & generation of genomic resources for accelerated utilization and improvement of minor pulses.	2018-19	DBT New Delhi	1,12,46,400
20	Transformation India's Green Revolution by Research & Empowerment for sustainable food supplies (TIGR2ESS).	2018-19	University of Cambridge, U.K.	5,53,89,000
21	Functional and pharmacological characterization of ecdysis triggering hormone and its receptor for developing new generation insecticides against whitefly, Bemisia tabaci",	2018-19	SERB, New Delhi	42,95,200
22	Establishment of Biotech-KISAN Hub at Punjab Agricultural University, Ludhiana	2018-19	DBT, New Delhi	98,00,000
23	Reimbursement of travel grant to Ms. Mridula Gupta, RRS Faridkot for attending 3 rd international whitefly symposium-2018, putting farmer first Australia	2018-19	SERB, DST, New Delhi	66,213
24	Revealing the genetic secrets of Aegilops tauschii genome to shape future cereal crops	2019-20	DBT, New Delhi	46,41,440
25	Mapping of genes for efficient Chickpea-rhizobia symbiosis using inter-specific population of Cicer	2019-20	DBT, New Delhi	31,52,040
26	High resolution QTL mapping for iron (Fe), zinc (Zn), grain protein and phytate content and their introgression in high yielding wheat cultivars	2019-20	DBT, New Delhi	79,26,720
27	Molecular cloning and characterization of Xa38 loci conferring resistance to bacterial blight(BB) disease in rice and identification of novel and superior alleles	2019-20	DBT New Delhi	87,14,320
28	Use of CMS lines developed with PCR markers for hybrids development in onion (Allium cepa L)"	2019-20	DBT New Delhi	21,59,040
29	Genetic dissection of productivity traits and disease resistance in wild emmer wheat T. dicoccoides-T. durum nested association mapping population	2019-20	DST New Delhi	35,21,800
30	Development of low lignin mutants of sugarcane through mutagenesis and genome editing approach	2019-20	CSIR, New Delhi	35,24,000
31	Pyramiding of gene contributing to the resistance to Brown Plant Hopper (Biotype 4) in rice"	2019-20	DBT New Delhi	47,99,064
32	Marker assisted introgression of genetic male sterility ms-1 gene in elite muskmelon genotype	2019-20	DBT New Delhi	52,51,104
33	Mitochondrial genome assembly, analysis and development of molecular markers for cytoplasmic male sterility (CMS) gene in tropical onion	2019-20	SERB New Delhi	29,40,344
34	Multiplex genome editing for transitional research aiming at designing novel resistance against bacterial blight in rice	2019-20	Indo-US Science & Technology Forum (IUSTF), New Delhi	14,20,000
35	Genetics and physiological architecture of weed competitive ability in Iranian Wheat landraces	2019-20	SERB, New Delhi	21,26,344
36	Expansion of activities of biotech Kisan hub in two aspirational district (Moga & Ferozepur) of Punjab and one aspirational district (Chamaba) of Himachal Pardesh	2019-20	DBT New Delhi	1,44,00,000
37	Mapping of phytophthora resistance in intergeneric rootstock population and development of improved rootstock in citrus	2019-20	DBT New Delhi	89,18,624

38	From QTLs/genes to direct seeded rice varietal development to meet future challenges	2019-20	DBT New Delhi	37,19,840
39	Development of hygienic honey bee (<i>Apis mellifera</i> Linneus) lines through selective bee breeding programme	2019-20	SERB New Delhi	28,10,240
40	Introgression breeding for transfer of aphid (<i>Rhopalosiphum padi</i> L.) resistance from <i>aegilops tauschii</i> , the D genome donor of wheat	2019-20	DBT New Delhi	63,58,136
41	Fine mapping, cloning and validation of brown plant hopper resistance introgressed from <i>oryza nivara</i> into <i>O. Sativa</i> L	2019-20	(SERB), New Delhi	48,07,264
42	New varieties of direct seeded rice for farmers in lower middle income countries	2019-20	Research & Innovation fund, (United Kingdom)	131,37,300
43	Germplasm Characterization & Trait Discovery in wheat using Genomics Approaches & its integration for improving climate Resilience, Productivity & Nutritional quality	2019-20	DBT, New Delhi	170,93,320
44	Optimizing Cereal Productivity under RCP Projected climate scenarios by mid & end of 21 st century in Punjab	2019-20	SERB, New Delhi	23,20,714
45	Exploiting Genetic Diversity for improvement of safflower through Genomics assisted Discovery of QTLs/ Gens Associated with Agronomic Traits under Mission Programme of Minor Oilseeds of Indian origin	2019-20	DBT, New Delhi	174,12,400
46	Main streaming sesame Germplasm for Productivity enhancement & sustainability through genomics assisted core development & trait discovery under Mission Programme of Minor oilseeds of Indian origin	2019-20	DBT, New Delhi	123,35,400
47	Main streaming rice landraces diversity in varietal development through genomic Predictions: A model for large scale utilization of gene bank collection of rice	2020-21	DBT, New Delhi	93,63,400
48	Pyramiding genes for resistance to yellow mosaic disease & null kunitz trypsin inhibitor in two most popular Soybean varieties through MAS	2020-21	DBT New Delhi	11,93,040
49	Genomics improvement of biotech & abiotic stress tolerance in mustard rape for economics & environment sustainability.	2020-21	DBT New Delhi	65,21,200
50	Conservation, improvement, management and promotion of sandalwood (<i>Santalum album</i> Lin.), cultivation in India	2020-21	Indian Council of Forestry Research and Education (ICFRE), Dehradun	35,29,900
51	Towards the development of Monitoring and forewarning system for late blight disease of potato by integrating Epidemiological, Proximal and remotely sensed data	2020-21	SERB New Delhi	19,34,946
52	Characterization of Chickpea Germplasm Resource to Accelerate Genomics-assisted Crop Improvement	2020-21	DBT New Delhi	1,88,10,480
53	Marker assisted stacking of genes associated with seed quality and aphid resistance in high yielding mustard cultivars	2020-21	SERB New Delhi	29,92,264
54	Use of big data Analytics for adapting impact of climate change on water Resources.	2020-21	DST New Delhi	9,10,000
55	Mining the genetic diversity for rust resistance in wild wheat <i>Aegilops tauschii</i> through combination of AgRenSeq and Genome wide Association Mapping.	2020-21	DST New Delhi	9,10,000



56	High resolution mapping and development of root knot nematode resistant root stocks in peach.	2020-21	SERB New Delhi	36,09,760
57	Introgression and mapping of bruchid resistance from rice bean (<i>vigna unbellata</i>) to mungbean (<i>v.radiata</i>)	2020-21	SERB New Delhi	28,30,344
58	Molecular mapping & transfer of parthenocarpy trait in desi cucumber	2021-22	SERB New Delhi	29,86,764
59	Valorization & dissemination of galgal (<i>Citrus pseudilimon Tan.</i>) Processing techniques for the sustainable livelihood of weaker sections of the society (F/by DST)	2021-22	DST New Delhi	58,91,944
60	Development of enhanced shelf life tomato mutants through income editing approach	2021-22	CSIR, New Delhi)	38,51,000
61	Application of Bioinformatics & computational Biology in Agriculture- BIC at Punjab Agriculture University, Ludhiana (F/by Govt. of India, Ministry of Science & Technology, DBT, New Delhi.	2021-22	DBT New Delhi	1,97,52,896
62	Rice stubble management through altered genotype x management (GEM) interventions in wheat crop (F/by GOI ministry of Science & Tech. DBT, New Delhi)	2021-22	DBT New Delhi	28,65,480
63	Development of resistant Starch Potato using nanomaterial mediated genome editing technology F/by GOI ministry of Science & Technology, DBT, New Delhi	2021-22	DBT New Delhi	45,39,120
64	Elucidating the genetic Architecture of tillering in wheat through CRISPR/CAS based editing of Ideal plant Architecture Gene (IPAI) & Teosinte Branched 1	2021-22	DBT New Delhi	57,89,760
65	Ecological implications of abundance of pink Stem Borer <i>Sesamia inferens walker</i> in rice-wheat cropping system in Punjab	2021-22	SERB New Delhi	33,27,616
66	Phenotyping & Molecular characterization of snapmelon germplasm against fusarium wilt resistance for development of mapping population in muskmelon (<i>Cucumis melo L.</i>) (F/by GOI, Ministry of Sci. & Technology, DBT, New Delhi	2021-22	DBT New Delhi	18,18,064
67	Bio systematic studies of phytoseiid mites on fruit crops from Trans Genetic plains & North Weston Himalya	2021-22	SERB New Delhi	34,22,920
68	Molecular mapping & fertility restorer gene in brinjal (<i>Solanum melongena L.</i>)	2021-22	SERB New Delhi	30,08,759
69	Identification & Characterization of genes responsible for premature bolting in tropical onion grown in India.	2021-22	SERB New Delhi	31,87,840
70	Development of SNP marker-based panel affordable to breeders for the traits imposing genorination of rice from deep sowing depth under direct seeded cultivation conditions	2021-22	SERB New Delhi	18,00,000
71	Unraveling the diversity of R Genes against yellow mosaic disease in <i>Vigna</i>	2021-22	SERB New Delhi	32,79,760
72	Role of ethylene in aeranchyma formation in cotton under waterlogged condition	2021-22	SERB New Delhi	29,94,665
73	Molecular mapping & transfer of Jassid resistance in okra (<i>Abemoschus esculentus (L) Moech</i>)	2022-23	DBT New Delhi	77,91,912
74	Development & integration of Advance Genomic Technologies for Targeted Breeding	2022-23	DBT New Delhi	27,19,31,368

75	Relationship of supply Chain Management and Venture Performance: A study of Honey Bee Entrepreneurs of Punjab	2022-23	ICSSR New Delhi	8,50,000
76	Strategies to overcome pre-fertilization barriers in chrysanthemum (<i>Chrysanthemum morifolium</i> Ramat) for improvement of self & cross compatibility traits.	2022-23	SERB, New Delhi	24,53,264
77	Development Of Haploid inducer rice lines using CRISPER cas9 zone. Editing system for high induction frequency	2022-23	DBT New Delhi	55,03,240
78	Genome-wide introgression of tetraploid non-progenitor <i>Aegilops peregrine</i> (UUSS) in hexaploidy wheat background & mapping of multiple disease resistance	2022-23	DBT New Delhi	1,19,56,640
79	Development of haploid inducer stock through gene-editing of PIAI & DMP genes in maize	2022-23	SERB, New Delhi	19,65,400
80	Evaluation of Yeast-encapsulated essential oil base bio-lavicide formulation for management of <i>Aedes aegypti</i> mosquito	2022-23	SERB New Delhi	22,60,016
81	Molecular mapping of root knot nematode resistance gene(s) introgressed from <i>S torvum</i> in brinjal	2022-23	DBT New Delhi	72,53,722
82	The INSPIRE Faculty Fellowship	2022-23	DST New Delhi	1,10,00,000
83	Indian participation in the CMS experiment at CERN Maintenance Operation and up gradation	2022-23	DST New Delhi	1,14,50,000
84	DBT –NORTH East centre for Agricultural Biotechnology Phase III Programme II : Development of Insect resistant chickpea varieties protected <i>helicovera armigera</i>	2022-23	DBT New Delhi	48,71,800
85	Mapping of loci conferring resistance against <i>ustilago tritici</i> causing loose smut in bread wheat	2022-23	SERB, New Delhi	28,18,320
86	Molecular mechanism underlying the difference in heat stress tolerance in rapeseed mustard crops	2022-23	DST, New Delhi	11,97,504
87	Cambridge India Network for translational Research in Nitrogen-2	2022-23	DBT New Delhi	1,19,32,077
88	Structural and Functional characterization of techykinins peptides and its receptor in <i>Bemisia tabaci</i> for development of novel insecticides (SERB)	2022-23	SERB, New Delhi	49,56,814
89	Genomics-assisted breeding for development of Dry-DSR ready basmati rice varieties	2022-23	DBT New Delhi	64,76,840
90	Tackling emerging diseases and insect pests problem in rice through innovative genomic approaches	2022-23	DBT New Delhi	2,14,94,800
91	Carbon and water foot printing of different cropping systems under variable climatic conditions in irrigated agro ecosystems of Punjab	2018-19	ICAR (NICRA)	27,40,083-
92	Paddy Straw residues management through in-situ microbial decomposition with mechanical interventions	2019-20	ICAR, New Delhi	1,642,758
93	Identification and validation of newer approaches for the management of whitefly <i>Bemesiatabaci</i> (Hemiptera: Aleyrodidae),	2020-21	ICAR, NASF, New Delhi	32,44,403
94	Implementation of Setting-up gradation of quality control/ Food testing laboratories at Regional Research Station, Bathinda	2020-21	ICAR, New Delhi	131,00,000
95	Characterization and evaluation of wild species and inter-specific derivatives of chickpea-Component III (NBPGR)	2021-22	ICAR, New Delhi	9,00,000
96	Consortium Research Platform on Agro Biodiversity Maize (CRPAB)	2021-22	ICAR, New Delhi	2,00,000



97	Marker assisting stacking of yellow mosaic disease resistance, null Kunitz trypsin inhibitor, null lipoxygenase-2 genes, and broadening the genetic base of soybean,	2022-23	ICAR, New Delhi NASF	22,52,250
98	Ecosystems, Agribusiness and Institutions Component: Impact Assessment of Agricultural Technology”	202-23	ICAR-NIAP, New Delhi	39,80,000
99	Revival of Sunflower cultivation, (PFMS Code 4034- Edible Oil-Oilseeds (KrishionnatiYojna)	2022-23	ICAR, New Delhi	26,36,000
100	Identification and characterization of fungal effectors and host factors in rice- false smut pathosystem,	2022-23	ICAR, New Delhi	30,40,446
101	CRP on Agro-diversity Lentil Project,	2022-23	ICAR, New Delhi	3,00,000
102	Evaluation of Brassica for Sclerotinia rot and Orobranche under CRP on Agroboidiversity”,	2022-23	ICAR, New Delhi	3,00,000

DELEGATION OF FINANCIAL POWERS BY THE BOARD OF MANAGEMENT **ANNEXURE VIII**

S. No.	Nature of powers	Registrar/Comptroller (Rs.)	Estate Officer -cum- Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admin- cum- Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
1.	Purchase of books, periodicals, maps etc. for official use	Full powers to the extent of budget provision	Full powers to the extent of budget provision	25000 Librarian/ full powers to the extent of budget provision	No change	15000	2000 in a year in each scheme	500 in a year in each scheme	1000 a year	1000 a year	Nil	15000	1000 a year	20000
2.	To make local purchase of stationery for office in case of urgency	2000 a year	2000 a year	10000	10000	5000	1000 a year	No change	1000 a year	5000	1000 a year	2000 a year	1000 a year	5000
3.	To give out urgent printing work to a private press	2000 in each case (subject to the limit of Rs. 10000 a year)	2000 in each case (subject to the limit of Rs. 10000 a year)	50000 Librarian	50000	25000	2000 a year subject to no objection from PAU Press	500 in each case with limit of Rs.2500 subject to no objection from PAU Press	1000 in each case with limit of Rs.5000 subject to no objection from PAU Press	Full powers subject to no objection from PAU Press (Material to be got approved from the Dean/ Director	Nil	15000	500 in each case with limit of Rs. 5000 a year	No change
4.	To rent or lease buildings or lands for University work	2500 p.m. in each case	2500 p.m. in each case	2500 p.m. in each case	5000 p.m. in each case	2500 p.m. in each case	1000 p.m. in each case	Nil	Nil	1000 p.m. in each case	Nil	1500 p.m. in each case	Nil	1500 p.m. in each case
5.	To sanction permanent advance to a subordinate officer	No change	Upto Rs-4000 for imprest	Full powers with the concurrence of Comptroller (Librarian upto Rs. 5000/- each case	Full powers with the concurrence of CAU (Librarian upto Rs. 5000/-)	Upto 1000 in each case	Nil	Nil	Nil	500/- p.m. in each case	Nil	Nil	Nil	Upto 1500 in each case
6.	To authorize urgent repairs of buildings of the Campus	No Change	No change	50000 in each case subject to no objection from E.O.	50000 in each case subject to no objection from E.O.	10000 in each case subject to no objection from E.O.	2000 in each case subject to no objection from E.O.	1000 in each case subject to no objection from E.O.	Nil	2000 in each case subject to no objection from E.O.	Nil	2000 in each case subject to no objection from E.O.	1000 in each case subject to no objection from E.O.	25000 in each case subject to no objection from E.O.



S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum- Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Special-ly authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn.-cum- Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
7.	To sanction purchase of store and articles of capital nature such as scientific instruments (including livestock)	200000 in each case	200000 in each case	200000 in each case	200000 in each case	100000 in each case	30000 in each case	Nil	Nil	30000 in each case	Nil	30000 in each case	30000 in each case	50000 in each case
8.	To sanction estimate to manufacture and repair in workshop controlled by PAU	Nil	Nil	25000	25000	10000 in each case	5000 in each case	No change	Nil	5000 in each case	Nil	10000 in each case	2000 in each case	15000
9.	To sanction purchase of stores required for the manufacture and repairs undertaken by the workshop	Nil	Nil	25000	25000 in each case	15000 in each case	5000 in each case	Nil	Nil	5000 in each case	Nil	15000 in each case	2000 in each case	20000
10.	Contact for sale of farms or garden produce	Nil	Nil	75000 in a year	100000 in a year	50000 in a year	10000 in a year	No change	Nil	50000 in a year	Nil	20000 in a year	5000 in a year	---
11.	To dispense with earnest or security money when plants and machinery, implements, spares etc. are supplied and erected by the firms of undoubted financial standing and repute	Nil	Full powers	Full powers	Full powers	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
12.	To sanction the purchase and manufacture of the office furniture and necessary estimate thereof	5000 a year	5000 a year	25000	25000	15000	2000 a year	1000 a year	2000 a year subject to budget provision	2000 a year subject to budget provision	Nil	15000 a year	1000 a year	20000
13.	To sanction hiring of furniture	1000 for offices under him and 500 for his own offices not more than a period of two months in a year	1000 for offices under him and 500 for his own offices not more than a period of two months in a year	15000	15000	3000	1000 a year	500 a month not exceeding two months in a year	500 a month not exceeding two months in a year	1000 a year	Nil	3000	--	4000

S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn- cum- Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
14.	To sanction the purchase of tents and Chowdaries	1000 in each case	1000 in each case	Full powers with the concurrence of the CAU (Librarian upto 25000)	Full powers with the concurrence of the CAU (Librarian upto 25000)	15000	500 in each case	Nil	Nil	1000 in each case	Nil	15000 in each case	500 in each case	20000
15.	To sanction purchase of typewriter, duplicators and calculating machines	5000 for offices under them not including purchase for their own offices	5000 for offices under them not including purchase for their own offices	25000 for offices under them not including purchase for their own offices	25000 for offices under them not including purchase for their own offices	15000 in each case	5000 in each case	Nil	Nil	10000 in each case	Nil	15000 in each case	1000 in each case	20000 for offices under them not including purchase for their own offices
16.	To dispose off through commission agent or by auctioner otherwise stocks (as distinct from surplus stock) of articles manufactured in workshop	Nil	Nil	2000	1500	1000	Nil	Nil	Nil	1000	Nil	Nil	Nil	Nil
17.	To sanction the refunds of revenue	No change	No change	Full powers with the concurrence of the CAU (Librarian-No change)	Full powers with the concurrence of the CAU (Librarian-No change)	Nil	Nil	Nil	Refund of exam fee upto 250 in each case	Nil	Refund of exam fee upto 100 in each case	Nil	Nil	250 in each case
18.	To write off losses arising from stores of any kind (including machinery, implements, bullocks, horses, misc. articles etc. purchased from farm or any other grants) which deteriorate to be come surplus or unserviceable to the extent that they must be sold or written off	1000 in each case	1000 in each case	5000 in each case	2000 in each case	2000 in each case	1000 in each case	250 in each case	100 in each case	2500 in each case	100 in each case	1000 in each case	1000 in each case	3000 in each case

S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & specially Authorized by Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
19.	(1) To write off irrecoverable dues of seed stores farms and gardens in cases in which recovery is not practicable (11) To write off losses of store due to unusual occurrence e.g. damage by weevils, rats, white-ants, rains etc.	No change Nil	Nil Nil	2000 in each case 1% of total stock subject to a maximum of Rs. 2000	1500 in each case 1% of total stock subject to a maximum of Rs. 2000	1000 in each case 1% of total stock subject to a maximum of Rs. 2000	500 in each case 1% of total stock subject to a maximum of Rs. 1000	Nil Upto Rs. 200 in a year	Nil Upto Rs. 200 in a year	1000 in each case Nil	Nil Upto Rs. 100 in a year	500 in each case 1% of total stock subject to a maximum of Rs. 1000	250 in each case 1% of total stock subject to a maximum of Rs. 1000	1000 in each case 1% of total stock subject to a maximum of Rs. 1500
20.	To write-off losses due to petty thefts, weighments and in transit	No change	Upto 1000	Upto 10% of total stock	Upto 10% of total stock	Upto 5% of total stock	Nil	Upto 100	Upto 200	Upto 5% of the total stock	Upto 100	Upto 2% of the total stock	Upto 2% of the total stock	Upto 7.5% of the total stock
21.	To write-off dryage in plants and grafts	Nil	Nil	Nil	Nil	No change	Nil	Upto 2% of the total stock	Nil	Upto 5% of the total stock	Nil	Upto 2% of the total stock	Upto 2% of the total stock	Nil
22.	To sanction expenditure on demonstration of implements, seeds & fertilizer etc.	Nil	Nil	10,000 in each case	20,000 in each case	5,000 in each case	3,000 in each case	1,000 in each case	Nil	Nil	Nil	3,000 in each case	2,000 in each case	5,000 in each case
23.	To sanction at a reduced rate sur-plus stock (seed, plants and grafts)	Nil	Nil	Upto 10 lb of seed of each kind and value not exceeding 1000 in each case	Upto 10 lb of seed of each kind and value not exceeding 1000 in each case	Upto 10 lb of each kind and value not exceeding 1000 in each case	Nil	Upto 250 in each case	Nil	Upto 10 lb of seed of each kind and value not exceeding 500 in each case	Nil	Nil	Nil	Upto 10 lb seed of each kind and value not exceeding 1000 in each case

S. No.	Nature of powers	Registrar/Comptroller (Rs.)	Estate Officer-cum-Chief Engineer (Rs.)	Dean/Director/Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
24.	To sanction payment of demurrage wharfage charges	No change	No change	1000	No change	500 in each case	Nil	Nil	Nil	Nil	Nil	500 in each case	Nil	No change
25.	To sanction expenditure in connection with civil suits instituted with sanction of the Vice-Chancellor	No change	No change	No change	2000	500	Nil	200 in each case	200 in each case	200 in each case	Nil	Nil	Nil	Nil
26.	To sanction expenditure on book binding (including other binding works)	No change	No change	5000	5000	3000	Nil	250 in each case	Nil	500 in each case	Nil	3000	Nil	4000
27.	To sanction hiring of typewriters required for existing and new offices	No change	No change	Upto one year	Upto one year	Upto six months	Upto six months	Upto 3 months	Nil	Upto six months	Nil	Upto six months	Upto six months	---
28.	To sanction purchase of bicycle for the use of their own offices as well as for the subordinate offices	No change	No change	25000	No change	15000	Nil	Nil	Nil	Full powers	Nil	15000	Nil	No change
29.	To sanction supply of liveries summer clothing to employees of the University	No change	No change	No change	No change	15000	Nil	Nil	Nil	Full powers	Nil	15000	Nil	No change
30.	To sanction expenditure for prizes and awards	Upto 2000	Nil	Upto 4000 per function	Upto 4000 per function	2000 per function	Nil	Nil	Nil	1000 per function	Nil	1000 per function	1000 per function	---
31.	To sanction scholarship or stipends in the colleges	Full powers as laid down prospectus of the institute or scheme	Nil	Full powers as laid down prospectus of the institute or scheme	Full powers as laid down prospectus of the institute or scheme	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil



S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
32.	To remit late fee fines imposed on students	Full powers according to the prescribed rules	Nil	Full powers according to the prescribed rules	Full powers according to the prescribed rules	Full powers according to the prescribed rules	Nil	Nil	Full powers according to the prescribed rules	Full powers according to the prescribed rules	Nil	Nil	Nil	Nil
33.	To sanction expenditure connected with fruit, vegetables and other agricultural and livestock shows	Nil	10000 in each case	10000 in each case	10000 in each case	No change	Nil	Nil	Nil	1000 in each case	Nil	Nil	Nil	1500 in each case
34.	To sanction employment of skilled and unskilled labour on daily and monthly wages	Full powers for University press	No change	No change	No change	No change	Nil	Nil	Nil	Full powers at published as reasonable by D.C. concerned and subject to the condition that the period of employment does not exceed 12 months at a time in the case of a monthly paid labour	Nil	Full powers at published as reasonable by D.C. concerned and subject to the condition that the period of employment does not exceed 12 months at a time in the case of a monthly paid labour	Full powers at published as reasonable by D.C. concerned and subject to the condition that the period of employment does not exceed 12 months at a time in the case of a monthly paid labour	---
35.	To fix limits of security deposits of University employees and to prescribe method of recovery thereof	Full powers/ limit of security in each case to be fixed in consultation with CAU	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
36.	To fix sale rate of agricultural, dairy and poultry products, nursery plants/bacterial culture etc.	Nil	Full powers provided that the rates fixed are not less than the prevailing market rates	Full powers provided that the rates fixed are not less than the prevailing market rates	Full powers provided that the rates fixed are not less than the prevailing market rates	Full powers provided that the rates fixed are not less than the prevailing market rates	Nil	Nil	Nil	Full powers provided that the rates fixed are not less than the prevailing market rates	Nil	Full powers in perishable commodity provided that the rates fixed are not less than the prevailing market rates	Full powers in perishable commodity provided that the rates fixed are not less than the prevailing market rates	---

S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-AccountOfficer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
37.	To fix rates of commission payable to commission agents etc. on sale of agricultural production etc.	Nil	Nil	No change	No change	No change	Nil	Nil	Nil	Full powers subject to the control of Dean/ Director	Nil	Nil	Nil	---
38.	To lay down scales for the issue of concentrate fodder etc. for feeding livestock	Nil	Nil	No change	No change	No change	Nil	Nil	Nil	Full powers subject to the control of Dean/ Director	Nil	Nil	Nil	---
39.	To declare animals, agricultural produces nursery plants, fruit trees, FYM compost etc. as surplus to requirement	Nil	Nil	No change	No change	20000	20000	Upto 5000 in each case	Nil	20000	Nil	20000 in each case	10000 in each case	---
40.	To declare animals, agricultural produce, nursery plants, fruit trees, FYM compost etc. as unserviceable	Nil	Nil	No change	No change	20000 in each case	Nil	Upto 1000 in each case	Nil	2000 in each case	Nil	Upto 2000 in each case	Upto 1000 in each case	---
41.	To sanction sale of animals, agricultural produce, nursery plants, fruit trees, FYM Comp. declared surplus by competent authority at book value or mkt. value whichever is greater	Nil	Nil	150000 in each transaction subject to any condition imposed by V.C.	150000 in each transaction subject to any condition imposed by V.C.	Upto 100000 in each transaction subject to any condition imposed by V.C.	Upto 2000 in each transaction subject to any condition imposed by V.C.	Upto 5000 in each transaction subject to any condition imposed by V.C.	Nil	Upto 50,000 in each transaction subject to any condition imposed by V.C.	Nil	Upto 40,000 in each transaction subject to any condition imposed by V.C.	Upto 15000 in each transaction subject to any condition imposed by V.C.	---
42.	To sanction sale by public auction of animals agricultural produce, nursery plants, fruits, trees, FYM compost etc. declared surplus or unserviceable by competent authority	Nil	Nil	150000 in each transaction	150000 in each transaction	100000 in each transaction	20000 in each case subject to any condition imposed by V.C.	2000 in each case subject to any condition imposed by V.C.	Nil	50000 in each transaction	Nil	30000 in each transaction subject to any condition imposed by V.C.	10000 in each transaction subject to any condition imposed by V.C.	



S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum- Chief Engineer (Rs.)	Dean/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn- cum- Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
43.	To sanction disposal by sale or otherwise of animals, agricultural produce, nursery plants, fruit trees, FYM compost etc. declared unserviceable by the competent authority	Nil	Nil	Upto 10000 in each transaction (subject to any condition imposed by V.C.)	Upto 10000 in each transaction (subject to any condition imposed by V.C.)	Upto 4000 in each transaction (subject to any condition imposed by V.C.)	Upto 2000 in each transaction	Upto 1000 in each transaction	Nil	Upto 2000 in each transaction	Nil	1000 in each transaction (subject to any condition imposed by V.C.)	1000 in each transaction (subject to any condition imposed by V.C.)	---
44.	To sanction sale of seeds and seedlings at market rates	Nil	Nil	No change	No change	No change	Nil	Nil	Nil	Full powers subject to control of Dean/ Director	Nil	Nil	Nil	---
45.	To sanction write-off of books periodicals and maps/ lost or rendered unserviceable	No change	No change	2000 in each case	2000 in each case	No change	Nil	Upto 500 in each case	Nil	Upto 500 in each case	Nil	Nil	Nil	---
46.	To write-off the value of animals died or destroyed	Nil	Nil	No change	No change	No change	Nil	No change	Nil	Upto 5000 in each case	Nil	Nil	Nil	---
47.	To fix rates of depreciation in respect of articles of stores and livestock	Nil	Nil	Full powers with the concurrence of the CAU (Librarian-Nil)	Full powers with the concurrence of the CAU (Librarian-Nil)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	---
48.	To approve mortality in young nursery etc.	Nil	Nil	No change	No change	Full powers	Nil	Nil	Nil	Full powers	Nil	Nil	Nil	---
49.	To approve mortality in mature plants	Nil	Nil	No change	No change	Full powers	Nil	Nil	Nil	Full powers	Nil	Nil	Nil	---
50.	To declare articles of store or stock surplus or unserviceable	No change	Upto book value of 2500 in each case	Full powers with the concurrence of the CAU (Librarian No change)	Full powers with the concurrence of the CAU (Librarian No change)	Upto book value of 2000 in each case	Upto bookvalue of 1000 in each case	Upto bookvalue of 1000 in each case	Upto bookvalue of 1000 in each case	Upto bookvalue of 1000 in each case	Nil	Upto bookvalue of 2000 in each case	Upto book value of 1000 in each case	---

S. No.	Nature of powers	Registrar/Comptroller (Rs.)	Estate Officer-cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn- cum- AccountOfficer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
51.	To sanction the sale of articles of stores or stocks declared surplus or unserviceable by competent authority	No change	Upto 7500 in each transaction	Full powers with the concurrence of the CAU (Librarian upto 7500 in each case)	Full powers with the concurrence of the CAU (Librarian upto 7500 in each case)	Upto 5000 in each transaction	Nil	Upto 2000 in each transaction	Upto 2000 in each transaction	Upto 5000 in each transaction	Nil	Upto 4000 in each case	Upto 3000 in each case	---
52.	To sanction expenditure on service postage stamps for use in office and institutions	No change	No change	Full powers with the concurrence of the CAU (Librarian upto 10000)	Full powers with the concurrence of the CAU (Librarian upto 10000)	10000	2000 at a time	2000 at a time	Upto 1000 at a time	5000 at a time subject to the budget provision	Nil	10000	2000 at a time	15000 at a time
53.	To sanction expenditure on ordinary postage stamps (foreign postages)	Upto 1500 per annum	Upto 1500 per annum	Full powers with the concurrence of the CAU (Librarian upto 1500 per annum)	Full powers with the concurrence of the CAU (Librarian upto 1500 per annum)	1000 per annum	Nil	500 per annum	500 per annum	1000 per annum	500 per annum	100 per annum	100 per annum	---
54.	To sanction write-off finally or irrecoverable value of stores or public money lost by fraud or negligence of individuals or similar cases	No change	No change	No change	No change	No change	Nil	Upto 50 in each case	500 annually	Upto 500 in each individually case	Nil	Nil	Nil	---
55.	To sanction expenditure on entertainment functions etc.	5000	5000	5000 Librarian upto 1000 in each case	5000 in each case	2500 in each case	500 in each case	Nil	500 in each case	1000 in each case	Nil	500 in each case	250 in each case	1000 in each case
56.	To sanction contingent expenditure not otherwise provided for in these delegation orders	Registrar upto 25,000 in each case and full powers in respect of payment of electricity charges only 50,000 in each case full powers in	60,000	Deans/Directors 60,000 and full powers Librarian upto 15000 for any onetime	70,000 and full powers #	Upto 40,000 for any one time	10,000	Nil	2,000 in each case	15,000 at a time	Nil	40,000 and 70,000 # (see note below)	Upto 10,000 in each case (30,000 # in each case to the Assoc. Prof. (trg). The Incharge of KVVKs is 3700-5700 scale (see note below)	50,000 and 1,00,000 # (see note below)



S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
		respect of advertisement of the Univ. in various newspapers and in respect of advertisement of the Univ. in various newspapers and in respect of payment of electricity charges only												
57.	Powers to sanction printing of technical reports	Nil	Nil	Full powers with the concurrence of the Comptroller (Librarian upto 25000)	Full powers with the concurrence of the Comptroller (Librarian upto 25000)	Upto 15000	Nil	Nil	Nil	Upto 2000 at a time	Nil	Upto 15000 at a time	Upto 1000 at a time	20000
58.	To renew University expenses before the prescribed period	Full powers	Full powers	Full powers	Full powers	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
59.	Waiving of the discrepancies relating to stores received short or found damaged in respect of overseas consignments received in an un-open and outwardly good condition	Upto the value of 500 in each case	Upto the value of 500 in each case	Upto the value of 500 in each case	Upto the value of 500 in each case	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
60.	To sanction the waiving in half or whole of recover-	upto 1000/-	upto 1000/-	upto 1000/-	upto 1000/-	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

S. No.	Nature of powers	Registrar/ Comptroller (Rs.)	Estate Officer -cum-Chief Engineer (Rs.)	Dean/ Director/ Librarian except Director of Research (Rs.)	Director of Research (Rs.)	Head of Deptt./ Addl. Director (C) (Rs.)	Professor & equivalent specially Authorized by Head of Deptt. (Rs.)	Group A Employees Specially authorized by Head of Deptt. or by Estate Officer (Rs.)	Deputy Registrar (Rs.)	Admn-cum-Account Officer (SPO) (Rs.)	Asstt. Registrar (Rs.)	Professor & equivalent Assoc. Director (Rs.)	Assoc. Prof. or equivalent (Rs.)	Addl. Director (Rs.)
61.	ies of charges pointed out by audit To sanction over-time allowance ministerial staff, peons, daffries, drivers etc.	Full powers in respect of employees working under them	Full powers in respect of employees working under them	Full powers in respect of employees working under them	Full powers in respect of employees working under them	Full powers in respect of employees working under them	Nil	Nil	Nil	Full powers in respect of employees working under them	Nil	Nil	Nil	---

Note : The powers delegated in this schedule are subject to provision of funds, scales fixed and procedure prescribed.

* A.S.P.O. authorised to sanction expenditure upto Rs. 5000/- for any one item in the absence of A.O. (S.P.O.)

In case of purchase of fertilizers, pesticides (insecticides, weedicides and fungicides) and food/fodder and agril. operations e.g. fixing of rates of combines, tractors, transplanting of paddy, picking of cotton, hiring of contractors, labour etc. in respect of electricity charges only.

LIST OF FACULTY AWARDS

Distinguished Chair/ Fellow / Honour by Professional Society

Sr.No.	Faculty (Department)	Award	Agency
1	Dr OP Choudhary (Soil Science)	Professor Manjit Singh Chhinan Distinguished Professor Chair 2018	PAU, Ludhiana
2	Dr Sarvjeet Singh (Plant Breeding and Genetics)	Professor Manjit Singh Chhinan Distinguished Professor Chair 2018	PAU, Ludhiana
3	Dr Param Pal Sahota (Microbiology)	Professor Manjit Singh Chhinan Distinguished Professor Chair	PAU, Ludhiana
4	Dr Rajan Aggarwal (Soil and Water Engineering)	Professor Manjeet S Chinnan Distinguished Professor Chair Award 2020	PAU, Ludhiana
5	Dr RK Gupta (Soil Science)	Professor Manjeet S Chinnan Distinguished Professor Chair Award 2022	PAU, Ludhiana
6	Dr Sangeet Ranguwal (Economics and Sociology)	Orange Knowledge Programme (OKP) Fellowship	Nuffic, Dutch Organisation for Internationalisation, The Netherlands
7	Dr BS Brar (Soil Science)	Fellow of Indian Society of Soil Science	Indian Society of Soil Science
8	Dr Pushp Sharma (Plant Breeding and Genetics)	Fellow of Society of Rapeseed Mustard Research	Society of Rapeseed Mustard Research
9	Dr RK Dubey (Floriculture and Landscaping)	Indian Society of Ornamental Horticulture Fellowship	Indian Society of Ornamental Horticulture (ISOH),
10	Dr Bavita Asthir (Biochemistry)	Fellow of Indian Society of Agricultural Biochemists	Indian Society for Agricultural Biochemistry
11	Dr Manjeet Kaur Sangha (Biochemistry)	Fellow of Indian Society of Agricultural Biochemists	Indian Society for Agricultural Biochemistry
12	Dr Satvir Kaur Grewal (Biochemistry)	Fellow of Indian Society of Agricultural Biochemists	Indian Society for Agricultural Biochemistry
13	Dr Parveen Chhuneja (School of Agricultural Biotechnology)	ISGPB Fellow	Indian Society of Genetics and Plant Breeding (ISGPB)
14	Dr Sandeep Singh (Fruit Science)	Life Fellow	Entomological Society of India, IARI, New Delhi
15	Dr OP Choudhary (Soil Science)	Fellow of National Academy of Agricultural Sciences (NAAS)	National Academy of Agricultural Sciences (NAAS)
16	Dr Prabhjyot Kaur (Department of Climate Change and Agricultural Meteorology)	Fellow of Association of Agrometeorologists	Association of Agrometeorologists
17	Dr Beant Singh (Department of Plant Breeding and Genetics)	SAWBAR Fellow Award 2021	Society for Advancement of Wheat and Barley Research, ICAR- Indian Institute of Wheat and Barley Research
18	Dr Buta Singh (Department of Plant Breeding and Genetics)	Indian Society of Agronomy Associateship Award 2021	Indian Society of Agronomy, IARI
19	Dr Vinita Kanwal (Economics and Sociology)	International Association of Agricultural Economists (IAAE) Award - ICWAE fellowship/mentorship programme 2022	International Committee of Women in Agricultural Economics (ICWAE), IAAE
20	Dr Harminder Singh (Fruit Science)	IAHS Fellowship 2021	Indian Academy of Horticultural Sciences (IAHS)
21	Dr PPS Gill (Fruit Science)	Fellow Award 2022	Society for Promotion of Horticulture (SPH), ICAR-IIHR

22	Dr Ashok Kumar Dhakad (Forestry and Natural Resources)	Member of Executive Committee	National Environmental Science Academy
23	Dr PS Shera (Entomology)	Fellow, Society for Biocontrol Advancement, ICAR-NBAIR, Bengaluru	Society for Biocontrol Advancement, ICAR-NBAIR, Bengaluru
24	Dr Savita Sharma (Food Science and Technology)	Fellow, NADSI	National Academy of Dairy Sciences (India)
25	Dr Parveen Chhuneja (School of Agricultural Biotechnology)	Fellowship of National Academy of Agricultural Sciences (NAAS)	National Academy of Agricultural Sciences (NAAS)
26	Dr Parveen Chhuneja (School of Agricultural Biotechnology)	Fellowship of National Academy of Sciences, India (NASI)	National Academy of Sciences, India (NASI)
27	Dr OP Choudhary (Soil Science)	Indian Society of Soil Salinity and Water Quality Fellow	Indian Society of Soil Salinity and Water Quality
28	Dr Shayla Bindra	ISPRD Fellow Award 2023	Indian Society of Pulses Research and Development, Kanpur
29	Dr R K Dhall (Vegetable Science)	Fellow of Indian Society of Vegetable Science	IIVR, Varanasi
30	Dr RIS Gill (Forestry & NR)	Indian Society of Agroforestry Fellow	Central Agroforestry Research Institute (CAFRI) Jhansi
31	Dr Inderjit Singh	Prof. MS Chhinan Distinguished Professor Chair	PAU, Ludhiana

Personal Awards and Distinctions

Sr.No.	Faculty (Department)	Award	Agency
1	Dr Madhu Bala (Floriculture and Landscaping)	Young Scientist Award 2018	Agricultural Technology Development Society, Ghaziabad
2	Dr RK Dhall (Vegetable Science)	Hans Raj Pahwa Memorial Award 2016-17	PAU in 2019 for best research work in horticulture
3	Dr Sandeep Singh (Fruit Science)	Outstanding Achievers Award 2019	The Society of Tropical Agriculture, New Delhi.
4	Dr OP Choudhary (Soil Science)	ISSS - Dr JSP Yadav Memorial Award 2018	Indian Society of Soil Science (ISSS), New Delhi
5	Dr SK Jindal (Vegetable Science)	cash award	PAU in 2019 for the development of chilli hybrid CH 27
6	Dr Satish Kumar Gupta (Training Unit)	Best Teacher Award 2018	Indian Society for Technical Education (ISTE)
7	The Krishi Vigyan Kendra, Sangrur and the Gram Panchayat, Chatha Nanhera	Rajpal Sarvotam Village Award	PAU, Ludhiana
8	Drs Manjeet Singh, GS Manes, HS Sidhu, Manpreet Singh, Jaskarn Singh Mahal, Rajesh Goyal and Aseem Verma (Farm Machinery and Power Engineering)	ISAE Team Award 2018	Indian Society of Agricultural Engineers (ISAE)
9	Drs Manjeet Singh, GS Manes, HS Sidhu, Manpreet Singh, Rajesh Goyal and Aseem Verma (Farm Machinery and Power Engineering)	cash award of Rs 1,00,000/ for outstanding technology - PAU SuperSMS	PAU, Ludhiana
10	Dr Buta Singh (Plant Breeding and Genetics)	Best Thesis Award 2018	the Indian Society of Agronomy
11	Dr Nilesh Biwalkar (Soil and Water Engineering)	Best Teacher Award 2019	International Association of Research and Development Organization
12	Dr Rajan Aggarwal (Soil and Water Engineering)	Gold Medal	Soil Conservation Society of India, New Delhi



13	Dr Rimaljeet Kaur (Biochemistry)	(INSPIRE) Faculty Award 2018	Department of Science and Technology (DST)- Innovation in Science Pursuit for Inspired Research
14	Dr Rimaljeet Kaur (Biochemistry)	Newton- Pulses and Oilseed Research Initiative (PORI) research grant	Indo-UK project funded by the Department of Biotechnology (DBT) - Biotechnology and Biological Sciences Research Council (BBSRC)
15	Dr Deepika Vig (Human Development and Family Studies)	Excellence in Education Award 2019	Chandigarh College of Education, Mohali
16	Dr Vinay Singh (KVK, Bathinda)	Young Scientist Award	Astha Foundation during the International Conference, Rajasthan Agricultural Research Institute, Durgapura, Jaipur
17	Dr Aparna (KVK, Ropar)	Excellent Extension Scientist Award	2 nd International Conference organized by Agricultural Technology Development Society, Ghaziabad
18	Dr Inderjit Singh Yadav (School of Agricultural Biotechnology)	ICAR Netaji Subash Chander Fellowship	Pursuing Ph.D
19	Dr Arun Kaushal (Soil and Water Engineering)	Bharat Ratna Dr Radhakrishnan Gold Medal Award 2020	Global Economic Progress and Research Association.
20	Dr Manjeet Singh, Dr Manpreet Singh, Dr Rajesh Goyal Dr HS Sidhu (Farm Machinery and Power Engineering)	NRDC Meritorious Invention Award 2019 (cash prize of Rs 3.00 lakh)	National Research Development Corporation (NRDC), Karnal, Haryana
21	Dr Ruchika Zalpouri Dr Preetinder Kaur (Processing and Food Engineering)	Innovative Student Projects Award 2019 (M.Tech.)	Indian National Academy of Engineering
22	Dr Sandhya (Processing and Food Engineering)	Women Scientist Award 2019	2 nd National Conference organized by Society for World Environment, Food and Technology, New Delhi
23	Dr Richa Arora (Microbiology)	Young Scientist Award 2020	Association of Microbiologists of India
24	Dr DK Kocher (Zoology)	Dr VP Sharma Award in the field of Medical Entomology	Society of Medical Arthropodology
25	Dr Sandeep Singh (Fruit Science)	Swaran Singh Virk Memorial Award	Progressive Citrus Growers of Punjab
26	Dr Rumesh Ranjan (Plant Breeding and Genetics)	Best Outstanding Researcher Award	Kamarajar Institute of Education and Research (KIER), Tamil Nadu
27	Drs Varinderpal Singh, Dr RK Gupta, Dr OP Choudhary and Dr Bijay Singh (Soil Science)	FAI Golden Jubilee Award	Fertilizer Association of India (FAI) for excellence in the field of plant nutrition
28	Dr Arun Kaushal (Soil and Water Engineering)	Life Time Achievement Award	University of Allahabad, Prayagraj, Uttar Pradesh
29	Dr Samanpreet Kaur (Soil and Water Engineering)	Gold Medal	Association of Agrometeorologists, Anand
30	Dr Samanpreet Kaur (Soil and Water Engineering)	Dr MS Randhawa Best Book Award	PAU, Ludhiana
31	Dr Samanpreet Kaur and Er Lovepreet Singh (Soil and Water Engineering)	first prize in the field of agricultural engineering	Indian Society of Technical Education

32	Dr Manpreet Kaur Saini (Processing and Food Engineering) secured the “organized by the from November 23 to December 18, 2020.	First position in the Training Course on “Scientific Methods of Storage and Inspection of Food Grains”	Ministry of Consumer Affairs,
33	Dr Rajwinder Singh (Zoology)	Excellence in Research Award	Webinar organized by Dr Ram Avatar Shiksha Samiti (DRASS)
34	Dr Rajwinder Singh (Zoology)	Young Scientist Award	International Seminar organized by the University of Allahabad, Prayagraj
35	Dr Richa Arora (Microbiology)	MSI - Young Scientist Award	Microbiologists Society of India (MSI)
36	Dr Jaspreet Kaur (Microbiology)	Appreciation Award for COVID-19 testing duty	Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana
37	Dr Kiran Bains (Food and Nutrition)	Invited as Panelist at “VAIBHAV Summit”	Indian Science and Academic Institution
38	Dr BS Dhillon (KVK, Amritsar)	Pandit Deen Dayal Upadhyay Rashtriya Krishi Vigyan Protsahan Puraskar	ICAR for Zone 1, ATARI
39	Dr BS Dhillon (KVK, Amritsar)	Nanaji Deshmukh ICAR Award for outstanding interdisciplinary team research in agricultural and allied sciences	Zonal Workshop of ATARI
40	Dr AP Singh Dhaliwal (KVK, Bathinda)	Certificate of Appreciation by ICAR	ICAR, New Delhi and Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana
41	Dr Tejbeer Singh (KVK, Shaheed Bhagat Singh Nagar)	Appreciation Certificate	ICAR, New Delhi
42	Dr Aparna (KVK, Ropar) received an from and Inspiring Lady Veterinarian from Pashudhan Prahree magazine for the year 2021.	Appreciation Award	ZPD ATARI, Ludhiana
43	Dr Aparna (KVK, Ropar)	Inspiring Lady Veterinarian	Pashudhan Prahree magazine
44	Dr Ravi Prakash Pal	SK Ranjhan Best Ph.D. Thesis Award	Animal Nutrition Society of India
45	Dr Saurabh Ratra (IT section of Directorate of Extension Education)	International Electrical Research and Innovation Discovery Competition 2021	Centre for Electrical Excellence
46	Dr Rohinish Khurana Dr Satish Kumar Gupta (Farm Machinery and Power Engineering)	Runners-up position (Mentors)	National Level Competition ‘TIFAN 2022’ organized by the Society of Automative Engineers - India and John Deere Limited, Pune
47	Dr GS Kocher (Microbiology)	Distinguished Professor Award 2021	Institute of Researchers
48	Dr GS Kocher (Microbiology)	Gold Medal Award 2021	Hi-Tech Horticultural Society
49	Dr GS Kocher (Microbiology)	Applied Fermentation Excellence Award 2022	the Microbiologists Society, India
50	Dr Pratibha Vyas (Microbiology)	Best Teacher Award 2021	the Microbiologists Society, India
51	Dr Keshani (Microbiology)	Young Microbiologist Award 2021	the Agro Environmental Development Society
52	Dr Keshani (Microbiology)	Young Microbiologist Award 2021	by the Microbiologists Society, India.
53	Dr Rimaljit Kaur (Biochemistry)	SAAR Young Scientist Award 2021	the Society for Agriculture and Allied Research (SAAR)
54	Dr Ritu Mittal Gupta (Extension Education and Communication Management)	Academic Excellence Award 2021	Ministry of Micro, Small and Medium Enterprises, Government of India



55	Dr Hira Singh (Vegetable Science)	Young Scientist Award 2021	3 rd International Conference organized by the Agricultural and Environmental Technology Development Society, Uttarakhand
56	Dr Hira Singh (Vegetable Science)	Rashtria Nirman Rattan Award 2022	Nirman Campus of Education, Research and Training, IGNOU Centre, Sunam, Sangrur.
57	Dr HS Rattanpal Dr Monika (Fruit Science)	4 th Swaran Singh Virk Award 2022	Citrus Growers Association, Faridkot
58	Dr HS Rattanpal (Fruit Science)	Councillor for Indian Society of Citriculture	Indian Society of Citriculture, Nagpur
59	Dr RK Dubey (Floriculture and Landscaping)	Certificate of Appreciation	Punjab State Council for Science and Technology, and the Consulate General of Canada for mapping the floral diversity of MAGSIPA complex, Chandigarh
60	Dr RIS Gill (Forestry and Natural Resources)	ISAF Gold Medal 2021	Indian Society of Agroforestry (ISAF)
61	Dr Rajan Bhatt (Regional Research Station, Kapurthala)	Award of Appreciation 2021	Department of Botany, Government Girdhari Lal Dogra Memorial Degree College, Jammu
62	Dr Opinder Singh Sandhu (KVK, Ropar)	Young Scientist Award 2021	Society for Community Mobilization for Sustainable Development, New Delhi
63	Dr Gurlal Singh Gill (KVK, Faridkot)	Academic Excellence Award 2021	Rana Badal Educational Society for his outstanding contribution to the growth of Baba Hira Das Ji College of Veterinary Pharmacy
64	Dr Vikas Jindal (Entomology)	Travel Grant to attend the "3 rd International Whitefly Symposium: Putting Farmers First" at Perth, Australia	Department of Biotechnology, New Delhi
65	Dr Neena Singla (Zoology)	International Travel Grant for attending '7th International conference on Rodent Biology and Management (ICRBM7)' in Arusha, Tanzania, Africa	DST, New Delhi
66	Drs Manjeet Singh, Dr GS Manes, Dr HS Sidhu, Dr Manpreet Singh, Dr Rajesh Goyal, Dr Aseem Verma and Dr SK Singh (Farm Machinery and Power Engineering)	GS Khush Team Award 2018-19	Khush Foundation, PAU, Ludhiana
67	Dr Vipin Kumar Rampal (KVK Fatehgarh Sahib) was conferred with the by the for the year 2020; by for the year 2020 and in agricultural and allied sciences for the year 2019.	Best KVK Scientist Award 2020	Society of Extension Education, Agra
68	Dr Vipin Kumar Rampal (KVK Fatehgarh Sahib)	Best KVK Professional Award 2020	Mobilization Society
69	Dr Vipin Kumar Rampal (KVK Fatehgarh Sahib)	Nanaji Deshmukh ICAR Award for outstanding interdisciplinary team research 2019	ICAR, New Delhi
70	Dr Satbir Singh (KVK, Sangrur)	Best KVK Scientist Award (Animal Science) 2020	Society of Krishi Vigyan

71	Dr Maninder Singh Bons (KVK, Hoshiarpur)	Nanaji Deshmukh ICAR Award	ICAR, New Delhi
72	Dr Maninder Singh Bons (KVK, Hoshiarpur)	Appreciation Certificate	ICAR-ATARI, Zone I
73	Drs Amandeep Singh Brar (KVK, Moga), Jaswinder Singh (KVK, Patiala) and Mandeep Singh (KVK, Sangrur) received for the year 2019.	Nanaji Deshmukh ICAR Award for outstanding interdisciplinary team research in agricultural and allied sciences	ICAR, New Delhi
74	Dr GS Kocher (Microbiology)	Plaque and Merit Certificate 2019	PAU, Ludhiana
75	Dr Balkarn Singh (KVK, Muktsar)	Dr Satwant Kaur Memorial Award 2019-20	PAU, Ludhiana
76	Dr Mahesh Chand Singh (Soil and Water Engineering)	Gold Medal for doctoral research 2021	PAU, Ludhiana
77	Dr Maninder Singh Bons, Dr Pawitar Singh, Dr Prabhjot Kaur, Dr Sukhwinder Singh Aulakh, Dr Arunbeer Singh and Dr Manisha Bhatia (KVK, Faridkot)	Appreciation Certificate 2020-21	PAU, Ludhiana
78	Dr Shahida Nisar (Soil Science)	Commendation Certificate 2021 for the best Ph.D. thesis	Indian Society of Soil Science
79	Dr Maninder Singh Bons and Er Ajaib Singh (KVK, Faridkot)	Appreciation Certificate 2018-19	PAU, Ludhiana
80	Dr NS Dhaliwal, Dr Karamjit Sharma, Dr Madhu Shelly, Dr Balkaran Sandhu, Dr Chetak Bishnoi and Dr Mahekpreet Kaur (KVK, Sri Muktsar Sahib)	First prize 2018-19 & 2019-20	PAU, Ludhiana
81	Dr NS Dhaliwal, Dr Karamjit Sharma, Dr Chetak Bishnoi and Dr Mahekpreet Kaur (KVK, Sri Muktsar Sahib)	Second prize 2020-21	PAU, Ludhiana
82	Dr OP Choudhary (Soil Science)	Dr GS Khush Distinguished Professor Chair Award	Dr GS Khush Foundation
83	Dr Manpreet Singh Mavi (Soil Science)	Dr Darshan Singh Brar Young Scientist Award	Dr GS Khush Foundation
84	Dr Mandeep Sharma (Extension Education and Communication Management)	Best KVK Scientist Award	Indian Society of extension Education, New Delhi
85	Dr G S Aulakh (KVK)	Lifetime Achievement Award	Society of Krishi Vigyan
86	Drs Ajaib Singh, Maninder Singh Bons (KVK Hoshiarpur)	Appreciation Certificate	ICAR-ATARI, Zone-I, PAU Campus, Ludhiana
87	Dr Tejbeer Singh (KVK, SBS Nagar)	Best Scientist Award	The Society of Krishi Vigyan
88	Dr Narinder Deep Singh (KVK, Pathankot)	Appreciation Certificate	ICAR- ATARI Zone I
89	Dr Satbir Singh (KVK Ropar)	Appreciation letter	The Director, ICAR ATARI Zone I
90	Dr Aparna (KVK, Ropar)	Appreciation Certificate	ICAR ATARI Zone I, RVSKVV Gwalior and NADCL, Baramulla.
91	Dr Ashok Kumar (KVK, Sangrur)	Best Extension Scientist Award and Best Poster Presentation Award	Society of Krishi Vigyan
92	Dr Hari Mohan Meena (Soil Science)	Certificate of Appreciation	College of Agriculture, PAU
93	Dr Buta Singh Dhillon (Plant Breeding & Genetics)	Best Poster Award	PAU, Ludhiana
94	Dr Gagandeep Kaur (Processing & Food Engineering)	Certificate of Appreciation for Excellence in Teaching	College of Agriculture, PAU
95	Dr Ashoo Toor (Agricultural Journalism, Languages & Culture)	Certificate of Appreciation for Teaching Services	College of Agriculture, PAU, Ludhiana



96	Dr Jaspreet Kaur (Microbiology)	Certificate of Appreciation for Teaching Services	College of Agriculture, PAU, Ludhiana
97	Dr Narinderpal Singh (Economics & Sociology)	Team Award for Reviving Historical Trees	Punjab Agricultural University, Ludhiana
98	Dr Harsimranjeet Kaur Mavi (Economics & Sociology)	Certificate of Appreciation for Teaching Services	College of Agriculture, PAU, Ludhiana
99	Drs Jaswinder Singh Brar, KS Gill, Sandeep Singh (Fruit Science)	University Team Award for rejuvenation of historical trees	PAU, Ludhiana
100	Dr Sandeep Singh (Fruit Science)	Farm Literature Popularization Award	PAU, Ludhiana
101	Dr Sandeep Singh (Fruit Science)	Appreciation Award for sale of PAU literature	PAU, Ludhiana
102	Dr Sandeep Singh (Fruit Science)	Award of Honour from Alumni Association	PAU, Ludhiana
103	Dr Parveen Chhuneja (School of Agricultural Biotechnology)	Jeanie Borlaug Laube Women in Triticum (WIT) Mentor award	Borlaug Global Rust Initiative (BGRI)
104	Dr. Nitika Sandhu (School of Agricultural Biotechnology)	SERB Women Excellence Award	Science and Engineering Research Board, New Delhi
105	Dr SS Dhaliwal (Soil Science)	Dr J. A. P. Yadav Memorial Award for Excellence in Soil Science	Indian Society of Soil Science
106	Dr Virender Singh Sohu (Plant Breeding and Genetics)	Dr MV Rao Memorial Award	SAWBAR
107	Dr Hari Ram (Plant Breeding and Genetics)	Dr S Nagarajan Memorial Award	SAWBAR
108	Dr Usha Nara (Plant Breeding and Genetics)	Certificate of Appreciation	Controller General of Patents, Designs and Trademarks
109	Dr Poonam Sharma (Plant Breeding and Genetics)	ISPRD Excellence Award (Crop Production)	Indian Society of Pulses Research and Development, Kanpur
110	Dr Gaurav Kumar Taggar (Plant Breeding and Genetics)	ISPRD Excellence Award 2023 (Crop Protection)	Indian Society of Pulses Research and Development, Kanpur
111	Dr Rahul Kapoor, Meenakshi Goyal, Maninder Kaur, Ashlesha Singla (Plant Breeding and Genetics)	Certificate of Appreciation	AICRP(FCU), IGFR, Jhansi under the aegis of ICAR, New Delhi
112	Dr Satish Kumar Gupta Drs RohinishKhurana and Dr Anoop Dixit as faculty mentors (Agril. Engg.)	All India Winners (AIR-1 and cash prize of Rs. 1.5 lakh in the National Level Competition 'SAEINDIA TIFAN 2023)	Society of Automotive Engineers – India and John Deere Limited, Pune
113	Dr Satish Kumar Gupta, Er Tarandeep Singh as faculty mentors (Agril. Engg.)	Future Award in the National Level Competition-SIEP-Hero e-bike Challenge	Imperial Society of Automotive Engineers
114	Dr Gurveer Kaur (Processing and Food Engineering)	Young Scientist Award	The International Research Awards on Science, Technology, and Management
115	Dr Gurveer Kaur as faculty mentor (Processing and Food Engineering)	1st and 3rd Prize in Calendar Conceptathon	Indian Society of Agricultural Engineering
116	Dr Preeti (Processing and Food Engineering)	Young Researcher Award	Institute of Scholar, ISO 9001:2015 certified and registered under Ministry of MSME and Corporate Affairs, Govt. of India
117	Dr Sandhya (Processing and Food Engineering)	Young Scientist Award	Society for World Environment, Food and Technology, New Delhi
118	Dr Shiwani Guleria Sharma (Microbiology)	Young Scientist Award (State level, Punjab)	Microbiologists Society, India
119	Dr Shiwani Guleria Sharma (Microbiology)	Young Scientist Award (National level)	Microbiologists Society, India
120	Dr GS Kocher (Microbiology)	State President of Microbiologists Society, India	FSSAI, India

121	Dr GS Kocher (Microbiology)	Selected on expert Panel of Alcoholic Beverages	FSSAI, India
122	Dr Rajwinder Singh	Best Zoologist Award	6th International Conference SCALFE-2023 by Himachal Pradesh University, Shimla
123	Dr Rajwinder Singh	International Young Scientist Award	International Institute of Organized Research- I2OR and Green ThinkerZ, Ministry of MSME, Govt. of India
124	Dr Rajwinder Singh	Universal Best Young Faculty award	International American Council for Research and Development, Tamil Nadu
125	Dr Kamal Vatta (Economics & Sociology)	Letter of Appreciation for supporting research work on Paddy Stubble Management in India	Research Institute for Humanity and Nature, Kyoto, Japan
126	Dr Kamal Vatta (Economics & Sociology)	President's Award for co-chairing a session	Indian Ecological Society in SKUAST, Jammu
127	Dr Shaikh Mohd Mouzam (Economics & Sociology)	Dr RT Doshi Second Prize in Paper Presentation	Agricultural Economics Research Association, New Delhi
128	Dr Rashmi Upreti (Human Development & Family Studies)	Young Researcher Award	Institute of Scholars (InSc), Registered under MSME & Corporate Affairs, Govt. of India
129	Dr Sandeep Singh (Fruit Science)	Member, Editorial Committee of Tephritid Workers of Asia, Australia and Oceania (TAAO) Newsletter, Australia.	Tephritid Workers of Asia, Australia and Oceania (TAAO), Australia.
130	Dr Hira Singh (Vegetable Science)	Awarded DST-AWSAR-2022 Award	Department of Science and Technology, Ministry of Science and Technology, Government of India.
131	Dr Gurlal Singh Gill (KVK, Faridkot)	Young Scientist Award	Krishi Vigyan Kendra, Ujjain



ACTION TAKEN REPORT ON THE LAST RECOMMENDATION/ OBSERVATION OF NAEAB

Sr No.	Recommendation of the Board	Action Taken
1	Academic Council does not include eminent academicians/ experts from outside and student representatives	<p>An eminent agricultural educationist Dr RK Pannu, Former Professor of Agronomy and Director of Research, CCSHAU, Hisar has been nominated by the Vice-Chancellor as 'Special invitee' for the meetings of the Academic Council.</p> <p>There is no provision of students' representatives for the meetings of the Academic Council in the PAU Act & Statutes.</p>
2	Digitalization of University Library may be strengthened for issuing of books	<p>The Central Library of PAU (MS Randhawa Library) has digitized all the theses and PAU publications like PAU Annual Reports, Proceedings of Research and Evaluation Committee, Agricultural Research Journal, Progressive Farming, Changi Kheti, etc. for providing online access of these resources to the users. The Library has fully computerized system of issue and return of the documents.</p> <p>The constituent colleges have college level Book Bank. Largely the digitization of College Book Banks as well as Departmental Libraries of various colleges has been accomplished. All the books available in Book Bank of the College of Agriculture have even been catalogued on computers.</p>
3	Smart classrooms were established in all the faculties. However, it is observed that many faculty members were not acquainted with these facilities	<p>The faculty across various colleges of PAU are fully acquainted with and is utilizing smart classrooms. To enhance the desired acquaintance with smart classroom, trainings for faculty of all the constituent colleges were arranged at PAU.</p> <p>Faculty members also attended ICAR Organized 'Capacity Building Session for all Agricultural Universities' organized under NAHEP.</p> <p>A live demo on smart class room platform was organized by College of Agricultural Engineering & Technology for all faculty to acquaint features of smart class room platform for academic work including online teaching.</p>
4	The profits from Experiential Learning Modules are not shared as per the guidelines of ICAR	<p>Student READY programme has already been implemented for all the UG degree programmes as per ICAR's FDC recommendations.</p> <p>ICAR guidelines are being followed for Experiential Learning Modules: In College of Community Science, students are paid 60% share of the profit earned and GST @ 5% is deposited with the Comptroller, PAU.</p> <p>After deduction of GST and profit shared with students, the balance amount is deposited in the Revolving Fund of ELU account of the College. The profit earned from the ELP units is deposited in the specially opened account in the name of Dean of the college.</p>

5	Outside domain experts may be invited regularly in Research Council meetings	<p>The Research Council comprises of domain experts from ICAR and other state institutes as well as eminent retired scientists from various fields as per details given below:</p> <ul style="list-style-type: none"> • Director, ICAR-CIPHET • Director, Punjab Remote Sensing Centre • Dr Ashok Kumar Mehta, Former ADG (Extension), ICAR • Dr Chander Mohan, former Professor of Plant Pathology • Dr Inder Mohan Chhibba, former Senior Soil Chemist • Dr Gurkanwal Singh, Former Director of Horticulture, Punjab • S Jagtar Singh, V&PO Mehma Brar Sarja, Distt. Bathinda
6	It has been noticed that the number of publications per faculty needs attention	<p>Research publications are considered as an important parameter in the Annual Progress and Assessment Report of scientists as well as for promotion to higher cadre under CAS. During the period under report, more than 3100 research papers have been published in the reputed journals having NAAS rating of 5 and above. . Out of these, 1061 research papers have NAAS rating of 8.0 and above.</p>
7	An effective IPR Cell may be strengthened to look into the protection and commercialization of the technologies developed	<p>Technology Marketing and IPR Cell is fully functional at PAU. The cell has a dedicated office space and staff under the Directorate of Research and has an independent designated portal on the homepage of PAU's website.</p> <p>During the review period, the University was granted 19 patents, 10 patents were published, 18 new applications for patents were filed, signed 153 Memorandum of Agreements (MoAs) to commercialize various technologies and developed new Agricultural machines (12), and tested 138 machines. Further, PAU signed 42 Memorandum of Understanding (MOUs) with renowned foreign universities, like, Michigan State University, Washington State University, California State University, etc. and National Institutes/ IITs/Universities, Research Centres, Corporations and Industries.</p>
8	International student cell is in place. However, the requirements of overseas students need to be taken on priority	<p>A dedicated University level International Students' Cell (ISC) has been established under the control and chairmanship of Director of Students' Welfare with one senior Professor from each college as Member and the Cell information is accessible to all the International students, made available on PAU website as well as via a dedicated WhatsApp Group of International students with all the Members of the Cell therein. All the queries and requirements of these students are addressed on priority by the Cell. Further, the requirements of International students are always given top priority by the allotted Advisor and Heads of the Departments as well as by the University administration.</p> <p>Allotment of Major Advisor is done as per preference of student for crop and subject area, so that the student can contribute to his nation, as per his/her requirements.</p> <p>Their academic issues regarding offering of special courses or allowing of extra research credit hours than the maximum limit are immediately resolved, enabling them to complete their degree well in time. Currently, the PAU has 37 foreign students from eight countries.</p>



9	<p>Fund Raising through CSR is low, considering the contribution of the University in the area of food grain production, concerted efforts are needed to attract large scale CSR funding. This may be pursued in consultation with the State Government</p>	<p>Estate Organization is regularly contacting various agencies that could fund PAU activities under CSR. Based on interactions, PAU could manage to get various facilities, the prominent ones include Ambulance for PAU Health Centre, E-rickshaws for farmers and students, barricades for traffic control on campus, sitting benches along roads, sanitary napkin incinerators for girls' hostels, dustbins, etc. In addition, the business houses and bank branches stationed at PAU Campus are providing funds to upgrade the infrastructure (PAU Market, Students' Home area) under CSR.</p> <p>College of Community Science, PAU, Ludhiana is running a Consultancy Project, funded by Nestle India Limited under CSR, for creating nutritional awareness among rural school children. Under this project, the Department has received an amount of Rs.36.00 lakh during the period from 2017-18 to 2022-23 and more than 7,600 school children from Ludhiana, Moga, Faridkot and Ferozepur Districts, were imparted nutrition education.</p>
10	<p>It has been observed that the newly recruited staff members are given only basic salary for the initial three years as per the policy of the state government. This may be sorted out on top priority within time frame to attract the meritorious candidates from within Punjab as well as outside the state.</p> <p>Immediate steps may be taken to fill the vacant positions of Associate Professors and Professors.</p> <p>Steps may be initiated to complete the CAS for faculty whoever is due on priority</p>	<p>Basic salary is being paid to newly recruited faculty as per decision of the State Govt. The matter is subjudice in the Hon'ble Punjab and Haryana High Court, Chandigarh/Supreme Court of India, New Delhi. Though the said decision has been quashed by the Hon'ble Punjab and Haryana High Court, Chandigarh, the response from the Govt. of Punjab is awaited.</p> <p>As per decision of the Govt. of Punjab, no post was to be filled in the unrevised scale after July 17, 2020. The revised pay scales in respect of faculty members have been implemented in the university on April 1, 2023. The vacant posts will now be filled up at the earliest as per budgetary provision.</p> <p>Most of the cases of teachers under CAS called up to the prescribed date and 328 cases of the faculty members during the reporting period have been cleared and the teachers have been promoted/placed in higher scale, etc.</p>
11	<p>The best teacher award is not implemented in last few years. Steps may be taken immediately</p>	<p>ICAR has discontinued funding for ICAR Best Teacher Award. However, PAU has instituted a number of awards such as The Best Teacher Award, Distinguished Scientist Award, Best Outstation Scientist Award, Dr Satwant Kaur Best Extension Worker Award etc. In addition, a number of awards in the name of eminent scientists in the form of Chairs, Awards, and Plaques have also been instituted.</p>
12	<p>University Officers selection as per statutes (Selection of HODs may be made based on open advertisement)</p>	<p>Selection of University Officers is being done as per provisions contained in the PAU Act & Statutes. So far as selection of HODs through open advertisement is concerned, the same was implemented in the PAU, but has been withdrawn as per decision of Board of Management.</p>

13	Health insurance is not provided. It is recommended to take necessary steps for providing health insurance to all the students including international students	<p>The health care facility, both indoor and outdoor, exists in the university campus which caters to emergent medical needs of the students.</p> <p>For outside hospitalization of students, the reimbursement provision to the tune of 75 % of the amount subject to maximum of Rupees Forty Thousand (Rs. 40,000/-) has been made. The medical bills are reimbursed to the students by the University.</p>
14	Faculty wise placement and personality development centre may be created to provide adequate opportunities and respective subject matter domains	<p>A central cell (University Counselling and Placement Guidance Cell) is functional in the University for students' placement and counselling activities. The central cell is under the administrative control of Director Students' Welfare.</p> <p>The placement cell maintain continuous liaison with the various companies and corporates for placement of undergraduate and postgraduate students of different colleges in leading companies. Placement and personality development programmes are also organised at regular intervals.</p>
15	The entire state fund is utilized to meet the salary expenditure except those from RKVY. The state government needs to provide adequate amount to meet the contingency requirement for effective utilization of the expertise available with the university for research and extension programmes	The State Government is regularly providing contingency under different schemes to PAU, wherein, Rs. 44.60 crore were allocated from 2018-19 to 2021-22.
16	Considering the available plant varieties, technologies and expertise in various advanced areas, further initiatives may be taken to enhance the internal resources through commercialization and licencing of technologies	The university has Technology Marketing and IPR Cell (TMIPR Cell) which is commercializing various technologies by signing non-exclusive Memorandum of Agreements (MoAs), so that the technologies reach to masses. All the marketable technologies under the TMIPR Cell have been uploaded on the PAU website for the information of masses. During the report period, 44 technologies developed by PAU have been commercialized through 158 MoAs on non-exclusive basis to various entrepreneurs.



17	Alumni Support needs to be strengthened further	<p>The PAU has more than 4000 registered alumni both from India and abroad. The alumni are kept posted about the activities and updates about PAU. Similarly, the alumni activities of the chapters in different countries are also shared in the group and the chapters' links have been provided on the PAU Alumni portal on the homepage of the PAU website. The College of Agricultural Engineering and Technology (COAET) organizes lectures by experts, annually, to tap their professional knowledge for career building of budding agricultural engineers. Besides financial assistance of approximately Rs. 7 lakhs is disbursed to students every year. In College of Community Science (COCS), alumni of the college supported the students in the form of two fellowships and one medal during the report period.</p> <p>The Alumni of the College of Basic Sciences and Humanities (COBSH) have funded 15 fellowships/scholarships/medals for the College students. In College of Agriculture (COA), ten fellowships/scholarships and medals have been instituted for students of the college from the financial support provided by Alumni of the college.</p>
18	Tenure of Deans is only four years and not as per model act of ICAR	<p>The post of Dean and the tenure is as per provision contained in the PAU Act & Statutes. The discussions have been initiated to implement various provisions. As soon as the Model Act is implemented, the tenure would be changed.</p>
19	As per records, 30% faculty posts are vacant in College of Agriculture (COA), which should be filled in time-bound manner and supporting staff needs to be increased	<p>Efforts have been made to fill the vacant faculty positions over the period of time.</p> <p>During the report period, a total of 47 new appointments were made in COA - 11 Assistant Professors in the Department of Plant Breeding and Genetics, one in School of Agricultural Biotechnology, one in Department of Agrometeorology and Climate Change, three in Department of Extension Education, 15 in Department of Soil Science, three in Department of Entomology, five in Department of Plant Pathology, four in Department of Food Science and Technology and five in Department of Agronomy. Vacant posts of supporting staff are being filled on receipt of permission of the competent authority and as per requirement.</p>
20	Feedback mechanism in COA, although in place, yet, needs to be improved for enhancing quality of education	<p>Feedback mechanism from UG & PG students is in place in the College of Agriculture and regular confidential feedback is taken from the students of various courses. Feedback from parents is taken through respective advisors as well as during parent-teacher meetings for which a Parent-Teacher Committee is in place at college level.</p>
21	School of Organic Farming may be renamed as School of Organic Farming and Good Agricultural Practices	<p>The School of Organic Farming is a suitable name as all the production and protection technologies developed by different departments and included in the Package of Practices are good agricultural practices.</p>
22	Board of Studies (BOS) of COA need to have experts drawn from outside the university	<p>The Board of Studies comprises of the Dean of the college as Chairperson, Dean, Postgraduate Studies and all Heads of Departments of the college as members. In addition, one senior-most Professor, one senior most Associate Professor and one senior most Assistant Professor are nominated as member by the Chairperson, by rotation. The Chairperson gets the nomination of Secretary, BOS, duly approved from the Vice Chancellor.</p>

23	Students may be included in Board of Studies of COA as special invitees	Students' representatives are members of a number of college level committees, but there is no provision in PAU Act & Statutes to include student representatives in BOS. However, their proposals are surely deliberated in the meetings of BOS, RIC (Resident Instructions Committee) and Academic Council.
24	Ratio of 3:2:1 (Assistant:Associate:Professor) need to be maintained in COA for efficient functioning	Sanctioned strength of posts is in accordance with the prescribed ratio.
25	Diverse faculty is in place, however, serious attempt need to be made to attract talents from outside state	During the last five years more than 40% faculty appointments have been made from outside state. Many newly recruited faculty during this period belong to other states viz.: Department of Plant Breeding and Genetics (6 out of 11), Soil Science (6 out of 15), Plant Pathology (3 out of 5), Food Science (3 out of 4), Extension Education (1 out of 3), School of Agricultural Biotechnology (1 out of 1).
26	National and International exposure of faculty of COA needs to be enhanced	The Directorate of Research has a special scheme under which scientists are asked to identify the reputed international institutes/scientists where they can spend 6-12 months and equip with the advanced techniques in this area of research. During the period under report, more than 43 scientists visited International Institutes in about 14 different countries.
27	Sabbatical leave by the faculty of COA needs to be promoted	To encourage/ motivate the faculty to avail Sabbatical leave, the university has amended the rules/ guidelines of the same as under: 'To promote sabbatical leave, the PAU faculty should be encouraged to use the same even in nearby institutions. There are very good national institutes at Mohali, Chandigarh and Ropar. Guru Nanak Dev University, Amritsar and Punjabi University Patiala may also be considered for sabbatical leave in selected subjects where these universities have good strength.' During this period three teachers availed sabbatical leave.
28	Cataloguing of books etc. needs to be computerized and reading hall should be spruced up in book bank and reading hall of COA	All the books in the Book Bank of the colleges are catalogued on computer. The Book Bank Hall is well equipped with all required facilities. The computerized cataloguing of books and digitization of the library is under process.
29	Attrition rate is high in B.Tech. (Biotechnology) especially of girl students	Students move to other professional courses as PAU counselling is usually done much before the counselling of professional courses at All-India level.



30	In hostels, chairs for sitting and reading need to be provided immediately	Chairs have been sufficiently provided in hostel rooms. Further, whenever any additional requirements arise, these are arranged accordingly.
31	Availability of contingency for research is inadequate in COA, therefore, the university needs to search for funds for research as the grant from the state is adequate only for salaries and pension	PAU regularly demands contingency funds and State Govt. has been providing contingency under different schemes. During the period 2018-19 to 2022-23, an amount of Rs. 170.54 crore has been received by the College of Agriculture as research contingency, from various funding agencies.
32	A large amount of fund is available under Corporate Social Responsibility (CSR) and the college need to make serious attempt in collaboration with the state of Punjab to attract funds for meeting recurring expenses in research, education as well as extension	<p>The university has been approaching/contacting various companies/private organizations in this context. Facilities like ambulance, benches, dustbins, green campus, CRM Machines, etc. have been provided by various organizations under CSR Support.</p> <p>Owing to efforts in this endeavour, a Project entitled 'Sensitizing farming families for sustainable water use behavior' by BCS India Pvt Ltd was supported under CSR in 2022. Under the project, sensitization programmes were conducted in the selected villages, demonstration units (Rain water harvesting structure) were installed in each selected village. Other water saving devices had also been distributed to the farm families.</p>
33	Selection of students in ARS shows declining trend which does not indicate prevalence of excellence in teaching and COA has to start special coaching for the students appearing in ARS	Trainings, seminars/ lectures and special sessions are being organized for the students of the college seeking admissions in national and international institutes. A number of students qualify UGC/ICAR JRF every year. During the report period, a total of 23 students got JRF, 36 students got SRF, 95 students qualified NET conducted by various agencies like UGC, ASRB, ICAR and five students qualified ARS examination.
34	Students' placement cell needs to be strengthened and invite more number of recruiting agencies	<p>A central cell (University Counselling and Placement Guidance Cell) exists in the University for Placement and Counselling activities. Employment Fairs are regularly organized to help students get jobs in various private and public sector undertakings. Placement Cells are also functioning in all the colleges and activities like personality development workshops/ lectures, are regularly being conducted.</p> <p>Students enroll themselves with the Placement Cell of the College and the information on various advertisements related to various vacancies are sent to students through emails or WhatsApp groups. Two Employment fairs were organized during the reporting period, for benefit of the students.</p>

35	The College of Agriculture needs to train the students additionally to make them industry-ready, start-up ready and entrepreneurship-ready	<p>UG and PG students of the college are guided through special lectures/ workshops/trainings to prepare for competitive exams (JRF, SRF, NET) as well as preparing for various posts in private and public sectors.</p> <p>Two extra-mural projects on employability of Agricultural University students were conducted and annually two workshops on Web designing/ photography/ video production were conducted to improve the technical skills of students.</p> <p>Visits of students to established entrepreneurs, media houses, training institutes and non-government organisations are also organized for students' motivation so that they may be job providers rather than job seekers.</p> <p>Workshops are regularly organized for entrepreneurship development and skill enhancement of the students by inviting eminent experts.</p> <p>Inter-disciplinary hands-on training (80 to 120 hours) by the university faculty has been initiated for the UG students in addition to their UG curriculum to enhance their professional skills.</p>
36	The staff of College of Agricultural Engineering and Technology (COAET) need training on the complete use of Smart class rooms for curricula delivery using all available features like smart classrooms/interactive boards etc.	<p>To enhance the acquaintance of faculty with smart classroom for efficient utilization of the facility, trainings for smart class room usage were arranged by the office of Dean, Postgraduate Studies, PAU.</p> <p>A live demo on smart class room platform was organized by College of Agricultural Engineering & Technology to acquaint the faculty with features of smart class room platform for academic work including online teaching.</p> <p>Faculty members also attended ICAR organized 'Capacity Building Session for all Agricultural Universities' under NAHEP.</p> <p>Smart class rooms are now being used for seminars, guest lectures and also for teaching of UG and PG courses.</p>
37	In COAET, one hall is presently occupied by state government which may be got vacated at the earliest to enable the college to use	<p>Examination Hall is available with the COAET but occupied by District Administration since 25.07.2016. Regular correspondence is being done to get it vacated as early as possible.</p> <p>However, a newly built Examination Hall (Dr K S Aulakh Examination Hall) is available to all constituent colleges for conducting various exams.</p>
38	Research contingency in COAET, must be improved by securing externally aided projects	<p>Due to concerted efforts of the faculty, during the last five years, the college bagged 38 new competitive external funded and sponsored projects worth Rs. 324.58 lakh.</p>



39	Few students in COAET are going for JRF/SRF/ARS and mostly the students are inclined for higher study abroad. Students may be encouraged to go for GATE also	<p>Counselling activities/sessions, trainings, seminars/lectures and special sessions were organized for the students seeking admissions in national and international institutes to help the students plan their higher education and because of these efforts, every year a good number of students got admission in top Institutes like IIT's, IIM, IRMA, MANAGE etc. to pursue higher education after clearing GATE/CAT, ARS-NET, CSIR-UGC NET, UGC/ICAR JRF etc</p> <p>During 2023, five students of the college qualified ASRB-NET and two qualified UGC/CSIR NET.</p>
40	In COAET, feedback from stakeholders (Students, Parents, industries, employers, farmers etc.). It should be completely confidential without provision for the name of the student	<p>Feedback mechanism from UG and PG students is now in place in all the colleges and regular confidential feedback is taken from the students for various courses.</p> <p>Now, a feedback proforma has been approved by the University which is now further being developed into Google Form which will be available online on the PAU website.</p> <p>Feedback from parents is taken through respective advisors as well as during parent-teacher meetings for which the PAU has Parent-Teacher Committees at college levels.</p> <p>The Registrar is also sending a copy of the OCPA sheet of every semester to students' parents by post.</p> <p>All the constituent colleges also have a well organised advisory system at different levels, i.e. Advisor/Class Incharge/HOD. All the issues related to academics or otherwise are discussed in the various level advisory meetings held at regular intervals (weekly every Wednesday, VII period). Students are also free to discuss their academic issues with Advisor, HOD and Dean, as and when need arises.</p> <p>Any feedback from any stakeholder at all platforms, including Academic/Research/Extension Councils or by BOM, are always considered.</p> <p>A WhatsApp group was also created which has parents of the students as members to apprise them of latest developments in academics and performance of students and also to get feedback from them.</p> <p>It is mandatory now for every student to provide feedback for every course towards the end of the semester.</p>
41	More interaction of students with Dean, College of Basic Sciences and Humanities (COBSH) needed	<p>The Dean of the college addresses the students at the time of admission to inform them about the academics of the College and various facilities and available infrastructure. During the course of the semesters, advisory meetings at Advisor, Class Incharge, Head of the departments and Dean level (every Wednesday during VII period) are also held and any feedback from the students is conveyed to the Dean and required actions are taken accordingly. Regular Dean's level meetings with the students are scheduled (at least three in each semester) and as and when required.</p> <p>In the college, an Academic Affairs Committee (AAC) is constituted with Chairperson Teaching Committee (CTCs) of all the departments as the Members. This is also a mechanism to seek the feedback related to the activities of the college by the Dean.</p> <p>Further, every application of feedback/issue/problem from any student is duly attended to by the Dean.</p>

42	A Bio-safety induction committee/programme to be arranged for safe use of biologicals, chemicals, etc. in COBSH	Organic solvents are distilled and reused for further reactions/ column chromatography/ washings, etc. Greener technologies such as use of sonicator, microwave and photocatalysis are preferred. Laboratory waste is also segregated into wet and dry waste bins and disposed off properly. For disposal of biological waste, services of a private biological disposal company are being utilized along with the facility of incinerator. Further, the biological waste is also discarded after autoclaving, as per protocol. Majority of the departments are working on plant based material. Any such agricultural research material left is used for composting. Handling of biological waste also forms the part of curriculum in various courses.
43	In COBSH, more than 50% of the position lying vacant in the Departments viz. Biochemistry, Economics & Sociology, Math, Stat & Physics, and Microbiology and more faculty from outside the State to be recruited as only 6% outside faculty is in place	A total of 31 new appointments were made in various departments of the college and out of these 11 appointees were from outside state. In addition, 12 Teaching Assistants have also been recruited on contract basis under Self Financing Scheme.
44	In COBSH, as only half of the sanctioned strength of the technical and supporting staff in position, so, efforts need to be placed for recruiting more staff to meet desired requirement.	Ten posts of technical and supporting staff were filled during the reporting period and more vacant posts will be filled on receipt of permission of the competent authority.
45	Necessary steps to be taken to develop a comprehensive library in COBSH	A College level Book Bank has been established.
46	Faculty of COBSH should be encouraged to bring more externally funded projects to further strengthen the laboratory facilities in the cutting edge areas of research	The scientists of the college are regularly motivated to write and submit project proposals to various funding agencies like DBT, DST, ICAR, etc. Under Career Advancement Scheme, due weightage is being given to the scientists based on the amount of funds generated through bringing new competitive projects. The existing labs have been strengthened by adding more gadgets /machines /equipment. The college has received a grant of about Rs. 4.5 crores from DBT and two new labs with common facilities are being developed for students/ research workers. Concerted efforts were made to enhance the research contingency of the college and as a result, the college bagged 58 research and sponsored projects worth Rs. 892.04 lakhs.



47	Emphasis need to be given to create more facilities as required for basic sciences, e.g. Bioinformatics, and Computational Biology	<p>Department of Economics and Sociology of the college provided Advanced excel training on understanding NSSO-unit and extraction process, Data collection using ODX and other software, a training on Impact Assessment Technique and another training on E-Views-12: A Walk.</p> <p>Skill enhancement programmes are organized such as Data Entry, Research Tools and Research Analysis, etc. to hone varied skills of learners.</p>
48	Summer internship of 4-6 weeks for Agribusiness students seems out of place in COBSH	MBA (Agribusiness) students now undergo 6-8 weeks of summer internship at the end of second semester. School of Business Studies of the college is arranging internship of students in reputed agribusiness and other related organisations like Verka, Vardhman Spinning Mills, Trident, Amul, NABARD, etc.
49	It is suggested that an open final viva-voce examination be conducted for Ph.D. Thesis evaluation for students of COBSH	<p>Thesis and comprehensive viva-voce for M.Sc. and Ph.D. students are conducted by an external examiner in the presence of members of Advisory Committee members and HOD. During Covid-19 regime, the viva-voce were conducted through online mode by the external examiner and Advisory Committee.</p> <p>Existing rule has recently been amended and now open final examination shall be conducted for Ph.D. thesis evaluation. According to a newly amended rule, there will be two external examiners for the evaluation of Ph.D. theses, and out of two, one external examiner shall conduct the viva-voce.</p>
50	In COBSH, more motivational lectures on Personality development by subject matter specialists need to be arranged	<p>Placement Cell is working towards soft skill development of the students. Workshops/ sessions related to personality development are organized throughout the year.</p> <p>A large number of personality development workshops/ webinars/motivational lectures for uplifting the personal as well as professional skills of the students were organized by the various constituent colleges. These lectures by eminent personalities and professionals include topics like Stress Management, Road Safety, Post Covid Effects and Vaccination, Women's Health, Art of Well Being and Mind Set to Succeed in Life, organized by various constituent colleges and Directorate of Students' Welfare.</p>
51	Provisions to be made for adequate lighting system in the existing Lecture Room-cum-Examination Halls of COBSH	The Examination Halls/classrooms of the colleges are now fully furnished. The lighting in Lecture Room-cum-Examinations Halls has been enhanced by installing more LED lights.
52	Exhibition Hall only for the Zoology students is in place. Necessary steps to be taken over time to cover all other basic sciences subjects	<p>Mushroom Complex with practical oriented live demonstration has been developed by the Department of Microbiology.</p> <p>Botanical Garden has also been established in the year 2021 by the Department of Botany, where the rare and endangered species of plants have been preserved.</p>

53	The performance students of COBSH in national examinations needs further improvement and serious efforts needed to ensure maximal participation of students in all such competitive examinations with emphasis on ARS	<p>Continuous efforts are being made to motivate the students to appear in national level exams; the performance of students is improving in competitive exams including ARS.</p> <p>During last year, 23 Bachelor degree students of the PAU qualified ICAR's AIEEA-PG-2023 examination for admission to Masters' degree programmes and 46 students qualified ICAR's AICE-JRF/SRF-2023 examination for admission to Ph.D. programmes, with two students achieving first rank at All-India level. Further, a large number of students of the PAU are competing at international levels and are securing admission for higher education in highly reputed laboratories in foreign countries.</p>
54	Students need to be encouraged to initiate 'start ups', in collaboration with students from Agribusiness Management	Students are regularly motivated through various guest lectures of successful entrepreneurs, participation in start-up fairs and through continuous interaction with Incubation Centre of the PAU. In 2022-23, 28 lectures were arranged by reputed experts from industry.
55	Less students are admitted in different programmes of College of Community Science (COCS) i.e. Bachelors, Masters and Doctorate	<p>Concerted efforts are regularly being made to augment the intake of students including through wide publicity of admission notices in regional/national newspapers apart from personal contact campaigns for various academic facilities in the university.</p> <p>The Information Technology service have been upgraded and PAU website is updated constantly and PAU achievements and rankings at the national level is highlighted to attract the young talent for various programmes</p> <p>Counselling sessions and exposure visits are regularly organized for the undergraduate students to motivate them to get admission in various post graduate programmes.</p>
56	Few staff members have abroad training experience in COCS	The faculty members are being encouraged to visit abroad for trainings/research collaborations etc. Two scientists visited abroad during the reporting period.
57	Smart classrooms in COCS exist, but staff should make more efforts to utilize them to optimum level	<p>All the UG and PG classes, seminars, examinations and guest lectures are conducted in the smart class rooms. The multimedia facilities were extensively used for online lectures during COVID time and even now for hybrid mode of teaching. Softwares like Whiteboard and Jamboard are being extensively used for online teaching.</p> <p>The university level Smart Class Room established under ICARs' Agri-Diksha is intensively being used for making lecture videos.</p>
58	The informal training and placement committee is effectively functioning. Need to create placement cell in COCS	A central cell (University Counselling and Placement Guidance Cell) is existing in the University for Placement and Counselling activities. Now, Placement Cells are also functioning in all the colleges and activities like personality development workshops/ lectures, are regularly being organized.
59	COCS does not have its separate auditorium	Auditoriums are already existing in College of Agriculture (B P Pal Auditorium), COBSH (Wheat Auditorium) and COAET (Jacob Hall). A common auditorium (Dr Manmohan Singh Auditorium) is available at University level to be used by any of the constituent colleges, as and when required. Dr Manmohan Singh Auditorium further has hi-tech equipped small units for accommodating smaller audience.

LIST OF MOUS BETWEEN PAU AND OTHER UNIVERSITIES / INSTITUTIONS EXECUTED FROM THE YEAR 2018-19 TO 2022-23

Sr.No.	Univ.	Name of the institution
1	PAU	Department of Industries and Commerce, Chandigarh
2	PAU	International Center for Agricultural Research in the Dry Areas (ICARDA), Beirut, Lebanon (Headquarter)
3	PAU	M/s. EdCIL (India) Limited Vijaya Building, 5 th Floor, 17-Barakhamba Road, New Delhi
4	PAU	M/s. CDSL Ventures Ltd., Marathan, Futurex, 'A' Wing, 25 th Floor, Mafatlall Mills Compound, M.M. Joshi Marg, Mumbai-400013
5	PAU	M/s. ITC Limited, Chandigarh
6	PAU	Galilee International Management Institute, Israel
7	PAU	Tel-Aviv University, Israel
8	PAU	ARAWA Institute, Israel
9	PAU	Mahindra & Mahindra Limited, Gateway Building, Apollo Bunder, Mumbai-400001
10	PAU	University of Canberra, Australia
11	PAU	Nippon Steel & Sumikin Bussan Corporation, Tokyo, Japan
12	PAU	Haryana State Swachh Bharat Mission Development and Panchayats Department, Haryana
13	PAU	Michigan State University, East Lansing, Michigan, USA
14	PAU	Punjab & Sind Bank, Amritsar
15	PAU	Thapar Institute of Engineering & Technology, Patiala
16	PAU	John Deere (India) Pvt. Ltd., (JDIPL), Pune
17	PAU	Guru Nanak Dev University, Amritsar
18	PAU	India Meteorological Department, Ministry of Earth Sciences, Mausam Bhawan, Lodi Road, New Delhi-110003
19	PAU	Indian Institute of Food Processing Technology, Thanjavur (TN)
20	PAU	Jamia Millia Islamia University, New Delhi
21	PAU	M/s. Pagro Frozen Foods Pvt. Ltd., Sadhugarh (Fatehgarh Sahib)
22	PAU	California State University, Fresno, USA
23	PAU	International Fertilizer Development Centre (IFDC), Muscle Shoals Alabama, USA
24	PAU	International Rice Research Institute (IRRI), Manila, Philippines
25	PAU	National Research Development Corporation, New Delhi
26	PAU	Indian Institute of Technology, Roorkee, Uttrakhand
27	PAU	M/s. PepsiCo India Holdings Pvt. Ltd. (PIH), Gurgaon,
28	PAU	The Forest and Wildlife Department, Chandigarh Administration.
29	PAU	The Maharashtra State Seeds Corporation Limited, Mahabeej Bhawan, Krishi Nagar, Akola (MAH)
30	PAU	Punjab Biotechnology Incubator, Mohali
31	PAU	Centers for International Projects Trust, C-59, Shivalik Malviya Nagar, New Delhi-110 017
32	PAU	Directorate of Economics & Statistics, Department of Agriculture & Farmers Welfare, Govt. of India, New Delhi
33	PAU	National Remote Sensing Centre ISRO, Department of Space, Govt. of India, Balanagar, Hyderabad-500037

34	PAU	M/S Sokhi Manufacturing, Samrala
35	PAU	ICAR-Indian Institute of Soil Science, Nabibagh, Bhopal
36	PAU	IIT Ropar-Technology and Innovation Foundation for iHub-AwaDH, Indian Institute of Tecnology, Ropar 140001 & Punjab Water Regulation and Development Authority, Chandigarh
37	PAU	Forest Research Institute, Dehra dun, Uttrakhand-248006
38	PAU	The Research Institute of Organic Agriculture (FiBL), Switzerland
39	PAU	FMC India Pvt. Limited TCG Financial Centre, 2 nd Floor, Plot No. C-53, G-Block, Bandar Kulra Complex, Bandra (East)-Mumbai 400098
40	PAU	CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (HP)
41	PAU	Agricultural Research Organization, Volcani Centre, Israel
42	PAU	ICAR-Central Institute for Cotton Research, Nagpur
43	PAU	Nature Conservancy India Solutions Pvt. Ltd., 37, Link Road, Lajpat Nagar-III, New Delhi-110024
44	PAU	Indian Institute of Maize Research, Ludhiana
45	PAU	Punjab Remote Sensing Centre, Ludhiana
46	PAU	Indian Council for Cultural relations, Ministry of External Affairs, Govt. of India
47	PAU	Mrs Bectors Food specialists Ltd., Theing Road, Phillaur
48	PAU	ICICI Foundation for inclusive growth, Chennai
49	PAU	National Centre for Organic & Natural Farming (NCONF), Ghaziabad
50	PAU	The International Crops Rsearch Institute for the Semi-Arid Tropics (TCRISAT) Patancheru 502324, Telangana

LIST OF INTERNATIONAL COLLABORATIVE PROJECTS FROM 2018-19 TO 2022-23

Sr. No.	Name of the project	Principal Investigator / Department	Funding agency	Sanctioned Budget (Rs.)	International Collaboration
1.	Climate Smart Management Practices	Dr. Buta Singh Dhillon Deptt. of Plant Breeding & Genetics	International Rice Research Institute (IRRI), Philippines	4,48,960	International Rice Research Institute (IRRI), Philippines
2.	Multiplex genome editing for transitional research aiming at designing novel resistance against bacterial blight in rice	Dr. Kumari Neelam School of Agril. Biotechnology	Indo-US Science & Technology Forum (IUSTF), New Delhi	14,20,000	University of Maryland, USA
3.	Use of big data Analytics for adaping impact of climate change on water Resources.	Dr. Rajan Aggarwal Department of Renewable Energy Engg.	DST New Delhi	9,10,000	Dr. Ahmed Awmy Ahmed Farag, 7 – Fahmey St. Manyli El Roda, Cairo, Egypt
4.	Mining the genetic diversity for rust resistance in wild wheat <i>Aegilops tauschii</i> through combination of AgRenSeq and Genome wild Association Mapping.	Dr. Parveen Chhuneja School of Agril. Biotechnology	DST New Delhi	9,10,000	Field Crop Research Institute, Agricultural Research Centre, Egypt
5.	Impacting sheath blight disease tolerance in rice”	Dr. J.S Lore Deptt. of Plant Breeding & Genetics	(IRRI) New Delhi through DBT	8,00,000	International Rice Research Institute (IRRI), Philippines
6.	Accelerating Genetics Gains in maize & wheat for improved Livelihoods (AGG)	Dr. V S Sohu Dr. G S Mavi Deptt. of Plant Breeding & Genetics	Bill & Melinda Gates, Foundation through CIMMYT, Mexico	7,45,139	Bill & Melinda Gates, Foundation, U.S.A.
7.	Towards effective genetic & Sustainable management of Assochyta. Blight of Chickpea	Dr. Saravjit Singh Dr. Upasna Rani Deptt. of Plant Breeding & Genetics	Grains Research & Development corporations (GRDC), New Delhi,	2,72,430	ICARDA-EGYPT
8.	Climate management practices.	Dr. Buta Singh Dhillon Deptt. of Plant Breeding & Genetics	International Rice Research Institute, Philippines	6,71,220	International Rice Research Institute, Philippines.
9.	Accelerating the mainstreaming of elevated zinc in global wheat breeding a Fluoride in meter, approach to nutrition	Dr. VS Sohu, Dr. GS Mavi Deptt. of Plant Breeding & Genetics	Bill & Melinda Gates Foundation through CIMMYT, Mexico	15,22,713	Bill & Melinda Gates Foundation through CIMMYT, Mexico

10.	AGGRI Alliance (One IRRI Breeding Network – DELS-1)	Dr. R S Gill, Deptt. of Plant Breeding & Genetics	International Rice Research Institute, Philippines	2,97,000	International Rice Research Institute, Philippines
11.	Rice value chain, value addition pest harvest management ICAR-IRRI Collaborative work plant project	Dr. Mahesh Narang, Deptt. of Farm Machinery & Power Engg	International Rice Research Institute, Philippines	2,42,400	International Rice Research Institute, Philippines
12.	To develop a work plan for developing the fertilizer deep placement with international fertilizer development centre	Dr. H S Sidhu, Deptt. of Farm Machinery & Power Engg	IFDC, USA	3,32,968	International Fertilizer Development Centre (IFDC), USA
13.	Transformation India's Green Revolution by Research & Empowerment for sustainable food supplies (TIGR2ESS).	Dr. Achla Sharma , Plant Breeding & Genetics Dr. Parveen Chhuneja School of Agricultural Biotechnology Dr. Sandeep Kapoor School of Business Studies	University of Cambridge, U.K.	5,53,89,000	University of Cambridge, United Kingdom.
14.	Genetic transformation of PAP1 gene in American cotton accessions coker 312 and PAU Bt 1 for developing coloured cotton	Dr. Navraj Kaur School of Agri. Biotechnology	Nippon Steel trading company Limited, Japan	1,75,04,780	Nippon Steel trading company Limited, Japan
15.	New varieties of direct seeded rice for farmers in lower middle income countries	Dr. Nitika Sandhu School of Agril. Biotechnology	Research & Innovation fund, United Kingdom through IRRI South Asia Regional Centre, (Varanassi)	131,37,300	Department of Plant Science, Rothamsted Research, Hertfordshire, United Kingdom
16.	Genomics improvement of biotech & abiotic stress tolerance in mustard rape for economics & environment sustainability.	Dr. SS Banga Dr. Gurpreet Kaur Deptt. of Plant Breeding & Genetics	DBT New Delhi	65,21,200	University of York, U.K. University of Hertfordshire, U.K. Rothamsted Research, U.K.



STEERING COMMITTEE FOR THE INSTITUTIONAL ACCREDITATION

Chairman **Dr Satbir Singh Gosal, Vice Chancellor**

Convener **Dr Manav Indra Singh Gill, Dean Postgraduate Studies**

Member

1. Dr Rishi Pal Singh, Registrar
2. Dr Shammi Kapoor, Dean (Addl. Charge), College of Basic Sciences and Humanities
3. Dr Manav Indra Singh Gill, Dean (Addl. Charge), College of Horticulture and Forestry
4. Dr Charanjit Singh Aulakh, Dean, College of Agriculture
5. Dr Manjeet Singh, Dean, College of Agricultural Engineering and Technology
6. Dr Kiran Bains, Dean, College of Community Science
7. Dr Ajmer Singh Dhatt, Director of Research
8. Dr Makhan Singh Bhullar, Director of Extension Education
9. Dr Nirmal Jaura, Director of Students' Welfare
10. Dr Yogita Sharma, University Librarian (Addl. Charge)
11. Dr Shammi Kapoor, Comptroller (Addl. Charge)
12. Dr Rishi Indra Singh Gill, Estate officer (Addl. Charge)
13. Dr Vishvajeet Singh Hans, Chief Engineer (Addl. Charge)
14. Dr G P S Sodhi, Additional Director of Extension Education
15. Dr P P S Pannu, Additional Director of Research (NR & PHM)
16. Dr Gursahib Singh, Additional Director of Research (FMBE)
17. Dr G S Mangat, Additional Director of Research (CI)

TASK FORCE FOR THE INSTITUTIONAL ACCREDITATION

Chairman **Dr Satbir Singh Gosal, Vice Chancellor**

Convener **Dr Manav Indra Singh Gill, Dean Postgraduate Studies**

Working Committee

1. Dr P K Chhuneja, Ex Professor, Department of Entomology
2. Dr Rohinish Khurana, Professor, Department of Farm Power & Power Engineering
3. Dr Harmeet Singh, Professor, Department of Agronomy
4. Dr Snehdeep Kaur, Assistant Professor (Education), O/o Dean, PGS
5. Dr S K Dhillon, Professor, Department of Plant Breeding and Genetics
6. Dr Satish Sharma, Professor, Department of Processing and Food Engineering
7. Dr Simerjeet Kaur, Principal Agronomist, Department of Agronomy
8. Dr Mohit Gupta, Professor, School of Business Studies
9. Dr Tejpreet Kaur Kang, Professor, Department of Human Development and Family Studies
10. Dr Ritu Gupta, Associate Professor, Department of Resource Management & Consumer Science
11. Dr Sucheta Sharma, Professor, Department of Biochemistry
12. Dr Priya Katyal, Microbiologist, Department of Microbiology
13. Dr Ashoo Toor, Assistant Professor, Department of Agricultural Journalism, Languages & Culture
14. Dr Vineet Kumar, Professor, Department of Plant Pathology
15. Dr Anirudh Thakur, Professor, Department of Fruit Science

Table 1: Intake capacity & Students admitted in 2023-24

Name of the Programme	Intake capacity	Students Admitted
UG Programmes		
B.Sc (Hons.) Agri. 4year	106	106
B.Sc (Hons.) Hort. 4 year	61	61
B.Tech.Food Tech. 4 year	76	69
B.Tech. (Biotech.) 4 year	75	46
B.Sc. (Hons.) Community Science 4 year	57	12
B.Sc. (Hons.) Nutrition & Dietetics 4 year	71	53
B.Sc. (Hons.) Agribusiness Management 4 year	40	26
B.Tech. (Agril.Engg.) 4 year	87	87
B.Sc. (Hons.) Agril. 4 year prg at Ballowal Saunkhri	64	59
B.Sc. (Hons.) Agri. 6 year (2+4) at Bathinda	64	63
B.Sc. (Hons.) Agri. 6 year (2+4) at Gurdaspur	62	61
Diploma in Agriculture 2 year at Ludhiana	60	25
Diploma in Agriculture 2 year at Faridkot	30	-
Diploma course in Hybrid Seed Production Technology	40	-
Total	893	668
5 year integrated M.Sc (Hons)	90	8
PG Programmes		
College of Agriculture		
Agronomy	27	27
Agricultural Meteorology	11	11
Agricultural Extension Education	13	12
Entomology	21	20
Food Technology (Processing Technology)	23	18
Plant Pathology	17	16
Genetics & Plant Breeding	26	25
Soil Science	26	26
Molecular Biology & Biotechnology	23	10
GAT-B	10	0
Total	197	165

College of Horticulture & Forestry		
Horticulture (Fruit Science)	20	20
Horticulture (Vegetable Science)	17	17
Horticulture (Floriculture & Landscaping)	12	12
Forestry	11	11
Total	60	60
College of Agricultural Engineering & Technology		
Farm Machinery & Power Engineering	11	2
Processing & Food Engineering	17	5
RSGIS	15	14
Soil & Water Conservation Engineering	10	5
Irrigation & Drainage Engineering	10	2
CSE	8	0
Civil Engineering	7	0
Total	78	28
College of Basic Sciences & Humanities		
Agricultural Economics	23	9
Biochemistry	14	1
Botany	17	2
Chemistry	14	2
Microbiology	21	5
Sociology	11	1
Zoology	20	3
Mathematics	7	1
Physics	10	2
Statistics	8	0
MJMC	7	1
MCA 2 year	30	-
MBA	50	12
MBA Agribusiness	41	39
Total	273	78
College of Community Science		
Apparel & Textile Science	11	3

Resource Management & Consumer Science	10	2
Food & Nutrition	18	18
Extension Education & Communication Management	10	3
Human Development & Family Studies	11	6
Total	60	32
Ph.D. Programmes		
College of Agriculture		
Agronomy	16	15
Agricultural Meteorology	4	2
Agricultural Extension Education	7	7
Molecular Biology & Biotechnology	10	7
Entomology	11	11
Food Technology (Processing Technology)	11	11
Genetics & Plant Breeding	14	14
Plant Pathology	9	9
Soil Science	13	12
Total	95	88
College of Horticulture & Forestry		
Horticulture (Fruit Science)	9	9
Horticulture (Vegetable Science)	11	11
Horticulture (Floriculture & Landscaping)	4	4
Total	24	24
College of Agricultural Engineering & Technology		
Farm Machinery & Power Engineering	6	3
Processing & Food Engineering	6	1
Renewable Energy Engineering	6	0
Soil & Water Conservation Engineering	4	2
Irrigation & Drainage Engineering	4	1
Total	26	7
College of Basic Sciences & Humanities		
Agricultural Economics	9	6
Biochemistry	11	5
Botany	9	5

Business Administration	6	1
Chemistry	8	2
Microbiology	11	3
Sociology	6	1
Zoology	10	1
Total	70	24
College of Community Science		
Apparel & Textile Science	6	3
Resource Management & Consumer Science	4	0
Food & Nutrition	9	9
Extension Education & Communication Management	5	1
Human Development & Family Studies	7	4
Total	31	17

Chapter 2

ACADEMIC SUPPORT

6.6.2.3 Library

Table 2.3: Library Holdings

Particulars	2023-24
Total holdings	424270
Books, Print Journals, databases, e-journals and e-books added each year	
1.Books	1229
2.Thesis	497
3.CD format Documents	497
4.Indian print journals	2
5.Foreign print journals	08
6.Online databases	4
7.Online journals	54
8.Online journals (under CeRA & j-gate)	21840
9.e-books	-

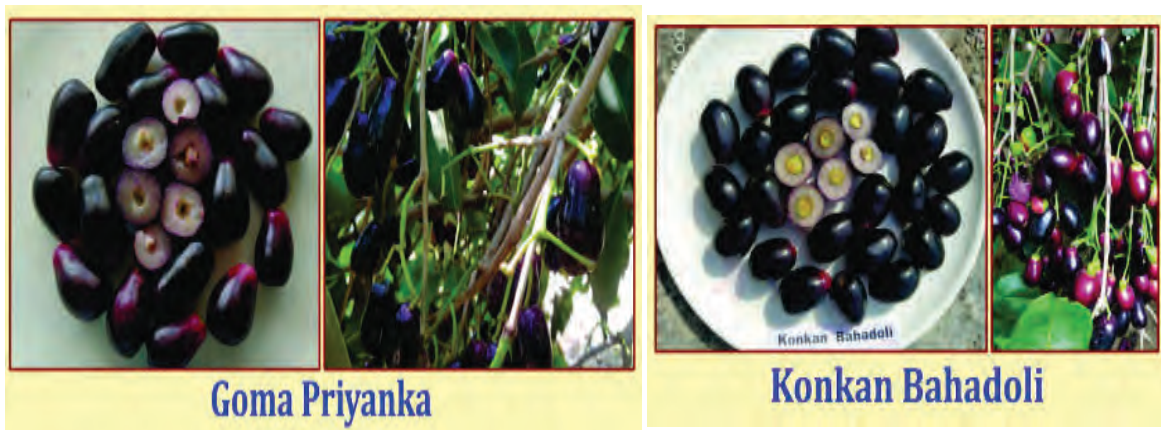
Chapter 3

RESEARCH SUPPORT

6.6.3.3. Technology Developed and its Adoption

Varieties/hybrids:

- a) Sugarcane Variety CoPb 17215 (CoPb 99): It is a mid-late maturing variety. The cane of this variety is erect, tall, medium thick, bobbin shaped internodes and greenish yellow in colour. Its juice contains 16.0 and 18.0 per cent sucrose in 10 and 12 months, respectively. It is a good ratooner. The average cane yield is about 90 t/ha. It is tolerant to the prevalent pathotypes of red rot disease and less susceptible towards early shoot borer, stalk borer and top borer.
- b) Jamun varieties-Konkan Bahadoli and Goma Priyanka: Two Jamun varieties namely Konkan Bahadoli and Goma Priyanka have been released for cultivation in Punjab. These varieties have yield potential of 51 kg.



- c) Brinjal variety- PBH-6 (2023): It is an early maturing hybrid of long fruit group of brinjal. Its plants are medium in height, compact, thorn-less with green foliage. Flowers are purple and borne in cluster. Fruits are medium-long, thin, and black purple with green calyx. Its average yield is 695 q/ha. It is also identified in Zone IV (Punjab, UP, Bihar, Jharkhand) and Zone VI (Rajasthan, Gujarat, Haryana, Delhi) of the country during 39th Group Meeting of AICRP-Veg Crops, 7-9th Sept., 2021 and released as PBH-6 in Punjab (Central level –Notification proposal submitted).



Brinjal variety- PBH-6 (2023)

- d) Lentil: LL 1655 - High yield potential: Recorded 1432 kg/ha seed yield with 10.07% and 6.15% higher yield than the check varieties L4147 and Pant L063, respectively. Moderately resistant to rust and tolerant to wilt. Good culinary properties with exceptionally high protein content.
- e) ML 1839 - High yield potential: Recorded 1058 kg/ha seed yield with 13.52, 12.55 and 27.62% higher yield than the check varieties IPM 2-3, IPM 2K-14-9 and Pant M-4, respectively. Moderately resistant to Yellow Mosaic Disease and tolerant to other foliar diseases. Medium bold seeds with good culinary properties.
- f) ML 2015- High yield potential: Recorded 1118 kg/ha seed yield with 19.96, 18.94 and 34.86% higher yield than the check varieties IPM 2-3, IPM 2K-14-9 and Pant M-4, respectively. Moderately resistant to Yellow Mosaic Disease and tolerant to other foliar diseases. Medium bold seeds with good culinary properties.
- g) Mash 878- High yield potential: Recorded 1462 kg/ha seed yield with 12.98, 15.48, 31.59 and 44.61% higher yield than the check varieties KUG 479, Pant U 31, IPU 94-1 and KPU 405, respectively. Resistant to YMV and tolerant to Web blight, Anthracnose and Bacterial leaf spot. Medium bold seeds with good culinary properties.

Table 3.6 Varieties /Hybrid released during 2023-24

Crop	Varieties released in Punjab
Wheat	PBWZN 2, PBW RS 1, PBW Biscuit 1
Basmati Rice	Pusa Basmati 1847
Maize Hybrid	DKC 9144, Bioseed 9788
Field Pea	IPFD 12-2
Chickpea	PBG 10
Fodder Maize	J1008
Proso Millet	Punjab Cheena 1
Pearl Millet	PCB 167
Fennel	Ajmer Fennel 2
Oat	OL 17
Vegetables	
Brinjal	PBHL-56
Muskmelon	Punjab Amrit
Watermelon	Punjab Mithas
Fruits	
Jamun	Goma Priyanka, Konkan Bahadoli

Table 3.7 Average yield (kg/ha) of wheat and non-Basmati paddy in Punjab

Year	Wheat	Non-Basmati Paddy
2023-24 (Estimates)	5126	7267

Table 3.8 Area under PAU recommended varieties (% to total area under crop)

Crop	2023-24
Wheat	94.14
Non-Basmati Paddy	57.34
Basmati Paddy	89.02

Table 3.10 Area and Production of Fruits and vegetable Crops

Year	Vegetables		Fruits	
	Area (ha)	Production (tons)	Area (ha)	Production (tons)
2023-24	358.8	7560	103.2	2334

Other Recommendations (Package of Practices)

- a) Standardization of propagation time and technique in sapota: The sapota cultivar Kaipatti can be propagated on Khirni rootstock by side and veneer grafting methods from March to August.
- b) IPM module for management of guava fruit borer: Guava fruit borer can be controlled by spraying two PAU Homemade Neem formulations @ 18 ml/liter water during July and again in October along with three releases of *Trichogramma chilonis* @ 2000 parasitised eggs/tree/release during July and October.
- c) Management of Planthoppers in basmati and non-basmati rice with Ecotine 5% (Azadirachtin 50 000ppm) @ 80 ml/acre under organic and conventional farming conditions (REC 299 on 29.01.2024)
- d) Management of planthoppers in basmati and non-basmati rice with PAU Homemade neem extract @ 4 litre/acre under organic and conventional farming conditions (REC 299 on 29.01.2024)
- e) Management of pink bollworm with PB Knot based Mating Disruption Technology (MDT) was approved for inclusion in POP for kharif crop in REC 299 held on 22.1.2024
- f) Management of whitefly with Clasto 20% WG (Pyrifluquinazon) in cotton was approved for inclusion in POP for kharif crop in REC 299 held on 22.1.2024
- g) Reduce dose of urea to 90 kg per acre after green manuring with sunnhemp or after application of 6 tonnes per acre of FYM. Use 110 kg urea per acre if summer moong residue has been incorporated after picking pods.
- h) One row of cucumber can be sown as intercrop in paired row trench (90:30 or 120:30 cm) planted spring sugarcane. Multiple Cropping: Maize (Green cobs/fodder)-Potato-Onion and Summer moong-DSR-Wheat, multiple cropping systems are recommended for higher productivity and returns. Sorghum multicut-Berseem, fodder based cropping system is recommended for cultivation.
- i) Spray 500 ml per acre of Novixid 3.25 OD (florpyrauxifen-benzyl 1.31%+ penoxsulam 1.2%) or 40 g per acre of Eketsu 43 WG (bispyribac 38 % + chlorimuron ethyl 2.5% + metsulfuron methyl 2.5%) for control of weeds at 20-25 days of rice transplanting.
- j) Spray 40 g per acre of Eketsu 43 WG (bispyribac 38 % + chlorimuron ethyl 2.5% + metsulfuron methyl 2.5%) for control of weeds at 20-25 days after sowing in DSR.

6.6.3.3 Technology Developed

Food Science and Technology

- a) Technology for “Production and formulation of Baker’s yeast for dough fermentation” was approved for inclusion in the compendium of technologies for commercialization in 299th REC meeting held on 22.1.2024.
- b) Technology for the development of high protein soy powders for beverage and food applications.
- c) Technology for development of value-added products from figs.

6.6.3.8 GLOBAL SUPPORT

PAU holds Collaboration Meeting on ‘Nanoengineering Aspects for Sustainable Agriculture’

In the wake of significant strides in the field of Nanoscience and its potential benefits in the promotion of sustainable agricultural technologies, the Electron Microscopy and Nanoscience Lab (EMN-Lab), Department of Soil Science, Punjab Agricultural University (PAU), organized a Collaboration Meeting on “Nanoengineering aspects for sustainable agriculture” on February 19, 2024.



Fig. 1 PAU holds Collaboration Meeting on ‘Nanoengineering Aspects for Sustainable Agriculture’

Interaction of Dr. G. S. Selopal from Dalhousie University, NS, Canada with Worthy Vice-Chancellor, Dr. S.S. Gosal and Dr. M. S. Sidhu, Dr Nitish Dhingra from EMN-Lab, Dr. Vishal Bector, Associate Director (Institutional Relations) regarding ‘Nanoengineering Aspects for Sustainable Agriculture’.

Table No 3.13 Patents Applications Filed (2023-2024)

Sr. No.	Application No.	Invention	Department	Status
1	202311062469	A vertical flow based assay detection kit of potato virus Y (PVY)	Department of Vegetable Science	Complete specification filed
2	202411028363	Technology for The Production of Bio-encapsulated Cotton Seed with Plant Growth-Promoting Bacteria (PGPB)	School of Organic Farming	Complete specification filed

3	202411040199	Robotic Mechanism for Plantation of Saplings in the Vegetable Plantations	College of Agricultural Engineering & Technology	Complete specification filed
4	202411040200	The Automated Multi-Vegetable Transplanter	College of Agricultural Engineering & Technology	Complete specification filed

Table 3.14: Patents granted in year 2023-2024

Sr. No.	Application No.	Invention	Department	Status
1	201911040938	A Process For Bioethanol Production From Industrial Graded Wheat Grains Using An Alpha Amylase	Department of Microbiology	Patent granted on 24/08/2023 and number 446897
2	2038/DEL/2015	Paddy straw Bale Com-bustor or Geyser	College of Agricultural Engineering and Technology	Patent granted on 30/08/2023 and Patent number 448270
3	201711015796	A Novel Spraying Attachment For Seed Drill And/Or Multicrop Planter	Department of Farm Machinery and Power Engineering	Patent granted on 14/09/2023 and number 451645
4	949/DEL/2015	Pollen Collector-cum-pollinator for research and commercial use in agriculture	Department of Vegetable Science	Patent grant on 18/12/2023 and number 484752
5	201711032209	Bacteriological food testing kit (BFTK) for rapid and efficient detection of presence/absence of recurrent indicator and emerging pathogens in food sample	Department of Microbiology	Patent granted on 08/02/2024 and number 508659

Table 3.15: List of technologies/varieties commercialized by PAU 2023-2024

Sr. No.	Name of the Technology	No.
Department of Food and Nutrition		
1	Vitamin D enriched mushroom powder technology	1
Department of Farm Machinery and Power Engineering		
2	PAU Cutter-cum spreader and PAU Surface Seeder	17
3	PAU Surface Seeder	4
Department of Mechanical Engineering		
4.	Hybrid Hydroponics Technology with improved Water and Nutrient perforation and recirculation system	1
Department of Food Science and Technology		
5.	Bottling of Sugarcane Juice Technology	3
6.	Multigrain Atta for Diabetics	1
Department of Plant Breeding and Genetics		
7.	Maize Hybrid PMH 14	1
8.	Maize Hybrid PMH 12	1
Department of Renewable Energy Engineering		
9.	Modified PAU fixed Dome Type Janta Model Biogas Plant having capacity from 25 m ³ /day to 500 m ³ / day.	2
10.	PAU fixed Dome Type Family size Biogas Plant having capacity from 1 m ³ /day to 25 m ³ /day.	3
11.	A Fungal Consortium for Degradation of Lignin and or Silica, Process Therefor and Application Thereof Technology	1
12.	Binderless briquettes from chopped paddy straw	1
Department of Vegetable Science		
13.	CH 27 (Chilli hybrid)	1
14.	CH-52 (Chilli hybrid)	1
15.	Tomato-TH-1	1
16.	Tomato-PTH-2	2
	Total	41

Table 3.16 List of meetings held at TMI&PR cell of Punjab Agricultural University, Ludhiana. (2023-2024)

Sr.No	Date	Major Recommendations
1	11.12.2023	Evaluation of the technology for filing the patent
2	23.02.2024	Meeting for Commercialization of technology PMH-12
3	26.04.2024	Meeting for Commercialization of technology of Kinnow Fruit bar
4	16.05.2024	Meeting for Commercialization of technology of Maize Hybrid of PMH-10
5	16.05.2024	Meeting for Commercialization of technology of OL-14

Chapter 4

Extension Support

Kisan Mela dates for 2023-24

Place	September 2023	March 2024
<i>KisanMela</i> at KVK, Nagkalan Jahangir (Amritsar)	5-9-2023	05-03-2024
<i>KisanMela</i> at RRS, Ballawal Saunkhri	8-9-2023	07-03-2024
<i>KisanMela</i> at RRS, Bathinda	29-9-2023	12-03-2024
<i>KisanMela</i> at PAU Campus	14 & 15-9-2023	14 & 15-03-2024
<i>KisanMela</i> at RRS, Faridkot	19-9-2023	18-03-2024
<i>KisanMela</i> at RRS, Gurdaspur	27-9-2023	20-03-2024
<i>KisanMela</i> at KVK, Patiala	22-9-2023	22-03-2024



Fig. 2 Kisan Mela PAU, KVK Bathinda

➤ **Flower show**

Dr MS Randhawa Flower Show at PAU on 28 & 29 February, 2024

- AICRP Workshop
- Three scientists attended “XI group discussion of the All India Coordinated Research Project(AICRP) on Fruits, from January 23-24, 2024”
- Dr BS Gill, Dr Harpreet Kaur Virk and Dr Navjot Kaur Dhillon attended the Annual Group Meeting of Soybean at UAS Dharwad on March 13-14, 2024
- Scientists attended 42nd AICRP (vegetable Science) meeting at NDUAT, Kumarganj, Ayodhya from 21-23.2.2024

- Scientists attended annual AICRP (Floriculture) meet at Horticulture research station, Kahikuchi, Assam Agricultural University, 23-25 January, 2024.
- Scientists attended XIV annual group meet of All India Network Research Project on Onion & Garlic from 11-13 January 2024 at JNKVV Jabalpur.

Other important information

- Dr. Christine Moliner, Associate Professor and Head, Centre of Migration and Mobility Studies O.P. Jindal University Sonipat delivered a lecture on Seeking Greener Pastures: Punjabi Culture of Migration and the Recent Feminisation of Migration to Canada on 05.03.2024.
- Dr. D K Marothia, President of the Indian Society of Agricultural Economics (ISAE) Mumbai, visited the Department of Economics and Sociology on 21.03.2024 to interact with faculty and students of the department.
- An Inaugural ceremony of AccelBreed Speed Breeding Facility was organized by PAU, Ludhiana on January 08, 2024.
- NABL Accreditation of Punjab Agricultural University Pump Testing Centre TC- 13307, Department of Soil and Water Engineering, PAU, Ludhiana.

TRAININGS ORGANIZED

- To improve the mental well-being of students a “Health and Happiness Workshop” was organized in the Department of Microbiology on 12th Feb, 2024. Mr. Amandeep Singh, an Ex-Merchant Navy Officer and a mentor of “Art of Living” interacted with the students and discussed that a tried and tested combination of yoga, powerful breathing exercises and meditation can help them to live healthy and happy life.



Fig. 3 “Health and Happiness Workshop” was organized by Department of Microbiology, PAU, Ludhiana.

- The Department of Microbiology and Department of Renewable Energy Engineering celebrated the “World Bio Enzyme Day” on the birth anniversary of Dr. Rosukon Poompanvong (Inventor of EcoEnzyme) on 4th January by spraying bioenzyme in a stagnant pond located in the village Majri of Mullanpur Dakhan.



Fig.4 “World Bioenzyme Day” celebration by spraying bioenzyme in a village pond by Department of Microbiology, PAU, Ludhiana.

c) Fostac Training

The Department of Food Science and Technology PAU, in partnership with FSSAI, hosted a successful Food Safety Training and Certification (FoSTaC) programme for DAV College students on 18-03-2024. The training aimed to enhance public health standards and ensure optimal food safety practices. Attended by 33 participants, the programme focused on educating students on essential food safety protocols during manufacturing and handling. Participants also gained knowledge on emerging trends, empowering them for future endeavors in the food industry.

d) Pau Training Focusses On Food Safety Practices And Skilled Manpower

In a proactive move towards fostering food safety awareness and ensuring availability of healthier foods, the Department of Food Science and Technology of Punjab Agricultural University (PAU) organized a two-day comprehensive training in “Basic and Advanced Manufacturing Modules” from 24-25 January, 2024 under Food Safety Training and Certification (FoSTaC) initiative of FSSAI. This training focused on imparting food safety practices and enhancing the availability of skilled manpower to food industries.

e) Training Course On Home Scale Processing And Preservation Of Fruits And Vegetables

A five-day Training Course on Processing and Preservation of Fruits and Vegetables was conducted by the faculty of Department of Food Science and Technology under the Skill Development Centre, PAU, Ludhiana from 15.01.24 to 19.01.24.

Chapter 5

Faculty and Staff Development

Table 5.1 Current Faculty strength College/Directorate wise and Cadre wise for the year 2023-24

Name of College/ Directorate	Faculty Position			Total Faculty
	Professor & equivalent	Associate Professor & equivalent	Assistant Professor & equivalent	
College of Agriculture	101	40	127	268
College of Horticulture & Forestry	35	9	29	73
College of Agricultural En- gineering & Technology	38	15	28	81
College of Community Science	16	5	14	35
College of Basic Sciences & Humanities	48	13	55	116
Dean Post Graduate Office	1	0	1	2
Directorate of Research	20	17	55	92
Directorate of Extension Education	24	18	90	132
Director Student Welfare	1	1	2	4
Estate Office	1	-	-	1
Library	1	1	3	5
Controller of Examinations	-	-	-	-
Total	287	119	404	810

Table 5.2 a: Distribution of Current Faculty in Teaching, Research and Extension

Name of College/ Directorate	Teaching		Research		Extension	
	Sanc- tioned	Filled	Sanc- tioned	Filled	Sanc- tioned	Filled
College of Agriculture	105	39	290	197	58	32
College of Horticul- ture & Forestry	20	16	65	47	23	10
College of Agricultural Engineering & Tech- nology	60	32	54	43	26	6

College of Community Science	40	23	12	10	5	2
College of Basic Sciences & Humanities	120	57	99	55	14	4
Dean Post Graduate Office	2	2	0	0	0	0
Directorate of Research	0	0	178	92	0	0
Directorate of Extension Education	0	0	0	0	162	132
Director Student Welfare	7	4	0	0	0	0
Estate Office	1	1	0	0	0	0
Library	16	5	0	0	0	0
Controller of Examinations	1	0	0	0	0	0
Total	373	180	698	444	288	186

Table 5.2 b: Distribution of Faculty at PAU Campus and at Outstations

Name of College or Directorate	Research			Extension		
	Total Filled Faculty	Faculty at PAU Campus	Faculty at Outstations	Total Filled Faculty	Faculty at PAU Campus	Faculty at Outstations
College of Agriculture	197	194	3	32	12	20
College of Horticulture & Forestry	47	42	5	10	5	5
College of Agricultural Engineering & Technology	43	43	-	6	6	-
College of Basic Sciences & Humanities	55	54	1	4	2	2
College of Community Science	10	10	-	2	2	-

Directorate of Research	92	11	81	-	-	-
Directorate of Extension Education	-	-	-	132	14	118

Table 5.3 Direct Recruitment and Promotions of Faculty and Higher Positions during 2023-24

Category	Recruitment/ Promotion	2023-24	Remarks
Statutory Officer		-	-
ADR/ADC/ADEE		-	-
Head		02	March, 2024
Professor & Equivalent	Direct	-	-
	Promotion	-	-
Associate Professor & Equivalent	Direct	-	-
	Promotion	-	-
Assistant professor & Equivalent	Direct	22	Feb, 2024
	Promotion	-	-

6.6.5.2 Participation of Faculty in Symposia/Workshops:

- Trainings (≥ 7 days only)/Winter school/Short courses, etc.
- Dr. O.P.Meena attended 21 days Winter School training entitled, “Crop Residue Management and Regenerative Agriculture Machinery” from February 1-21, 2024 held at Punjab Agricultural University, Ludhiana
- Dr. Madhu Sharma attended 21 CAFT training entitled, ‘Genome utilization and editing of the crop plant for useful traits’ at ICAR-NIPB, New Delhi from 7.02.2024 to 27.02.2024
- Dr Anuradha, Plant Pathologist (Sugarcane), RRS, Kapurthala attended 21 days training on “Effective Strategies for Modern Plant Disease Management” at Swami Keshwana-nd Rajasthan Agricultural University (SKRAU), Bikaner from 6th to 26th February 2024.
- Dr. Deepika Bisht attended Two weeks Refresher course on “Higher Education: National Policy and its Implementation” Two weeks Refresher course on “Higher Education: National Policy and its Implementation” at UGC-Malaviya Mission Teacher Training Centre (MMTTC), Panjab University, Chandigarh from 26.12.2023 to 08.01.2024
- Dr. Deepika Bisht attended 21 days Winter school on “Artificial Intelligence for Water Resource Management in Agriculture” at Department of Soil and Water Engineering, PAU from 18.01.2024 to 07.02.2024.
- Dr Jyoti Gaba attended UGC – sponsored Refresher Course at Panjab University Chandigarh from 15.02.24 to 28.02.24.

- Training was organized on “Precision agriculture technology including Greenhouses Management” from 07.03.2024 to 13.03.2024 at Committee room, Department of Soil and Water Engineering, PAU, Ludhiana
- Winter school Organized on “Artificial Intelligence for Water resources Management in Agriculture” from Jan 18 to Feb 07, 2024.
- Dr. Yadhu Suneja, attended a 21 days CAFT training on “ Agri-derived Nutrients and Nutraceuticals for Innovative Health Foods: Tools and Strategies” at Division of Bio-chemistry, IARI, New Delhi from 15th December, 2023 to 4th January, 2024.
- Dr. Sumita Chandel attended 10 days short course training programme on “Soil Pollutants Impact Assessment and Remediation of Contaminated Soil” at IISS Bhopal during 12 to 22 Feb 2024.
- Dr Shahida Nisar and Dr Gazala Nazir attended 21 days winter school training at SKUAST-Kashmir from 8-28, Feb 2024.
- Dr Harsimran Kaur and Dr Hari Mohan Meena attended 21 days winter school training at CSSRI Karnal from Feb 15th to March 6th, 2024.
- Symposium/Conference (National/International)
- Dr Simrat Singh, Dr Madhu Bala, Dr Aman Sharma, Participated and presented in Re-cent trends and future prospects of Floriculture in India’ January 9-11, 2024 at IIHR, Bengaluru.
- Dr. Pushp Sharma attended the 5th National Brassica Conference (Oilseed Brassicas for sustainability, Profitability & Nutritional security on Feb 7-9, 2024 at RARI, Durgapura, Jaipur (Rajasthan).
- A National Symposium on “Genomics Revolution to Foster Advances and Innovations in Crop Improvement” was organized by PAU during 27-29 Feb 2024.
- Dr GS Sanghera, Director, Dr Rajinder Kumar, Attended National symposium on “Genomics Revolution to Foster Advances and Innovations in Crop Improvement” under the aegis of Gurdev Singh Khush Institute of Genetics, Plant Breeding and Biotechnology on February 27-29, 2024 held at PAU, Ludhiana
- Dhiman, D, Kalia, A., Sharma, S.P. Taggar, M.S. and Dheri, G.S. (2024) Nano-boron application reduced the proportion of cracked tuber yield in potato. Participated and poster presentation in ISVS Golden Jubilee National Seminar on Technological Innovations in vegetable Production under changing climate regime held at Acharaya Narendra Deva University of Agriculture & Technology, Ayodhya, UP, India from 24 to 26 February 2024.
- A National Symposium on “Genomic Revolution to Foster Advances and Innovations In Crop Improvement” was organized by PAU during February 27-29, 2024.
- Dr Virender Sardana, Principal Agronomist (Oilseeds) attended and presented papers in the 5th National Brassica Conference held at RARI, Durgapura, Jaipur on February 7-9, 2024.

MoUs & Technology Commercialized

- a) MoU with NATIONAL CENTRE FOR ORGANIC AND NATURAL FARMING (NCONF) Ghaziabad for Promotion of Organic and Natural Farming
- b) MoA: Royal Sugarcane Pvt. Ltd, VPO- Basantpura, Teh- Rajpura, Distt. Patiala, Pin Code-140401 for Sugarcane Juice Bottling Technology on 28.02.2024.

Patents

- a) Indian Patent (No. 508659) has been obtained for Bacteriological food testing kit (BFTK) for rapid and efficient detection of presence/absence of recurrent indicator and emerging pathogens in food sample on 08.02.2024

Copyright

- a) Indian copyright number 21261/2022-CO/SW titled “Material Estimator for Brick wall.” Er Sarvesh Kumar from Department of Civil Engineering, Dr Rohit Sharma from Department of Processing and Food Engineering, and Dr Chetan Singla from Department of Soil and Water Engineering.

Chapter 6

Student Development

Table 6.1 Scholarship Earned by Students (2023-24)

Year	NTS	PG Scholarships/Fellowships (ICAR/ CSIR/ UGC/ INSPIRE/ICMR/others)
2023-24	133	79

National Cadet Corps(NCC)

Table 6.4: Number of cadets passed 'B' and 'C' Certificate examination from to 2023-24

College	College of Agriculture		College of Agriculture Engineering & Tech		College of Home Science		College of Basic Science		College of Horticulture and Forestry		Total	
	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'	'B'	'C'
2023-24	11	1	1	3	-	1	5	3	1	2	18	10

Table 6.5 Events organized at PAU in 2023-24

S.N.	Year	Event
National/AIU/ICAR/State level		
1	2023-24	37 th Inter-University National Youth festival for the session 2023-24 was organized by the Punjab Agricultural University, Ludhiana under the aegis of Association of Indian Universities (AIU), New Delhi. Total 2047 participants (officials, students & professionals) of 106 universities from nationwide participated in this festival. This mega event was organized at six designated venues of Punjab Agricultural University. Dr (Mrs) Pankaj Mittal (Secretary General, AIU) was the chief Guest of Inauguration ceremony & Renowned Artist Jasbir Jassi was the guest artist. On the Day of concluding, Renowned Singer Gurdas Mann was the Chief Guest.
PAU Inter-College level		
1	2023-24	PAU Inter-College Youth Festival for the session 2023-24 was organized by Directorate of Students' Welfare from November 1 to 9, 2023 at PAU campus. Students from constituent colleges & institutes of PAU participate in the events pertaining to Dance, Music, Fine Arts, Literary, Theatre & Heritage

Table 6.6 (a) Participation & Recognition of students in ICAR/AIU Inter University Festivals/Punjab State & others (2023-24)

Year	Event	AIU National Inter-University Youth Festival, GOI	AIU North Zone Inter-University Youth Festival, GOI	ICAR All India Inter-Agri Universities Youth Festival, GOI
2023-24	Debate Elocution Rangoli Quiz Mime Poster Making Mehandi Group Song Western Collage Making Literary Category		Silver Medal Silver Medal Bronze Medal 4 th Position 4 th Position 4 th Position 4 th Position 5 th Position 5 th Position Overall Runners-up Trophy	
	Elocution Debate Rangoli Literary Category	Gold Medal Silver Medal Bronze Medal Overall Runners-up trophy		

Table 6.6 (b) Participation & Recognition of students in National/Punjab State Inter University Festivals & others (2023-24)

Year	Event	National Youth Festival, GOI	Punjab State Inter-University Youth Festival, GOP
	<i>Pihri Making</i> <i>Pakkhi Bunnah</i> <i>Rwaeity Pehrawa</i> <i>Mehandi</i> <i>Lammi Hek Wale Geet</i> <i>Phulkari Kadna</i> <i>Geet Gazal</i> Poster Making One Act Play <i>Chikku Bnaunah</i> <i>Nalaa Bunnah</i> <i>Bhand</i> Mime Group Folk Song <i>Muhavredaar Vartalaap</i> Collage Making Rangoli Photography		Gold Medal Gold Medal Gold Medal Gold Medal Silver Medal Silver Medal Silver Medal Silver Medal Silver Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal Bronze Medal

Table 6.11: Workshops and Events for honing Personality and Soft Skills of the students

S. No	Topics	2023-24
1.	Personality Development	8
2	Communication Skills	4
3	Soft Skills	4
4	Entrepreneurship Skills	2
5	Career Counseling	3
6	Team Building	2
7	Resume Crafting	7
8	Mock Interviews, GD	6
9	National and International Competitions	8
10	Mental Wellness	10

Table 6.12: Campus Placement Record of the University during 2023-24

Year	PSU	Private	RF/TA	Self	Higher	Total
2023-24	21	115	18	3	103	260

PAU organized the 37 Inter-University National Youth Festival

The 37 Inter-University National Youth Festival for the session 2023-24 was hosted by Punjab Agricultural, Ludhiana, under the aegis of Association of Indian Universities (AIU), New Delhi, from March 28 to April 1, 2024. Teams/ individual winners from the eight zones of India, participated in this National Youth Festival in diverse events such as Literary, Fine Arts, Music, Dance and Theatre. The contingent of each participating university also showcased its cultural ethos in the Cultural Procession event, which was an embodiment of vibrance, colour and zest.

A total of 2047 participants (Officials, students and professionals) from 106 universities, all over the nation, congregated in this National Youth Festival, with its overarching theme- Hunar-Harvesting National Talent. 12 universities from the East Zone, 10 universities from the North East Zone, 14 universities from the North West Zone, 10 universities from the North Zone, 15 universities from the South East Zone, 12 universities from the South Zone, 17 universities from the West Zone and 16 universities from the Central Zone participated in this festival.

Hospitality and organization of PAU Ludhiana was appreciated by all the stakeholders.

Other Activities organized by the Directorate of Students' Welfare during 2023-24

- Independence Day was celebrated on 15th August 2023 with great enthusiasm at the PAU campus. Dr Satbir Singh Gosal, Vice Chancellor, PAU unfurled the Tri-color and inspected the parade of NCC cadets.
- An event regarding "G-20 Universities Connect - Participation of Youth Minds" was organized on August 21, 2023 by Guru Angad Dev Veterinary & Animal Sciences University and Punjab Agricultural University, Ludhiana. PAU students won First prize in Elocution & Poster Making, Second & fourth Prizes in Creative Writing events.

- c) Lohri Function was celebrated by the Directorate of Students' Welfare on January 12, 2024 at newly build cafeteria of Students' Home. Worthy Vice Chancellor, PAU Dr Satbir Singh Gosal was the Chief Guest of this occasion. Deans, Directors, Officers, Teachers, staff and students of PAU participated in this celebration.
- d) Birth Anniversary of Dr Mahinder Singh Randhawa was celebrated on February 2, 2024 in the Students' Home, PAU. An exhibition of Fine Art events was displayed by the university students.
- e) "Maat Bhasha Divas" was celebrated by Young Writers' Association in collaboration with Directorate of Students' Welfare, PAU on February 21, 2024. International Folk Artist from Canada S. Satinder Pal Singh Sidhwan was the Chief Guest and he shared his views and motivated the students to learn their mother language.
- f) International Women's Day was celebrated by the Directorate of Students' Welfare, PAU Ludhiana on March 8, 2024. Dr Savita, an eminent PCS officer and a former medical personal was the Chief Guest of thie event.
- g) World Heritage Day was celebrated on April 18, 2024 by the Directorate of Students' Welfare at Students' Home. Students from the constituent colleges participated in the competition of 'Pranda Gundnaa' event.
- h) The competition of Fine Art events for the PAU students was conducted by the University Fine Arts Club under the Directorate of Students' Welfare, PAU, Ludhiana on May 22, 2024 in the Students' Home.



Fig.5 Glimpses of National Youth Festival held at PAU, Ludhiana

Chapter 7

INFRASTRUCTURE

Efforts to make the ambiance of the PAU campus

Students are regularly synthesized towards the clean and safe environment. Volunteers of Eco Club, NSS and NCC play vital role in maintaining the eco-friendliness of the campus. Tree plantation, prohibition of the use of plastic and polythene bags, periodical cleaning of the campus are some of the Eco-friendly activities initiated by the University. With the objective of clean environment, University has also started PAU Peddlers, where cycles have been provided on rent basis and E-rickshaws are available for movement within the campus without any charges. As water is a fast-depleting resource in the country, there is a need to conserve this valuable resource and to motivate the students, farmers and other stakeholder in this regard. Rainwater harvesting systems have been provided at key locations on the campus. Likewise, University has started garbage collection through the firm 'A2V'. An effective housekeeping system is practiced where hazardous waste management is effectively taken care of. The Environmental Club, with support from the NSS units, has taken up initiatives in solid waste management. Used papers and other recyclable wastes such as plastics are collected and sent to recycling units.

Landmark gate – New entry point at Gate number 2 constructed. The traditional look of gate becomes a landmark for the new visitor to the city.



Fig.6 Gate No.2, PAU, Ludhiana

Landscaping – 'Clean and Green' drive was launched on campus and it is planned to improve the landscape of the university. In the first phase, the lawns around the library area are revamped. Drip lines are laid out to have an automated irrigation system. In addition, the nursery area near Gate no. 2 is totally reorganized. New paths and beds are laid out along the road to improve the visibility of nursery plants available on sale. The sloppy land along the road is totally revamped with underground irrigation jets, levelling of land, and new grass.



Fig.7 Landscaping and Free Plantation at PAU, Ludhiana

Tree plantation on campus – Every year trees are planted on campus during Van Mahotsav (the festival of trees). The faculty, staff, and students are involved in the tree planting process.

Table 7.14: Number of trees planted during the last five years on campus

Sr No	Year	Number of trees planted
1	2023-24	1030

Table 7.15: In situ conservation and preservation of landraces and indigenous breeds

Forestry Trees	Ornamental Trees	Palms	Fruit Trees	Shrubs
33	85	9	18	39

Table 7.16: Plant species diversity indicator of the campus (more than 30 species)

Aegle marmelos (Bael)	Callistemon lanceolatus (Bottle brush)	Koelereuteria paniculata (Golden rain tree)
Azadirachtha indica (Neem)	Bauhinia purpurea (Kachnar)	Kigelia pinnata (Sausage tree)
Acacia catechu (Khair)	Cassia fistula (Amaltas)	Lagerstromia speciosa (Pride of India)
Dalbergia sisoo (Tahli)	Casuarina equisetifolia (Jor-tor)	Magnolia grandiflora (Bull bay)
Eucalyptus (Safeda)	Chakurasia tabularis (Chikrasi)	Pinus roxburghii (Chil)
Ficus infectoria (Pilkhan)	Chorisia speciosa (Silk floss tree)	Plumeria alba (Caterpillar tree)
Melia azedarach (Dek)	Delonix regia (Lal gulmohar)	Putranjiva roxburghii (Putranjiva)
Moringa olerifera (Suhanjana)	Erythrina blackeii (Indian coral tree)	Saraca asoca (Sita ashoka)
Pongamia pinnata (Sukhchain)	Ficus benghalensis (Bohar)	Schleichera oleosa (Kusum)
Alstonia scholaris (Satpattia)	Grevillea robusta (Silver oak)	Terminalia arjuna (Arjuna)
Ashoka pendula (False Ashoka)	Jacaranda acutifolia (Neeli gulmohar)	Toona ciliata (Tun)



Fig. 8 Bird nests have been fixed at various places on the campus

Sign boards – All sign boards across the campus are being painted afresh following guidelines from the Government of Punjab. This includes speed limit sign boards, lane names, house numbers, building locations, etc. A committee has been constituted by the worthy Vice Chancellor to maintain uniformity in sign boards across the campus. Speed limit and no smoking boards across the campus are painted afresh.



Fig. 9 Sign Boards across the campus

Energy conservation - PAU bagged the first position under the category of Commercial Buildings in the State Energy Conservation Awards held recently by Punjab Energy Development Agency, a state-designated agency of Punjab on February 02, 2023 at CII, Chandigarh. It carried a cash prize of Rs 50,000. The commercial buildings in the sector of educational institutions include government as well as private buildings. PAU has been striving constantly to be energy-efficient and it managed to save about Rs 50 lakh through solar energy annually. The overall saving is approximately Rs 70 lakh per annum which includes other environmentally-conscious efforts. Several green-collar measures like one MW rooftop solar plant, sensor-based lighting system, auto power factor control panels, energy-efficient appliances and other solar installations have drastically reduced PAU's dependence on non-renewable resources.

It may be noted that PAU had also secured the first position in 'Green and Clean Campus Awards' for the year 2020-21 sponsored by National Agricultural Higher Education Project, ICAR. It carried a cash prize of Rs 10 lakh.



Fig.10 Awards bagged by PAU

Table 7.17: Energy saving practices

Sr. No.	Project Description	Achievement of energy savings / year basis	
		Units in KWH	Total Saving in Rs lakhs / year
1	Star rating appliances	9200	0.74
2	Sensor based automatic lights	16254	1.30
3	Led Lights / bulbs	3500	0.28
4	APFC panels	72000	5.76
5	Installation of roof top solar of 1 mega watt capacity	974940	53.62
6	Solar Tubewells for irrigation (2 nos)	23320	1.87
	Total	1099214	63.57



Fig. 11 Solar panel fixed on roof of Thapar Hall building



Fig. 12 Led lights in campus

Green waste composting - Estate Organization has taken initiatives to utilize whole green waste (fallen leaves, twigs, grass cutting, tree trimmings etc.) generated at PAU and convert it into compost. The whole green waste of the university is collected by the Sanitation Wing of the Estate Organization in trolleys and taken to a composting site near the Fruit Research Farm of PAU where windrows of the raw material (along with cow dung) are prepared. These raw materials are mixed with a composting machine and frequent turnings are given to produce good quality compost. The compost so prepared is used within the campus in raising nurseries and applied to ornamentals plants grown at PAU campus as well as in orchards of PAU. Promoting such practices is an eco-friendly way to deal with green waste and keep the campus green and clean.

Table 7.18: Source and quantity of waste generation (kg/month/unit area for 3 months)

Source	January	February	March	Average
Residential	24800	23200	24800	24267.67
Farm	6200	5800	6200	6066.67
Laboratories	62	58	62	61

Table 7.19: Waste segregation (kg/month/unit area for 3 months Jan to Mar)

Type	Quantity (kg)
Dry waste	30333
Kitchen waste	6066

Table 7.20: Waste management methods for three months (Jan to Mar)

Types	Management Methods	Quantity (Kgs)
Dry	Waste Recycling	54600
	Collection by authorized agency	18200
	Any other	18200
Kitchen	Compost pit	17100
	Biogas plant	1820
	Organic Waste Converter	-
	Any other	-
Farm (including animal waste)	Compost pit	18200
	Biogas plant	12740
	Organic Waste Converter	-
	Any other	-
Hazardous chemicals	Disposing to agency	-
	Handling at University	-
Biomedical	(Disposal to agency)	40
	Handling at University	-
Any other	Any innovative Method	2002 (Mulching, Mushroom farm, Biochar, mats prepared by COCS)

Table 7.21: On campus waste treatment

Types	Quantity (Kg)
Dry	72800
Kitchen	1820

Water conservation practices

There are 10 rooftop water harvesting structures for the groundwater recharge at various

buildings of the PAU main campus and six recharge structure using open well in agricultural field, two recharge shafts in the agricultural field. There are five recharge structures for the Mela ground and adjacent to road.

Groundwater Recharge Structures

Table 7.22: Roof top water harvesting structures for groundwater recharge at PAU campus and KVK's of PAU:

Sr. No.	Location	Roof top area
1.	Behind VC office, Thapar Hall, PAU	1000 m ²
2.	Behind SPO office, Thapar Hall, PAU	1000 m ²
3.	University Library, PAU	500 m ²
4.	Behind PG Building, COAET, PAU	375 m ²
4.	Demo Unit, Department of Soil and Water Engineering	~ 1000 m ²
5.	Skill Development Centre	~500 m ²
6.	Jaggery Unit, University Museum	~ 600 m ²
7.	PG Building, College of Agricultural Engg and Technology (Three structures)	~ 2000 m ²
8.	Open Air Theatre	~2800 m ²
9.	KVK, Kheri, Sangrur	~ 500 m ²
10.	KVK, Bathinda	~ 500 m ²
11.	KVK, Samrala	~ 500 m ²
12.	KVK, Bahawal, Hoshiarpur	~ 500 m ²

Table 7.23: Abandoned well for groundwater recharge at PAU campus:

Sr. No.	Location
1.	Three abandoned wells, PAU Forestry Fields near PRSC
2.	Two abandoned wells, Research Farm, Deptt of Soil Science

Table 7.24: Groundwater Recharge Structures for Non-agricultural runoff:

Sr. No.	Location
1.	University Mela ground
2.	Bio-retention cell near University Hockey Stadium
3.	Bio-retention cell near University Meteorological Observatory

Rain water harvesting structure

Recharge Structure Department of Processing and Food Engineering



Recharge structure, Mela Ground PAU

Recharge structure 1 PG Building, COAE&T, PAU



Groundwater recharge from Pond



Fig. 13 Water recharge structures

Security arrangements – In order to have better security at campus, boom barriers have been installed at the main entrance gates (Gate no. 1, 2, 4 and 8). In addition, high resolution cameras have been installed at Main entry gates and strategic points in campus. A 24-hour security emergency mobile number (9478541599) has been introduced and landline numbers at all the main gates have been revived.



Fig.14 Security at campus

Disabled Friendly Facilities - Approached PWD, B&R Ludhiana to construct seven ramps and install eight elevators in different buildings of the institution to facilitate disabled employees and visitors.

Chapter 8

Financial Resource Management

Table 8.5 Adhoc Projects, Under Progress

Year	National Project	International Projects	Total Projects
2023-24	143	9	152

Table 8.1 Source of Funds 2023-24 (Rs. Crores)

Year	State	University Income	ICAR	CSS/UGC/Misc	Total Funds
2023-24	481.71	86.51	88.84	37.12	694.18

Table 8.2 Expenditure Details 2023-24 (Rs. Crores)

Year	Salary	Recurring Contingency	Non- Recurring Contingency	TA	Civil Work	Total Expenditure
2023-24	341.49	70.99	7.42	0.96	6.80	427.66*

***Subject to audit & Reconciliation**

Table 8.4 Internal Resource Generation

Year	Internal Resource Generation (Rs. Crores)
2023-24	86.51

***Subject to audit & Reconciliation**

Table 8.6 External Funding (in Rs.)

Schemes	2023-24
UGC	0
CSS	23,11,65,111
MISC	12,19,77,695
MISC FC	1,03,60,023
ICAR	88,83,79,413
NHM	76,68,000
TOTAL	1,25,95,50,242

Table 8.7 Activity wise Budget Estimates (in%)

S.No.	Budget Allocation to Activity	2023-24
1.	Research	52.01
2.	Teaching	24.48
3.	Extension	13.33
4.	General Administration, Estate and others	10.18

Chapter 9

Accomplishments

6.6.9.1 Awards to the University

Awards & Recognitions

Faculty Awards

1. Dr. J M Singh, Dr. Jatinder Sachdeva, Dr. Jasdev Singh and Dr. Baljinder Kaur received Prof. R.S. Deshpande Award for Research Paper in Agricultural Economics for 2023-24 for their research paper entitled “Irrigation water policies for sustainable groundwater management in irrigated north-western plains of India” publish in Current Science, Vol. 123, No.10, 25th November 2022 in collaboration with the economists from National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi.
2. Dr Kamal Vatta, Professor and formerly Head of the Department of Economics and Sociology at PAU, has been elected as Honorary Secretary and Treasurer of the Indian Society of Agricultural Economics in its recently held 83rd Annual Conference at the Odisha University of Agriculture and Technology, Bhubaneswar.
3. Award for Best Language Film (Punjabi) on Integrated Farming System by Communication Centre of Directorate of Extension Education Punjab Agricultural University Ludhiana Punjab, February 22, 2024 at MANAGE Hyderabad.
4. Dr Hira Singh received the Best Oral Presentation award during 3rd Indian Horticulture Summit-cum-International Conference-2024 at RARI, Jaipur, India (February, 01-03, 2024).



Fig.15 Dr Hira Singh received the Best Oral Presentation award

5. Dr Simrat Singh and Dr Madhu Balareceived the Best Poster Presentation Certificate, at National Conference on ‘Recent Trends and Future Prospects of Floriculture in India’ from January 9-11, 2024 at IIHR, Bengaluru.

Dr RK Dubey received the Outstanding Horticulture Teacher Award, 2021- 22, Indian Society of Horticulture Research and Development, Uttarakhand in Progressive Horticulture conclave, NAU, Navsari, 18-20 Jan, 2024.



Fig.16 Dr RK Dubey received the Outstanding Horticulture Teacher Award

6. The Department of Forestry and Natural Resources got accreditation A+ for Five years from Indian Council of Forest Research and Education-Dehradun
7. Dr Pushp Sharma was awarded Gold Medal by the Society for Rapeseed-Mustard Research (SRMR) Bharatpur for outstanding contribution to rapeseed mustard plant physiology research and services rendered to the SRMR. This accolade was presented to Dr Pushp Sharma in the 5th National Brassica Conference (NBC) on “Oilseed Brassicas for Sustainability, Profitability and Nutritional Security” held at Rajasthan Agricultural Research Institute, Durgapura (Jaipur) during February 07-09, 2024.



Fig.17 Dr Pushp Sharma received Gold Medal

8. Special Appreciation Award at International Conference on “Prediabetes to diabetes- A trajectory of concern,” for the paper entitled “Fatty acid profiling of bakery products available in market” authored by Prabhjot Kaur, Monika Choudhary and Jaspreet Kaur organized by Lifeness Science Institute (LSI) in collaboration with Knowledge partners- Nutrition Society of India and Indian Dietetic Association (Mumbai Chapter) at Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute, Andheri (West), Mumbai, Maharashtra on January 5-6, 2024.
9. Special Appreciation Award at International Conference on “Prediabetes to diabetes- A trajectory of concern,” for the paper entitled “Formulation of functional bakery product using foxnut (*Euryale ferox*): An aquatic super food” authored by Surbhi

Kapoor, Amarjeet Kaur, Vikas Kumar and Monika Choudhary organized by Lifeness Science Institute (LSI) in collaboration with Knowledge partners- Nutrition Society of India and Indian Dietetic Association (Mumbai Chapter) at Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute, Andheri (West), Mumbai, Maharashtra on January 5-6, 2024.

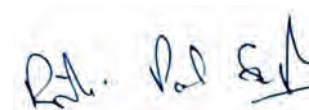
10. Best Oral Presentation Award at 2nd International Conference on Clinical Nutrition and Dietary Lifestyle for the paper entitled “Efficacy of Vitamin D₂ Enriched Mushroom Powder Supplementation on Vitamin D Deficiency and Metabolic Syndrome Biomarkers in Adults- A Randomized Control Trial” authored by Alisha Bhatia, Sonika Sharma, Kiran Grover, Sanjeev Mahajan and Khushdeep Dharni organized by Universal Society of Food and Nutrition (USFN) on 23rd and 24th February, 2024 .
11. Best Paper Presentation Award at National Conference on Seed Spices and Allied Crops for the paper entitled “Recent advances in addressing the nutritional, industrial and therapeutic effects of magical spice: Kalonji (Nigella sativa)” authored by Shrishti Joshi, Shikha Mahajan, Arashdeep Singh and Sonika Sharma organized by Indian Society of Seed Spices and ICAR National Research Centre on Seed Spices from 13th to 15th March, 2024 .
12. Dr PK Kingra, was awarded Fellow of Association of Agrometeorologists
13. Dr R K Pal received Dr S Venketrman Young Scientist Award
14. Dhiman, D, Kalia, A., Sharma, S.P. Taggar, M.S. and Dheri, G.S. (2024) Nano-boron application reduced the proportion of cracked tuber yield in potato. Best (2nd) poster award in technical session Theme-3 of ISVS Golden Jubilee National Seminar on Technological Innovations in vegetable Production under changing climate regime held at Acharaya Narendra Deva University of Agriculture & Technology, Ayodhya, UP, India from 24 to 26 February 2024.
15. Dr. Sumita Chandel got Young Achiever Award -2023 conferred by SOCIETY FOR ADVANCEMENT OF HUMAN AND NATURE (Registered under the Societies Registration Act XXI of 1860 Dr YS Parmar University of Horticulture and Forestry PO Nauri, Solan 173 230 Himachal Pradesh, India (SADHANA)
16. Dr. Sumita Chandel got Best Trainee Award in 10 days short course training programme on “Soil Pollutants Impact Assessment and Remediation of Contaminated Soil” at IISS Bhopal during 12 to 22 Feb 2023.
17. School of Organic Farming was awarded for Best Language Film (Punjabi) on Integrated Farming System by Communication Centre of Directorate of Extension Education Punjab Agricultural University Ludhiana Punjab, February 22, 2024 at MANAGE Hyderabad

Student Accomplishments

1. Kirti Taneja, an M. Sc student shortlisted in the Tata institute of Fundamental Research-TIFR/JGEEBILS exam held on 10th December 2023.
2. Kirti Taneja, an M. Sc student received the “Best Oral Presentation Award” at the 9th International Conference on Approaches in Agricultural, Biological & Applied Sciences for Sustainable Development (CAABASSD-2024) held at Kumaun University, Nainital, Uttarakhand from 1st - 3rd March 2024, for the topic entitled as “Inclusion of microbial fermented canola meal in poultry diet as a partial substitute for soybean meal” authored jointly by Kirti Taneja, Sanjula Sharma, Pratibha Vyas, Prem Prakash Dubey.
3. Jashandeep Kaur, an M. Sc student secured third position in oral presentation in International Conference on “Recent advances in formatting a healthier food system-7th AMIFOST 2024 held on 19-20 March, 2024, for the topic “Indian Spinach: Green leafy vegetable crop for strengthening the human immunity” authored jointly by Jashandeep Kaur, Shilpa Gupta and Hira Singh.
4. Charanjeet Kaur, a Ph.D. student has been awarded CSIR DIRECT SRF fellowship for her PhD research by Council of Scientific and Industrial Research, Human Resource Development Group, New Delhi for a period of three years. For her work on “Isolation and characterization of leaf protein concentrates from carrot (*Daucus carota* L.) and potato (*Solanum tuberosum* L.) for application in food products”.
5. Kirti Taneja, an M. Sc student has qualified CSIR-NET December 2023
6. Mr. Tarun Kapoor, (L-2022-A-79-M) had been awarded with Dr. Dalip Singh Deep Memorial Prize and Silver Medal (Elocution) –North Zone.

6.6.6.10. Certificate

I, Dr. Rishi Pal Singh, the Registrar of the Punjab Agricultural University, Ludhiana hereby certify that the information contained in Self Study Report 2023-2024 is furnished as per the records available in the University.



Signature of the Registrar

List of Testing Schemes during 2023-24

Number	Title	Department
Misc-016	Evaluation Of Efficacy Of Harvest+ Cytonutri Zinc 12%, SA-GroBloom , SA SARAS NUTRI, SA SARAS POWER And SA PYROLL (Organic Potash 14%) In Paddy	Agronomy
Misc-017	Efficacy Evaluation Of EMEK(Clodinafop Propargyl 9% + Metribuzin 20% WP) For Weed Management In Wheat	Agronomy
Misc-018	Bio-efficacy Evaluation Of Herbicide Pre-mixture, RIL-261/CF In Sugarcane	Agronomy
Misc-019	Efficacy Of Premix Of VPP72 60% Ad Its Comparison With Market Standards For Control Of Phalaris Minor And Broad Leaf Weeds In Wheat	Agronomy
Misc-020	Evaluation Of Rapigro Gr And Rapigro L For Growth & Yield Parameter Of Rice	Agronomy
Misc-021	Evaluation Of Herbicides Triafamone 37.5 + Fentrazamide 300 G/L SC And Triafamone 37.5 G/L + Oxidiazon 240 G/L SC For Weed Control In Transplanted Rice And Direct Seeded Rice	Agronomy
Misc-023	Evaluation Of Pretilachlor 30% W/v + Flopyrauxifen-Benzyl 1% W/v (31% W/v EC) For Total Weed Control In Transplanted Rice	Agronomy
Misc-024	Evaluation Of AWKIRA (Pyroxasulfone 85 WG) For Phytotoxicity (crop Safety) When Applied Through Drone In Wheat	Agronomy
Misc-025	Evaluation Of Pretilachlor 30% W/v Floryrauxifen-Benzyl 1% W/v(31% W/v EC) For Total Weed Control In Direct Seeded Rice	Agronomy
Misc-026	Evaluation Of Herbicide VPP72 60% WG For Control Of Phalaris Minor And Broad Leaf Weeds (BLW's) In Wheat For Third Season Fm	Agronomy
Misc-027	Evaluation Of Herbicide ADM.05001.H.1.A Against Weed Complex In Wheat	Agronomy

Misc-028	Bio-efficacy Evaluation Of IIF-1516 Against Sheath Blight , False Smut And Blast Disease Of Rice For Two Seasons	Plant Pathology
Misc-029	Bioefficacy Evaluation Of BIOMYCIN (Kasugamycin 3% SL) Against Early Blight Of Potato	Plant Pathology
Misc-030	Bio-efficacy Evaluation Of Biopesticide Bacillus Amiloliquefaciens Against Sheath Blight Of Rice	Plant Pathology
Misc-031	Bio-efficacy Evaluation Of Biofungicide IPF-FC-005(Trichoderma Viride + Trichoderma Harzanium) Against Wilt Of Okra	Plant Pathology
Misc-032	Bio-efficacy Evaluation Of Fluopyram 400g/L (Velum Prime)SC Against Root Knot Nematodes Of Rice	Plant Pathology
Misc-034	Bio-efficacy Evaluation Of Tebuconazole 430 G/L SC Against Leaf/neck Blast Of Rice	Plant Pathology
Misc-035	Bio-efficacy Evaluation Of Isotianil 120 G/L + Trifloxystrobin 100 G/L SC Against Bacterial Leaf Blight & Leaf/neck Blast Of Rice	Plant Pathology
Misc-036	Bio-efficacy Evaluation Of Propineb 70% WG Against Leaf/neck Blast And brown Leaf Spot Disease Of Rice	Plant Pathology
Misc-037	Bio-efficacy Evaluation Of Trifloxystrobin 500 G/L SC Against Dirty Panicle Of Rice	Plant Pathology
Misc-038	Bio-efficacy And Phytotoxicity Evaluation Of Kocide 3000 (copper Hydroxide 46.1%) On Potato Through Drone Application	Plant Pathology
Misc-039	Bio-efficacy Evaluation Of IIF-222 Against Sheath Blight, Brown Spot, False Smut And Grain Discoloration Of Rice	Plant Pathology
Misc-040	Bio-efficacy And Phytotoxicity Evaluation Of Fungicides Against Yellow Rust, Rust And Powdery Mildew Of Wheat	Plant Pathology
Misc-041	Evaluation Of Dharti Ka Chowkidar And Jaivik Kranti In Transplanted Rice	Director School Of Organic Farming
Misc-042	Evaluation Of Mifco Green Kranti (Organic Fertilizer) In Basmati Rice	Director School Of Organic Farming
Misc-043	Evaluation Of AGMA-Foliar (Brand Name :Kazuki Gold) In Transplanted Rice	Director School Of Organic Farming

Misc-044	Evaluation Of Fermented Organic Manure(FOM) In Potato	Director School Of Organic Farming
Misc-045	Response Of Transplanted Rice To Agma Biostimulant Granule (k Max Super)	Director School Of Organic Farming
Misc-046	Evaluation Of All Rounder Plus Decomposer For Rice Residue Management In Wheat	Director School Of Organic Farming
Misc-047	Evaluation Of Fermented Organic Manure In Summer Moong	Director School Of Organic Farming
Misc-048	Evaluation Of Rice Hybrids	Plant Breeding & Genetics
Misc-049	Productivity Assessment Of Private Sector Maize Hybrid	Plant Breeding & Genetics
Misc-050	Evaluation Of Maize Hybrids Developed By Private Sector During Kharif	Plant Breeding & Genetics
Misc-051	Evaluation Of Corn Hybrid	Plant Breeding & Genetics
Misc-052	Evaluation Of Hybrids Under Direct Seeded Rice	Plant Breeding & Genetics
Misc-053	Evaluation Of Crop Safety Of Pyriproxyfen 10 EC In Cotton Through Drone Application	Entomology
Misc-054	Evaluation Of Crop Safety Of Fenpropathrin 10 EC In Cotton Through Drone Application	Entomology
Misc-055	Bioefficacy Of Kalichakra L And Daman L Against Fall Armyworm (Spodoptera Frugiperda) In Maize	Entomology
Misc-056	PB Knot- An Innovative Approach To Manage Pink Bollworm In Cotton	Entomology
Misc-057	Bio-efficacy And Phytotoxicity Of A3R-1 19% W/v SC(triflumezopyrim + Benzylmoxan) Against Rice Planthoppers	Entomology
Misc-060	Evaluation Of Efficacy Of Ambition Complete As Liquid Fertilizers Transplanted Rice Crop	Soils Science
Misc-061	Evaluation Of Efficacy Of Nano DAP On Wheat Crop	Soils Science
Misc-067	Bioefficacy Evaluation Of Spirotetramat 15.31% W/w OD Against Mealybugs And Mites In Grapes	Fruit Science

Misc-068	Evaluation Of Brodifacoum 0.005% BB On Rice And Sugarcane	Zoology
Misc-069	Bioefficacy, Phytotoxicity Evaluation Of Rallis New Granular Insecticide Pre-mixture, RIL-281/CF(1% Gr) Against Early Shoot Borer And White Grub In Sugarcane	Kapurthala, Rs
Misc-072	Bio-efficacy And Phytotoxicity Evaluation Of UPST 222 Against Black Scurf Of Potato	Plant Pathology
Misc-073	Adaptive Research Trial On Taqat (Hexa+ Captan) For The Management Of Powdery Mildew Of Wheat	Plant Pathology
Misc-074	Bioefficacy And Phytotoxicity Evaluation Of Fungicides Against Diseases Of Wheat	Plant Pathology
Misc-075	Bioefficacy And Phytotoxicity Evaluation Of Fungicides Against Diseases Of Chilli And Cucumber	Plant Pathology
Misc-081	Evaluation Of Herbicide Pinoxaden 5% + Metribuzin 17.5% EC (225 G/L W/v) For Grass & Broad Leaf Weeds Control In Wheat	Agronomy
Misc-084	Brand Testing Of Citizen 18.5% SC (chlorantraniliprole) Against Early Shoot Borer In Sugarcane	Kapurthala, Rs
Misc-086	Bioefficacy Evaluation Pf Bio Fungicides Against Sclerotium Rot Of Sugarbeet	Plant Pathology
Misc-087	Evaluation Of Mating Disruptor UPB-21/BPG-435 Against Pink Bollworm And Its Effect On Natural Enemies In BT Cotton	Entomology
Misc-091	Evaluation Of The Bio-efficacy Of Spinetoram 11.7% W/w SC (12% W/v) Against Thrips, Psyllids And Leaf Miners In Citrus	Fruit Science
Misc-092	Efficacy Of Penoxsulam 21.7% (w/w) SC, Penoxsulam 1.02% (w/w) + Cyhalofop Butyl 5.1% (w/w) OD And Penoxsulam 2.67% (w/w) OD For Weed Control In Transplanted Rice	Agronomy
Misc-093	Bio-efficacy Evaluation Of Pseudomonas Fluorescens 1.0% WP (Strain No.IPL/PS/01) Against Pokkah Boeng Of Sugarcane	Plant Pathology
Misc-094	Bio-efficacy Evaluation Of Nematofree Plus Against Root Knot Nematodes In Capsicum Under Protected Cultivation	Plant Pathology

Misc-096	Bioefficacy Evaluation Of Bio-fungicide Formulation Bacillus Subtilis ZB87-I/2 Against Sheath Blight Of Rice	Plant Pathology
Misc-097	Bio-efficacy Evaluation Of Provax (carbonix 17.5% + Thiram 17.5% FF) Against Loose Smut Of Wheat	Plant Pathology
Misc-102	Evaluation Of Some Nutrient Additives On Productivity Of Different Cropping Systems And On Soil Health	Soils Science
Misc-103	Evaluation Of Efficacy Of Marktera 0.4 GR (Chlorantraniliprole 0.4 GR) Against Rice Stem Borers And Leaffolder In Basmati Rice,	Entomology
Misc-104	Evaluation Of Efficacy Of Chlorantraniliprole 0.4% GR (Ferterra/E2Y45 0.4% GR) Against Fall Armyworm, Spodoptera Frugiperda, Corn Stem Borer, Chilo Partellus And Pink Stem Borer Sesamia Inferens On Ma	Entomology
Misc-105	Bio-efficacy Evaluation Of Spinetoram (GF-4867-01 % W/w RB (Ready-to-use Bait) Against Fall Armyworm (spodoptera Frugiperda) In Maize	Entomology
Misc-107	Efficacy Evaluation Of Flupyradifurone 200 G/L SL (Sivanto Prime) Against Sucking Insect Pests In Tomato	Entomology
Misc-108	Evaluation Of Efficacy Of E2Y45-828-R120 5% Tablet (chlorantraniliprole 5% DT) Against Rice Stem Borers And Leaffolder In Rice	Entomology
Misc-110	Bioefficacy And Phytotoxicity Evaluation Of Amistar Gold 250 SC Against Yellow Rust, Brown Rust And Powdery Mildew Of Wheat	Plant Pathology
Misc-113	Bio-efficacy Evaluation Of Picoxystrobin 7.05% + Propiconazole 11.71% W/w SC Against Foliar Diseases In Corn	Plant Pathology
Misc-115	Bioefficacy Evaluation Of Mildown 2% AS Against Late Blight (phytopathora Infestants (Mont.) Of Potato	Plant Pathology
Misc-117	Evaluation Of Efficacy Of Supremo 50 SP (thiocyclam Hydrogen Oxalate 50 SP) Against Rice Stem Borers And Leaffolder In Rice	Entomology
Misc-119	Evaluation Of GEAC Recommended Bt Cotton Hybrids In North India (six Locations) During Kharif 2023-24 At Bathinda	Plant Breeding & Genetics

Misc-120	Evaluation Of Herbicide 2,4-D Sodium Salt 95% SP Against Weed Flora In Sugarcane	Agronomy
Misc-121	Bioefficacy Evaluation Of Rallis RIL-236 /CF (30%OD) Against Anthracnose And Leaf Spot Of Chilli	Plant Pathology
Misc-122	Evaluation Of Bio-efficacy Of Fungicide UPF 108 Against Late Blight Of Potato	Plant Pathology
Misc-123	Bioefficacy Evaluation Of Biofungicides Against Different Wilt And Cercospora Leaf Spot Of Okra	Plant Pathology
Misc-125	Evaluation Of Efficacy Of New Insecticide, Ulala 50 WG (flonicamid 50% WG) Against Planthoppers In Rice In The Adaptive Research Trails	Entomology
Misc-131	Evaluation Of The Efficacy Of Adjuvant MAK Adjuvol On Insect Pest Of Kinnow	Fruit Science
Misc-132	Bio-efficacy Evaluation Of Vibrance Integral And Ty-mirium Against Bakane Disease Of Rice	Plant Pathology
Misc-133	Brand Testing Of Danitol 10EC (fanpropathrin) Against Pink Bollworm In Bt Cotton	Entomology
Misc-134	Bio-efficacy Evaluation Of UPST 220 Against Loose Smut And Karnal Bunt Of Wheat	Plant Pathology
Misc-135	Bio-efficacy Evaluation Of Rallis RIL-236/CF (30% OD) Against Early Blight Of Tomato	Plant Pathology
Misc-136	Evaluation Of Efficacy Of Supermo 50 SP (thiocyclam Hydrogen Oxalate) Against Rice Stem Borers And Leaf Folders In Rice	Entomology
Misc-138	Bioefficacy Trial Of Nurturkind On Rice Crop	Soils Science
Misc-139	Bio-efficacy Of "NAYAZINC" (Zinc Polyphosphate) As Zinc Fertilizer For Soil Application In Low-land Trans-planted Paddy Cultivation	Soils Science
Misc-140	Evaluation Of Efficacy Of Harvest + (Horticrop), SA PYROLL, SA-GroBloom, SA SARAS POWER, SA SARAS NUTRI And Cytonutri Zin, On Paddy And Yield Attribute	Agronomy
Misc-141	Bio-efficacy Evaluation Of Fungicides Ayaan (kreoxim Methyl 40%+ Hexaconazole 8% WG) And Zaafu (hex-aconazole) Against Diseases Of Rice	Plant Pathology
Misc-143	Multilocation Evaluation Of Mungbean Variety In Summer	Plant Breeding & Genetics

Misc-144	Efficacy Evaluation Of Tetraniliprole 200 G/L SC (Vayego) Against Early Shoot Borer And Top Borer In Sugarcane	Kapurthala, Rs
Misc-145	Efficacy Evaluation Of Pyriproxyfen 10 EC Against Whitefly And Aphids In Chilli	Entomology
Misc-146	Brand Evaluation Of Clasto 20 WG (pyrifluquinazone) Against Whitefly On Bt. Cotton	Entomology
Misc-147	Bio-efficacy Of Myconem Plus For Management Of Root Knot Nematode In Tomato	Vegetable Science
Misc-151	Evaluation Of Pretilachlor 37% E.W And Butachlor 50% E.W Against Various Weeds In Rice	Agronomy
Misc-152	Evaluation Of Herbicide 2, 4-D Sodium Salt 44% + Metribuzin 35% + Pyrazosulfuron Ethyl 1.0% WDG Sold Brand Name "Triskele" By UPL	Agronomy
Misc-154	Evaluation Of Herbicide 2,4-D Ethyl Ester 38% EC In Wheat	Agronomy
Misc-156	Bio Efficacy And Phytotoxicity Of IPL-IC-008 (Metarhizium Anisopliae 5% + Beauveria Bassiana 5% SP) On Tomato Crop Against Fruit Borer (Helicoverpa Armigera)	Entomology
Misc-157	Evaluation Of Fungicide Against Disease Of Cotton	Plant Pathology
Misc-158	Bioefficacy Evaluation Of Spinetoram 11.7% W/w SC (12% W/v) Against Thrips And Leaf Miners In Watermelon	Entomology
Misc-159	Evaluation Of Bio-efficacy Of ALI-300 Against Lepidopteran Pests On Cauliflower	Entomology
Misc-161	Evaluation Of Efficacy Of Incipio 20 SC (isocycloseram) Against Stemborer In Rice	Entomology
Misc-162	Evaluation Of Simodis (isocycloseram 10% W/v DC) Against Thrips, Jassids & Bollworms, Its Phytotoxicity And Effect On Natural Enemies In Bt Cotton	Faridkot, Rs
Misc-163	Efficacy Studies Of Nano Npk Fertilizer (6:10:4) On Paddy	Soils Science
Misc-165	Adaptive Research Trials On Ferterra 0.4 GR Against Early Shoot Borer And Coragen 18.5 SC Against Top Borer In Sugarcane	Rrs Kapurthala

Misc-167	Evaluation Of Biostimulants In Cereal And Vegetable Crops To Combat Abiotic Stress	Soils Science
Misc-168	Evaluation Of Crop Safety Of Fosmite 50 EC In Cotton Through Drone Application	Entomology
Misc-169	Evaluation Of Crop Safety Of Keefun 15 EC In Cotton Through Drone Application	Entomology
Misc-171	Evaluation Of Efficacy Of Chlorantraniliprole 18.5 SC (Shenzi) Against Stem Borer And Leafroller In Rice	Entomology
Misc-172	Evaluation Of Efficacy Of Incipio 20 SC (isocyclopropanol) against Leafroller In Rice	Entomology
Misc-173	Bio-efficacy Evaluation Of Insecticide Flonicamid 50% WG In Kinnow	Fruit Science
Misc-174	Bioefficacy And Phytotoxicity Evaluation Of Bensulfuron Methyl 4.8% + Pretilachlor 48% OD (SIKOSA) In Transplanted Rice Crop Against Weeds	Agronomy
Misc-176	Adaptive Research Trials Of Eketsu 43 WG (bispyribac Sodium 38% + Metsulfuron Methyl 2.5% + Chlorimuron Ethyl 2.5%) In Direct Seeded Rice And Transplanted Rice	Agronomy
Misc-178	Evaluation Of Herbicide 2, 4-D Sodium Salt 44% + Metribuzin 35% + Pyrazosulfuron Ethyl 1.0% WDG (trishuk) In Sugarcane	Agronomy
Misc-179	Field Efficacy Of Sulfosulfuron 75% WG On Resistant Phalaris Minor In Wheat (second Season)	Agronomy
Misc-183	Evaluation Of Maize Hybrids For Fodder Purpose	Plant Breeding
Misc-185	Adaptive Trial Of RIL 066 Wheat Herbicides	Agronomy
Misc-189	Evaluation Of Natmate PBW .04 GR Against Pink Bollworm In Bt Cotton	Entomology
Misc-191	Evaluation Of Herbicide TVE 29 400g/l SC (tetflupyrrolidate) In Wet Transplanted Rice	Agronomy
Misc-192	Evaluation Of Herbicide PEPE 25% SE (penoxsulam 1% + Pendimethalin 24%) For Weed Management In Direct Seeded Rice	Agronomy
Misc-193	Bio-efficacy Of IIL 301 (herbicide) On Wheat Crop Followed By Succeeding Crop (veg/pulse/oilseed) For Two Seasons	Agronomy

Misc-196	Evaluation Bioefficacy Of RALLIGOLD GR (Mycorrhizal Bio-fertilizer) For Soil Application In Paddy At PAU	Microbiology
Misc-197	Evalaution Of Trial Of Products (yeast, Enzymes Etc.) For Production Of Bioethanol	Microbiology
Misc-199	Bioefficacy Evaluation Of Vibrance Premium (sedaxane 4% + Fludioxil 5%) 90 FS As Seed Treatment Against Black Scurf Of Potato	Plant Pathology
Misc-200	Bioefficaacy Evaluation Of Vibrance Duo Against Loose Smut Of Wheat	Plant Pathology
Misc-208	To Study The Effect Of Mi CITRA Bio-stimulant On Okra Crop, MI VEER On Tomato And Mi Y-Ras Plus On Capsicum	Director School Of Organic Farming
MISC-209	Evaluation Of Commercial Mycorrhizal Inoculant In Kharif Maize	Director School Of Organic Farming
Misc-210	Bioefficacy Evaluation Of Ampelomyces Quisqualis 2.0% AS Against Powdery Mildew Of Okra	Plant Pathology
Misc-211	Bioefficacy Evaluation Of Gpf 1521 Against Leaf And Neck Blast Of Rice	Plant Pathology
Misc-212	Bioefficacy And Phytotoxicity With Bioassay Study Of IPL-I-012(Hirsutella Thompsonii 2% AS) On Brinjal Crop Against Red Spider Mite	Entomology
Misc-213	Bioefficacy And Phytotoxicity With Bioassay Study Of IPL-I-011(Beauveria Bassiana 2% AS) On Tomato Crop Against Fruit Borer	Entomology
Misc-214	Bioefficacy And Phytotoxicity With Bioassay Study Of IPL-I-010(Metarhizium Anisopliae 2% AS) On Okra Crop Against Shoot & Fruit Borer	Entomology
Misc-215	Bioefficacy And Phytotoxicity With Bioassay Study Of IPL-I-009(Verticillium Lecanii 2% AS) On Brinjal Crop Against Whitefly	Entomology
Misc-216	Conduct Of Adaptive Research Trials Of 2,4-D Sodium Salt 48% + Mertibuzin 32% + Chlorimuron 0.8% WDG In Sugarcane Crop	Agronomy
Misc-217	Conduct Of Adaptive Research Trials Of 2,4-D Sodium Salt 44% + Metribuzin 35% + Pyrazosulfuron Ethyl 1.0% WDG In Spring Sugarcane Crop	Agronomy

List of Competitive Research Projects Sanctioned (2023-24)

Title of the projects	Funding agency	Department	Duration	Sanctioned amount (Rs.)
DBT –NORTH East center for Agricultural Biotechnology Phase III Programme II : Development of Insect resistant chickpea varieties protected helicovera armigera	DBT New Delhi	Plant Breeding & Genetics	3	48,71,800
Mapping of loci conferring resistance against ustilago tritici causing loose smut in bread wheat	SERB New Delhi	Plant Breeding & Genetics	3	52,35,802
Molecular mechanism underlying the difference in heat stress tolerance in rapeseed mustard crops	DST New Delhi	Plant Breeding & Genetics	3	35,38,512
Development of Technology for Production, Farm Level Processing and Packaging of Millets and Its Value Added Products	Tandrust Mission Punjab, SAS Nagar	Soil & Water Engg	2	47,89,000
Cambridge india Network for translational Research in Nitrogen-2	DBT New Delhi	School of Agri. Biotechnology	5	1,19,32,077
Structural and Functional characterization of techykinins peptides and its receptor in Bemisia tabaci for development of novel insecticides	SERB New Delhi	Entomology	3	49,56,864
Genomics-assisted breeding for development of Dry-Dsr ready basmati rice varieties	DBT New Delhi	Plant Breeding & Genetics	3	64,76,840
Tackling emerging diseases and insect pests problem in rice through innovative genomic approaches	DBT New Delhi	Plant Breeding & Genetics	3	2,14,94,800

Impact Evaluation of Watershed Development & Micro-irrigation components of PM Krishi Sinchai Yojana in select areas of Punjab & Haryana	ICSSR, New Delhi	Extension Education	1	14,00,000
Development of wine yeast starter inoculum with improved flavor phenotype through metabolic footprinting	DBT New Delhi	Microbiology	3	30,74,040
New Insight in understanding genomic footprints of nutrients uptake under direct seeded rice cultivation system	DBT New Delhi	School of Agri. Biotechnology	3	82,98,812
Mapping of Novel rust resistance gene(s) from exotic germplasm and landraces	SERB New Delhi	Plant Breeding & Genetics	3	56,20,439
Development of Robotic actuator for transplanting paddy wash root nursery using machine vision	SERB New Delhi	Farm Machinery & Power Engg	3	28,60,260
Identification of Potential rainwater Harvesting sites using geo-spatial Technologies in Kandi region of Punjab	SERB New Delhi	RRS Ballawal Saunkhri	3	19,53,180
Development of pilot-scale cold plasma system for microbial safety and quality enhancement in fruits & vegetable juices	DST New Delhi	Processing & Food Engg	3	34,38,560
Statistical evaluation of regional Inequalities in the Socio-economic development among states of India	SERB New Delhi	Math, Stat & Physics	2	12,77,360
Optimization of innovative processing Technology for polyphenols retention & bioavailability in millet food products	DST New Delhi	RRS Batinda	3	23,46,920

Functional Characterization Of Octopamine Receptor In Bemisia Tabaci (Gennadius)	DBT New Delhi	Entomology	3	49,90,500
Fine mapping of begomovirus resistance governing loci (qMI-Sq/To17.1 and qMI-Sq/To17.1) in Cucurbit moschata (Duch)	SERB New Delhi	Vegetable Science	3	29,96,554
FieldHeat: Adapting tomato germplasm to the dry and humid heat of the Indian monsoonal climate	DBT New Delhi	Vegetable Science	3	69,93,920
Fine mapping and cloning of novel leaf and stripe rust resistance genes derived from emmer wheat Triticum dicoccoides	DBT New Delhi	School of Agri. Biotechnology	3	53,45,000
Development of a universal fertility restorer line in Indian mustard (Brassica Juncea L. Czern.) possessing genes for fertility restoration in multiple cytoplasmic male sterility systems along with resistance to white rust and herbicide imidazolinone	DBT New Delhi	Plant Breeding & Genetics	3	49,93,000
Molecular mapping and introgression of lesser grain borer Rhyzopertha dominica) resistance from wild wheat Ae. Tauchii derived synthetic wheat	SERB New Delhi	School of Agri. Biotechnology	3	29,84,300
Wheat with Enhanced Resistant Starch: A Nutra-ceutical approach to better health	BIRAC, New Delhi	Plant Breeding & Genetics	3	46,08,000

List of International Collaborative Projects (2023-24)

S.No	Title of the project	Funding agency	Department
1	HarvestPlus challenge program Phase IV Agreement # 6408 research project “Bio fortified wheat for improved human nutrition”	HarvestPlus through CIAT, Columbia and IFPRI, USA	Plant Breeding & Genetics
2	HarvestPlus zinc fertilizer project, “Use of zinc containing fertilizers for enriching cereal grains with zinc and improving yield in different countries	HarvestPlus through Sabanci University, Turkey	Plant Breeding & Genetics
3	Direct Seeded Rice Consortium	IRRI, Philippines	Plant Breeding & Genetics
4	Accelerating Genetic Grain in Maize and Whet for improved livelihoods (AGG)	BMGF through CIMMYT, Mexico	Plant Breeding & Genetics
5	Towards effective genetic and sustainable management of Ascochyta blight of chickpea	Grains Research and Development Corporation – GRDC, Australia (donor)	Plant Breeding & Genetics
6	Accelerating the mainstreaming of elevated zinc in global wheat breeding: a ‘Fluoride in the water ‘approach to nutrition	BMGF % DFID through CIMMYT, Mexico	Plant Breeding & Genetics
7	Genetic transformation of PAP1 gene in American cotton accessions coker 312 and PAU Bt 1 for developing coloured cotton	Nippon Steel Trading Company Limited, Tokyo, Japan	School of Agril Biotechnology
8	To develop a work plan for developing the Fertilizer Deep Placement (FDP) with International Fertilizer Development Centre (IFDC)	International Fertilizer Development Centre (IFDC), USA	Farm Machinery & Power Engg.
9	AGGRI Alliance (one IRRI Breeding Network -DELS	ICAR-IRRI	Plant Breeding & Genetics