

8TH PSRM 

ABSTRACT & SOUVENIR

National Conference on Innovation,
Integration, and Sustainability in Agricultural,
Applied and Life Sciences for Future India

Organized by

PLANTICA-APSR & Tula's Institute



In Collaboration with

UKPCB, Govt. of Uttarakhand



In Association with

CORPORATE SETU
Secure Agri Internships & Placements
कौशल किशोर, कुशल उद्योग

www.pgrindias.in



17 & 18 April, 2026



Abstract and Souvenir

8th Plant Science Researchers Meet – 2025-26

**“National Conference on Innovation, Integration, and Sustainability
in Agricultural, Applied and Life Sciences for Future India”**

17 & 18 April, 2026



PLANTICA

Organized by

PLANTICA

**Association of Plant Science Researchers (APSR)
Dehradun, Uttarakhand, India**

www.pgrindias.in and www.plantica.in

**National Conference on Innovation,
Integration, and Sustainability
in Agricultural, Applied and Life
Sciences for Future India**

Abstract and Souvenir

Chief Editor:

Dr. Anoop Badoni

Managing Editor:

Mr. Himanshu Malhotra

Editorial Team:

Dr. Vinay Chamoli

Ms. Vandana Petwal

Mr. Suraj Joshi

Mr. Naveen Chandra

प्रो० देवेन्द्र भसीन
उपाध्यक्ष



उत्तराखण्ड राज्य उच्च शिक्षा उन्नयन समिति
उत्तराखण्ड शासन



पत्रांक २५०/३०६/२६

दिनांक १०-०४-२०२६

Message

It gives me immense pleasure to extend my best wishes and greetings on the occasion of the National Conference on Agricultural Applied and Life Sciences for Future India.

Agriculture has long been the backbone of our nation, and today it has evolved into a dynamic, science-driven sector integrating agricultural applied sciences and life sciences. These fields are playing a crucial role in addressing key challenges such as food security, environmental sustainability, climate change, and rural development.

India stands at a critical juncture where the integration of modern scientific innovations with traditional knowledge is essential. Research in areas like biotechnology, sustainable agriculture, soil and water management, and agri-technology is enhancing productivity while ensuring ecological balance.

Significantly, these emerging areas are also generating wide-ranging employment and entrepreneurial opportunities. Sectors such as agri-startups, food processing, biotechnology, and precision agriculture are opening new career avenues for youth. It is important that our educational institutions align learning with these evolving opportunities to foster skill development and innovation.

I appreciate the efforts of the organizers in bringing together scholars, scientists, and young researchers on a common platform. I am confident that this conference will contribute meaningfully to knowledge dissemination and future policy directions.

I wish the conference great success.

With best wishes,

Prof. Devendra Bhasin
Vice President,

Uttarakhand State Higher Education Upgradation
Committee, Uttarakhand Government



Dr. Parag Madhukar Dhakate
Member Secretary
Uttarakhand Pollution Control Board
(UKPCB), Dehradun,



Message

It gives me immense pleasure to extend my greetings and best wishes on the occasion of the **8th Plant Science Researchers Meet (PSRM) National Conference**, being organized on 17–18 April 2026. I congratulate **PLANTICA – Association of Plant Science Researchers (APSR)** and **Tula's Institute, Dehradun**, for jointly hosting this significant academic event in collaboration with the Uttarakhand Pollution Control Board (UKPCB).

The theme of the conference, *“Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India,”* is both timely and highly relevant. As we face increasing environmental challenges, including climate change, land degradation, and biodiversity loss, it is imperative to adopt sustainable and science-driven approaches in agriculture and allied sectors. The integration of innovative technologies with traditional knowledge systems will play a crucial role in ensuring ecological balance and long-term environmental sustainability.

UKPCB is committed to promoting environmentally sound practices and supporting initiatives that contribute to pollution prevention, resource conservation, and sustainable development. Platforms like PSRM provide an excellent opportunity for researchers, academicians, policymakers, and young scholars to exchange ideas, present their findings, and develop collaborative solutions to address pressing environmental and agricultural issues.

I am confident that the deliberations and research outcomes presented during this conference will contribute significantly to advancing knowledge and fostering sustainable practices in agricultural and life sciences. The Abstract and Souvenir Book will serve as a valuable repository of contemporary research and innovative ideas.

I extend my best wishes for the grand success of the conference and hope that it will inspire meaningful discussions and actionable outcomes for a sustainable future.

/-
(Dr. Parag Madhukar Dhakate)



Dr. Kapil Kumar Joshi, IFS
Ex. Principal Chief Conservator of Forest
Adjunct Professor
Centre for Sustainable Rural Development
(CSRD), IIT, Roorkee



Message

It gives me immense pleasure to extend my warm greetings on the occasion of the **8th National Conference on “Innovation, Integration and Sustainability in Agricultural, Applied and Life Sciences for Future India.”** The organization of such a meaningful academic gathering by **PLANTICA–IARRD, Dehradun** is truly commendable. In a time when the challenges of climate change, biodiversity loss, and sustainable resource management are becoming increasingly significant, platforms like this conference play a vital role in fostering dialogue, collaboration and innovation. Bringing together scholars, scientists, young researchers and academicians working in the fields of agriculture, plant sciences and life sciences creates an inspiring environment where ideas can flourish and solutions for a sustainable future can emerge.

Sustainability today is not merely an academic concept but a fundamental necessity for the survival and well-being of humanity. The responsible use of natural resources, conservation of biodiversity, and development of resilient agricultural systems are crucial for ensuring food security and ecological balance for future generations. Scientific innovation combined with traditional ecological wisdom can guide us towards sustainable development pathways that harmonize economic growth with environmental protection.

I would like to sincerely appreciate the efforts of **Dr. Anoop Badoni**, Chief Convenor of the conference, whose dedication and vision have helped create an excellent platform where young researchers can confidently present their scientific work and contribute to the advancement of plant and life science research. Such initiatives not only strengthen academic exchange but also inspire the next generation of scientists to address national and global environmental challenges.

I also extend my heartfelt thanks to **Shri Sunil Kumar Jain, Chairman, Tula’s Institute, Dehradun**, for his valuable support and encouragement in hosting this important conference at the institute. Institutional support of this kind greatly strengthens the culture of research, innovation and knowledge sharing.

I am confident that the deliberations and interactions during this conference will generate valuable insights and meaningful collaborations that will contribute significantly to sustainable agricultural development and life science research in India. I convey my best wishes for the grand success of the conference and hope that it will inspire many more such initiatives in the years to come.

With warm regards and best wishes.

/-
(Kapil K. Joshi)

Prof. (Dr.) A. K. Karnatak

Former Vice Chancellor of
MPUAT, Udaipur
VCSG UUFH, Bharsar
Doon University, Dehradun



Message from Chief Advisor of PLANTICA

It gives me immense pleasure to extend my warm greetings and best wishes on the occasion of the **8th Plant Science Researchers Meet (PSRM) – National Conference** on the theme “*Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India*”, being organized on **17th and 18th April, 2026**.

This significant academic gathering, jointly organized by **PLANTICA – Association of Plant Science Researchers (APSR)** and **Tula’s Institute, Dehradun**, in collaboration with **UKPCB, Government of Uttarakhand**, serves as an excellent platform for scientists, academicians, researchers, industry experts, and students to come together and deliberate on contemporary challenges and emerging opportunities in the field of agricultural and life sciences.

In the present era, where sustainability and innovation are critical to ensuring food security, environmental protection, and economic development, such conferences play a vital role in fostering interdisciplinary collaboration and knowledge exchange. The integration of advanced technologies with traditional practices will pave the way for resilient and sustainable agricultural systems, which are essential for the future of our nation.

I am confident that the **Abstract and Souvenir Book** of this conference will serve as a valuable repository of scientific knowledge, showcasing innovative research, practical insights, and transformative ideas contributed by scholars from diverse domains. It will not only document the academic richness of the event but also inspire future research and collaborations.

I congratulate the organizing committee for their dedicated efforts in successfully bringing together this prestigious event and extend my best wishes for its grand success. I also appreciate all contributors whose scholarly work has enriched this publication.

Let us continue to work collectively towards building a sustainable, innovative, and self-reliant India through science and research.

/-
(A. K. Karnatak)



पं० ल० मो० शर्मा श्री देव सुमन उत्तराखण्ड विश्वविद्यालय परिसर ऋषिकेश

Prof. (Dr.) G. K. Dhingra
Director Research and
Director IQAC



Message

It gives me immense pleasure to extend my warm greetings on the occasion of the **8th Plant Science Researchers Meet (PSRM) – National Conference** on “*Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India*”, being held on 17th and 18th April 2026.

This significant academic gathering, organized by **PLANTICA – Association of Plant Science Researchers (APSR)** and **Tula’s Institute, Dehradun**, in collaboration with the **Uttarakhand Pollution Control Board (UKPCB), Government of Uttarakhand**, reflects a commendable initiative to bring together researchers, academicians, industry experts, and young scholars on a common platform. The chosen theme is both timely and relevant, addressing the pressing need to integrate innovative scientific approaches with sustainable practices for ensuring food security, environmental conservation, and socio-economic development.

In the present era of rapid environmental changes and technological advancements, it is imperative to foster interdisciplinary research and collaborative efforts. Conferences like PSRM serve as catalysts for knowledge exchange, idea generation, and networking, ultimately contributing to the advancement of agricultural and life sciences in India.

I am confident that the deliberations, presentations, and discussions during this conference will provide valuable insights and pave the way for innovative solutions to contemporary challenges. The publication of the Abstract and Souvenir Book is a noteworthy effort that will serve as a valuable repository of scientific contributions and emerging research trends.

I extend my sincere appreciation to the organizers for their dedicated efforts in conceptualizing and executing this conference. I also convey my best wishes to all the participants for a fruitful and enriching experience.

I wish the conference grand success.

(Prof. G. K. Dhingra)



Dr. Shivendu Pratap Singh Solanki
District Horticulture Officer (DHO)
Office: Shaheed Major Nitin Bali Marg
,Kurukshetra UE,Sector-7,Kurukshetra-136118
OfficeTel.No.01744-222957
E-mailid:dhokurukshetra@gmail.com



Message

It gives me immense pleasure that PLANTICA-Association of Plant Science Researchers, Dehradun, Utrakhand is organizing National Conference on Innovation, Integration, and Sustainability in Agricultural, Applied and Life sciences for Future India at Dehradun, Uttarakhand from 17-18 April, 2026. The main objective of the conference is to encourage the exchange of scientific information on various and interdisciplinary aspects of plant sciences. The interactions would benefit the researcher's community comprehensively.

I congratulate the team for their organization and wish them all the best in their endeavor.

(Shivendu Pratap Singh Solanki)



Dr Abhishek Mathur
GM - R&D and
Techno commercials



Message

It gives me immense pleasure to extend my warm greetings to all participants, researchers, academicians, policymakers, and industry leaders attending the 8th PSRM 2026. This prestigious forum has consistently served as a dynamic platform for exchanging knowledge, fostering innovation, and strengthening collaborations across diverse scientific and technological domains. The 8th PSRM is not just a conference—it is a confluence of ideas where cutting-edge research meets practical implementation. It provides an excellent opportunity for young researchers and experienced professionals alike to present their work, engage in technical deliberations, and explore emerging trends in science, sustainability, and resource management. The emphasis on interdisciplinary research, translational science, and real-world problem-solving makes PSRM particularly relevant in today's context.

In an era where global challenges such as climate change, food security, environmental sustainability, and resource optimization demand urgent attention, PSRM plays a crucial role in shaping forward-looking solutions. The integration of biological innovations, precision agriculture, advanced materials, and data-driven technologies discussed at this forum will significantly contribute to building resilient and sustainable systems.

I would also like to highlight the importance of industry–academia partnerships that PSRM actively promotes. Such collaborations are essential for accelerating the commercialization of research outcomes, scaling innovative technologies, and ensuring that scientific advancements translate into tangible societal benefits.

I sincerely appreciate the efforts of the organizing committee in curating a comprehensive program that includes keynote lectures, technical sessions, poster presentations, and networking opportunities. I encourage all participants to actively engage, exchange ideas, and leverage this platform to build meaningful collaborations.

I am confident that the 8th PSRM 2026 will set new benchmarks in knowledge sharing and innovation, and will inspire transformative research that contributes to a sustainable and prosperous future.

I extend my best wishes for a highly successful and impactful conference.

Warm Regards

(Dr. Abhishek Mathur)



Raunak Jain
Vice Chairman
Tula's Institute, Dehradun



Message

It gives me immense pleasure to extend my warm greetings to all the participants, researchers, academicians, and stakeholders on the occasion of the *8th Plant Science Researchers Meet (PSRM) – National Conference* on the theme “*Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India*”, being held on 17th and 18th April 2026.

This prestigious conference, jointly organized by PLANTICA – Association of Plant Science Researchers (APSR) and Tula's Institute, Dehradun, in collaboration with UKPCB, Government of Uttarakhand, reflects a shared commitment to advancing scientific knowledge and fostering sustainable solutions for the challenges facing agriculture and life sciences today.

In an era where innovation and sustainability are pivotal to ensuring food security and environmental balance, such academic gatherings play a crucial role in bridging the gap between research and real-world applications. The integration of interdisciplinary approaches highlighted in this conference is essential for building a resilient and future-ready India.

I am confident that the deliberations, exchange of ideas, and research contributions presented in this Abstract and Souvenir Book will serve as a valuable resource for researchers, policymakers, and practitioners alike. It will inspire collaborative efforts and innovative thinking towards sustainable development in agricultural and life sciences.

I commend the organizers for their dedicated efforts in bringing together eminent scientists and young researchers on this significant platform. I extend my best wishes for the grand success of the conference and hope it will pave the way for meaningful advancements in the field.

/-
(Raunak Jain)



Dr Shailendra K. Tiwary
Director
Tula's Institute, Dehradun



Message

It is a matter of immense pride and honor for Tula's Institute, Dehradun, to host the **8th Plant Science Researchers Meet (PSRM) – National Conference on “Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India”**, scheduled on 17–18 April 2026.

On behalf of the entire Tula's family, I extend a warm and cordial welcome to all distinguished scientists, academicians, researchers, industry experts, students, and delegates from across the country. Your presence adds great value to this prestigious gathering and strengthens our shared commitment toward advancing scientific knowledge and sustainable development.

This conference, organized in collaboration with PLANTICA – Association of Plant Science Researchers (APSR) and supported by the Uttarakhand Pollution Control Board (UKPCB), Government of Uttarakhand, reflects a timely and significant initiative. The theme emphasizes the need for interdisciplinary innovation, integration of emerging technologies, and sustainable practices in agriculture and life sciences to address the challenges of future India.

At Tula's Institute, we strongly believe that such academic platforms play a vital role in fostering intellectual exchange, collaborative research, and the dissemination of innovative ideas. This event will provide an excellent opportunity for participants to engage in meaningful discussions, share research findings, and explore practical solutions for sustainable agricultural and environmental development.

I sincerely appreciate the efforts of the organizing committee, collaborators, and partners for their dedication in making this conference a reality. I am confident that the deliberations and outcomes of this meet will contribute significantly to scientific advancement and policy perspectives.

I once again extend my heartfelt welcome to all participants and wish the conference great success.

With best wishes

/-
(Dr Shailendra K. Tiwary)
Director



Dr. Anoop Badoni

(Ph.D., FAPSR, FIBTCA, FSABM)

Senior Scientist and Director

Indian Academy of Rural Development

(IARD), Dehradun

President, Association of Plant Science Researchers

(APSR), Dehradun



Message from the Chief Convener

It gives me immense pleasure to extend my warm greetings to all the distinguished delegates, researchers, academicians, industry experts, and students participating in the *8th Plant Science Researchers Meet (PSRM) – National Conference on “Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India”*, being held on 17–18 April 2026 at Tula’s Institute, Dehradun.

This conference, jointly organized by PLANTICA – Association of Plant Science Researchers (APSR) and Tula’s Institute, Dehradun, in collaboration with the Uttarakhand Pollution Control Board (UKPCB), Government of Uttarakhand, serves as a significant platform for intellectual exchange and interdisciplinary dialogue. It aims to bring together innovative ideas and sustainable approaches to address the pressing challenges in agriculture, environmental management, and life sciences.

The theme of this conference underscores the critical need for integrating scientific advancements with sustainable practices to ensure food security, environmental conservation, and socio-economic development. In the present era of rapid technological transformation and ecological concerns, fostering innovation and collaboration among stakeholders is the key to building a resilient and sustainable future for our nation.

I am delighted to note that this Abstract and Souvenir Book reflects a diverse range of research contributions from across the country. The compilation not only highlights emerging trends and scientific breakthroughs but also provides valuable insights into practical applications that can benefit farmers, industries, and policymakers alike.

I sincerely appreciate the efforts of the organizing committee, contributors, reviewers, and all stakeholders who have worked tirelessly to make this conference a success. I am confident that the deliberations and interactions during this event will pave the way for meaningful collaborations and impactful outcomes.

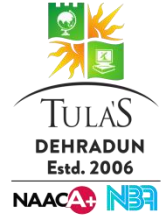
I wish the conference grand success and hope that all participants have a fruitful and enriching experience.

/-

(Anoop Badoni)



Dr. Sunil Semwal
Dean Research
Tula's Institute, Dehradun



Message from the Organizing Secretary

It gives me immense pleasure to extend a warm welcome to all delegates, researchers, academicians, industry experts, and students to the *8th Plant Science Researchers Meet (PSRM) – National Conference on “Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India”*, being held on 17–18 April 2026.

This prestigious conference, jointly organized by **PLANTICA – Association of Plant Science Researchers (APSR)** and **Tula's Institute, Dehradun**, in collaboration with **UKPCB, Government of Uttarakhand**, serves as a vibrant platform for intellectual exchange, interdisciplinary dialogue, and collaborative research advancement.

In the present era, where challenges such as climate change, food security, environmental degradation, and sustainable resource management are becoming increasingly critical, the integration of innovative scientific approaches across agriculture and life sciences is the need of the hour. This conference aims to bring together diverse perspectives to foster solutions that are practical, scalable, and sustainable for the future of India.

The Abstract and Souvenir Book reflects the collective efforts, ideas, and scientific contributions of participants from across the country. It stands as a testament to the enthusiasm and commitment of researchers working towards transformative advancements in plant science and allied disciplines. I sincerely appreciate all the contributors for their valuable submissions and their dedication to scientific excellence.

I extend my heartfelt gratitude to all organizing committee members, collaborators, sponsors, and volunteers whose tireless efforts have made this event possible. Special thanks are due to our knowledge partners and supporting institutions for their continuous encouragement and support.

I am confident that this conference will provide a meaningful platform for knowledge sharing, networking, and fostering future collaborations. I wish all participants a highly productive and enriching experience.

With best wishes for the success of the conference.

/-
(Sunil Semwal)

17 & 18 APRIL, 2026

8TH PSRM, 2025-26

PLANT SCIENCE RESEARCHERS MEET (PSRM)

National
Conference

Awards

Show
Case



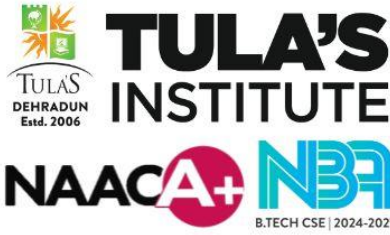
NATIONAL CONFERENCE ON INNOVATION,
INTEGRATION, AND SUSTAINABILITY IN AGRICULTURAL,
APPLIED AND LIFE SCIENCES FOR FUTURE INDIA



CO-ORGANIZED
AND HOSTED BY

Tula's Institute
Dehradun, Uttarakhand

Organized by:



Co-Organizers:



Industry Partners:



Knowledge Partners:



For any query contact Us: 97568 42006 / 99272 35929 / 78959 27407 / 95480 55290

National Conference on Innovation, Integration, and Sustainability in
Agricultural, Applied and Life Sciences for Future India

8TH PLANT SCIENCE RESEARCHERS MEET (PSRM) - NATIONAL CONFERENCE

CHIEF PATRONS



Shri Sunil Kumar Jain
Chairman
Tula's Institute
Dehradun, Uttarakhand



Dr. Devendra Bhaseen
Vice Chairman
Uttarakhand State Higher
Education Upgradation
Committee, Govt. of U.K.



Prof. (Dr.) A. K. Karnatak
Former Vice Chancellor
Maharana Pratap
University of Agriculture
and Technology, Udaipur

PATRONS



Mr. Raunak Jain
Vice Chairman
Tula's Institute
Dehradun, Uttarakhand



Ms. Silky Jain Marwah
Executive Director
Tula's Institute
Dehradun, Uttarakhand



Dr Raghav Garg
Vice President -
Technology
Tula's Institute
Dehradun, Uttarakhand



Dr Shailendra K. Tiwary
Director
Tula's Institute
Dehradun, Uttarakhand

ADVISORY BOARD



Prof. (Dr.) G. K. Dhingra
Director Research & IQAC
S D S Uttarakhand
University, Pt. L.M.S.
Campus, Rishikesh



Prof. (Dr.) J. S. Chauhan
H.O.D. Seed Technology
H. N. B. Garhwal University
(A Central University),
Srinagar, Uttarakhand



Prof. (Dr.) A. C. Mishra
Director Research
Banda University of
Agriculture and Technology,
Banada, U.P.



Prof. (Dr.) Sanjay Sachan
Head- KVK, Rudraprayag
G.B.Pant University of
Agriculture & Technology,
Pant Nagar



Prof. (Dr.) I. J. Gulati
Former Dean &
Faculty Chairman
S.K.R.A.U., Bikaner

CHIEF CONVENER



Dr. Anoop Badoni
Sr. Scientist & Director
PLANTICA - IARD, Dehradun

National Conference on Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India

CONVENER

Dr Nishant Saxena
Additional Director
Tula's Institute, Dehradun

Dr Vijay Kumar Upadhyay
Registrar
Tula's Institute, Dehradun

CO-CONVENER

Dr Sanjay Sharma
DSW and HOD- Agriculture
Tula's Institute, Dehradun

NATIONAL ADVISORY COMMITTEE

Prof. (Dr.) Kapil Joshi
Centre for Sustainable Rural
Development, IIT, Roorkee

Prof. (Dr.) J. Prabhakaran
Tamil Nadu Agricultural
University, Coimbatore

Prof. (Dr.) Babajide Odu
Obafemi Awolowo University
Nigeria

Prof. (Dr.) Birinchi K Sarma
Department of Mycology and
Plant Pathology
I.A.S., B.H.U., Varanasi

Prof. (Dr.) Udai P. Singh
Department of Agronomy
I.A.S., B.H.U., Varanasi

Prof. (Dr.) Ram Chandra
Department of Mycology and
Plant Pathology
I.A.S., B.H.U., Varanasi

Prof. (Dr.) R. S. Negi
Department of Rural Technology
H. N. B. Garhwal (A Central
University), Srinagar

Prof. (Dr.) Birendra Prasad
Department of Genetics and
Plant Breeding, GBPUAT,
Pantnagar

Prof. (Dr.) Shyam S Vaish
Department of Mycology and
Plant Pathology
I.A.S., B.H.U., Varanasi

Dr. Abhishek Singh
Yerevan State University, Armenia

Prof. (Dr.) Madhu Thapliyal
Govt. P. G. College, Uttarkashi

Dr. S. P. S. Solanki
DHO, Govt. of Haryana

Dr. Abhishek Mathur
The Omni Group, Panchkula, Haryana

Dr. Mehdi Rahimi
Graduate University of Advanced
Technology, Kerman, Iran

Dr. V Shankaran
Former GM
NSC, New Delhi

SECRETARIES ORGANIZING COMMITTEE

Dr. H. S. Banyal
H. P University, Shimla

Dr. Nitesh Kumar
H. P. University, Shimla

Dr. Sunil Semwal
Tula's Institute, Dehradun

Dr Tripuresh Joshi
Tula's Institute, Dehradun

Dr. Pallavi Chauhan
PLANTICA- IARD, Dehradun

Dr. Vinay Chamoli
JBIT, Dehradun

Mr. Himanshu Malhotra
SCHOLICS-SABM, Dehradun

Dr. R. P. Srivastava
Sandip University, Bihar

JOINT SECRETARIES ORGANIZING COMMITTEE

Dr. Pooja Kaintura
Dehradun

Dr. Deepali Joshi
HIT, Dehradun

Ms. Vandana Petwal
PLANTICA- IARD

Mr. Naveen Chandra
Quantum University, Roorkee

Mr. Adarsh Dangwal
GBPUAT, Pantnagar

Mr. Shailendra Tiwari
H.N.B.G.U., Srinagar

Mr. Ashish Negi
S.G.R.R.U., Dehradun

Mr. Aditya Raturi
R.I.M.T.U., Panjab

CO-SECRETARIES ORGANIZING COMMITTEE

Prof. (Dr.) P. K. Sahgal
U.O.U., Haldwani

Prof. (Dr.) D. S. Rawat
Maya Devi University, Dehradun

Dr. Vandana Bhakuni
Kumaun University, Nainital

Dr. Yuvraj Yadav
Geeta University, Panipat

Ms. Hema Rawat
PLANTICA-IARD

Dr Suresh Kumar
Tula's Institute, Dehradun

Mr. Shivendra Kumar
Tula's Institute, Dehradun

Ms. Anita Trivedi
SGRRU, Dehradun

COORDINATORS ORGANIZING COMMITTEE

Ms. Sonali Rajput
H.N.B.G.U., Srinagar

Ms. Meenakshi Joshi
H.N.B.G.U., Srinagar

Mr. Ankit Sati
H.N.B.G.U., Srinagar

Mr. Nabdeep Singh
H.N.B.G.U., Srinagar

Mr. Chandan Kumar
R.I.M.T.U. Punjab

For any query contact Us: 97568 42006 / 99272 35929 / 78959 27407 / 95480 55290

MEMBERS ORGANIZING COMMITTEE

Dr. Tejpal Singh
HNBGU, Srinagar

Dr. Rinkey Arya
Kumaun University
Nainital

Dr. Jaspal Chauhan
HNBGU, Srinagar

Dr. Akash Baboo
Sandip University, Bihar

Dr. Soniya Singh
Motherhood University,
Roorkee

Dr Prem Verma
Tula's Institute, Dehradun

Dr Mukesh
Tula's Institute, Dehradun

Mr. Sonu Kumar
Sandip University, Bihar

Mr. Satyendra K Jha
Sandip University, Bihar

Ms. Suhani Shrey
HNBGU, Srinagar

Mr. Swagat Ranjan
GBPUAT, Pant Nagar

Dr. K. N. Shah
HNBGU, Srinagar

Dr. Neha Joshi
Kumaun University
Nainital

Dr. Gajendra Pratap
JBIT, Dehradun

Dr. A. S. Rawat
JBIT, Dehradun

Dr. Isha Tehseen
GBPUAT, Pant Nagar

Dr Shivangi Negi
Tula's Institute, Dehradun

Dr. Rajeev Ranjan
Sandip University, Bihar

Mr. Sonu Saurav
Sandip University, Bihar

Mr. Sumit Gaur
GBPUAT, Pant Nagar

Ms. Tarannum Jahan
GBPUAT, Pant Nagar

Ms. Kavita Pun
SGRRU, Dehradun

Dr. Kunzang Lamo
University of Ladakh

Dr. Rajani
Kumaun University
Nainital

Dr. Atul Kumar
Sandip University, Bihar

Dr. Bharat VPS Rawat
JBIT, Dehradun

Dr. Neha Uniyal
Tula's Institute, Dehradun

Dr Tanuja Bharadwaj
Tula's Institute, Dehradun

Mr. Ashish Upadhyay
Tula's Institute, Dehradun

Mr. Paras Arya
GBPUAT, Pant Nagar

Mr. Abhay Singh
HNBGU Srinagar

Ms. Bhumika Bisht
L.P.U., Jalandhar

Mr. Dinkar Joshi
Graphic Era University

Dr. Amitabh Singh
GLA University, Matura

Dr. Vivek Singh
HNBGU, Srinagar

Dr. Subhash Kumar
JBIT, Dehradun

Dr. Swati Negi
GBPUAT, Pant Nagar

Dr. Rupinder Kaur
Tula's Institute, Dehradun

Dr Ankur
Tula's Institute, Dehradun

Ms. Shivani Sharma
Tula's Institute, Dehradun

Mr. Anil Kumar
GBPUAT, Pant Nagar

Mr. Amit Bhatt
SGRRU, Dehradun

Ms. Garima Bhargav
Chandigarh University

Ms. Priya Tiwari
Graphic Era University

Dr. Priyanka Bhatt
Kumaun University, Nainital

Dr. Santosh Singh
HNBGU, Srinagar

Dr. Basant Kumar
Sandip University, Bihar

Dr. Shruti Singh
APS University, M.P.

Dr Rekha Dhanai
Tula's Institute, Dehradun

Dr Shambhavi
Tula's Institute, Dehradun

Mr. Pankaj Negi
Tula's Institute, Dehradun

Mr. Vikas Jha
Sandip University, Bihar

Ms. Sushmita Rangarh
GBPUAT, Pant nagar

Ms. Sambita Bhattacharya
GBPUAT, Pant Nagar

Ms. Diksha Kushwaha
RLBCAU, Jhansi





PLANTICA-IARD

PLANTICA – Indian Academy of Rural Development (IARD) is a premier knowledge and action-oriented institution dedicated to transforming rural landscapes through science-led education, sustainable development, and community empowerment. Established with a vision to bridge academia, policy, and grassroots innovation, IARD works at the intersection of rural development, agriculture, environmental sustainability, and socio-economic upliftment.

At its core, IARD fosters capacity building and entrepreneurial growth in rural communities by offering cutting-edge training programs, hands-on workshops, field demonstrations, and extension services. By leveraging interdisciplinary expertise, IARD equips farmers, youth, women, and rural stakeholders with the tools to innovate, adopt sustainable practices, and create resilient livelihoods.

PLANTICA-APSR

PLANTICA – Association of Plant Science Researchers (APSR) is a vibrant professional society committed to advancing plant science research, innovation, and collaboration at national and international levels. APSR serves as a nexus for researchers, academicians, scientists, students, and industry experts passionate about understanding and enhancing plant systems in the context of biological, environmental, and agricultural challenges.

APSR fosters a collaborative ecosystem by organizing scientific forums, conferences, seminars, and publications that facilitate knowledge exchange, interdisciplinary discourse, and translational research. With a strong emphasis on sustainability and relevance to real-world challenges, APSR nurtures emerging talent and connects research with policy and practice.

“9 Years of Excellence”

PLANTICA FOUNDATION established in 2017, is the institutional umbrella that anchors both IARD and APSR, and orchestrates a wide array of initiatives for sustainable development, research translation, and community transformation. Based in Dehradun, Uttarakhand, the Foundation is committed to shaping inclusive solutions at the confluence of environment, science, rural economy, and human welfare.

Driven by a mission to integrate research, education, and field action, PLANTICA FOUNDATION supports strategic partnerships, policy discourse, and social innovation that address contemporary challenges like climate resilience, livelihood security, and ecological balance. It plays a vital role in nurturing collaborative platforms that unite government agencies, academic institutions, civil society, and private partners toward shared goals.

Talk To Us

Plantica Foundation
Madhur Vihar Phase-2,
Banjarawala Road, Ajabpur
Khurd, Dehradun, Uttarakhand

Contact:
+91 95480 55290

PLANTICA-IARD
www.plantica.in
E-mail:
planticaddn@gmail.com

PLANTICA-APSR
www.pgrindias.in
E-mail:
pgrindias@gmail.com



Tula's Institute

Tula's Institute is dedicated to serve the community by recognizing the diverse needs of the individuals. Tula's Institute is recognized as one of the 'Top Engineering Colleges in Uttarakhand. Known for its excellence in academic programs from undergraduate to postgraduate level, Tula's Institute attracts students from different states of India and neighbouring countries at priority. At Tula's Institute, we believe in maintaining a balance between academics and extra/co- curricular activities while keeping a healthy teacher-student ratio and in providing equal opportunities for all.

Tula's Institute is redefining the future of education. It goes beyond mere textbooks and lectures; it involves cultivating an environment conducive to invention. At Tula's, each project serves as a chance to challenge conventions, every concept represents a progression towards innovation, and every student is enabled to reimagine the realm of possibility. Education ignites curiosity and propels transformation.

"Tula's community embraces performance with ethical values for a progressive society through knowledge dissemination at all levels. We are inventive and obsessed with quality. We are open to young, energetic and passionate individuals regardless of their background. We invite talent from all across the world, with ingenuity and drive to join us in our journey for learning, innovation and discourse expanding frontiers of knowledge and wisdom."

Campus:

1. Location: Dehradun
2. Area: 10.33 Acres
3. Students' Residences: 4 Boys Hostel and 1 Girls Hostel.
4. Playing Fields: 3 Badminton courts, 1 Volley-ball court, 1 Basketball court, 1 Cricket field, 1 Football field, Indoor facility such as Table Tennis, Chess, Carrom.
5. No of programs:18
6. Student-Faculty ratio: 1:15
7. Alumni Strength: 4000
8. Libraries: 02 (Main Library & Reference Library)
9. Industrial Labs: 04

Tula's Institute is a privately managed, self-financing Engineering and Professional Institute, set up by the Rishabh Educational Trust in 2006. It is situated at Dehradun in Uttarakhand. It is affiliated to Uttarakhand Technical University, Dehradun and approved by AICTE and Uttarakhand Board of Technical Education for engineering courses and Sri Dev Suman Uttarakhand University for professional courses. The campus is at a distance of 16 km from the Dehradun Railway Station and 43 km from the Jolly Grant Airport, Dehradun.

Institute's Vision:

To emerge as an academic centre producing world class professionals, promoting innovation and research.

Institute's Mission:

To promote intellectual and skilled human capital generating employment and entrepreneurship.

To Be Educational centre of excellence of multi ethnicity and diversity.

To Establish as a technology-driven teaching-learning institution.

To Provide a world class platform for research and innovation.

To Inculcate social, environmental, heritage values.

Talk To Us

Tula's Institute, Dhoolkot, Post Office: Selaqui, Chakrata Road, Dehradun- 248011 Uttarakhand

Contact:
+91 9837 983721

Tula's Institute
<https://www.tulas.edu.in>

E-mail:
info@tulas.edu.in

National Conference on Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India

THEMES OF THE CONFERENCE

Innovation, Integration, and Sustainability in Agricultural, Applied and Life Sciences for Future India

This theme underscores the need for:

Innovative solutions that drive productivity and sustainability,

Integrated approaches combining agriculture, environment, technology, and society,

And a clear vision for a sustainable future through education, research, and rural empowerment.

CONFERENCE TRACKS

The conference will feature the following tracks covering a wide range of topics related to agriculture, applied sciences, and life sciences:

- Agri-Innovation & Smart Farming
- Climate-Smart Agriculture & Environmental Sustainability
- Soil Health, Water Management & Natural Resource Conservation
- Botany, Biotechnology, Bioinformatics & Genomics
- Organic, Natural & Integrated Farming Systems
- Agroforestry, Horticulture & Plantation Crops
- Zoology, Livestock, Fisheries & Allied Sciences
- Agri-Entrepreneurship, Extension & Rural Development
- Medicinal & Aromatic Plants, Ethnobotany & Traditional Knowledge
- Post-Harvest Technology, Food Science & Agro-Processing



For any query contact Us: 97568 42006 / 99272 35929 / 78959 27407 / 95480 55290

Key Note Address -1

INNOVATION, INTEGRATION, AND SUSTAINABILITY IN INDIAN AGRICULTURE

Prof. (Dr.) I. J. Gulati

Former Dean and Faculty Chairman
SK Rajasthan Agriculture University, Bikaner

Indian agriculture stands at a critical juncture in 2026. While we have grown from a net-cereal-importing nation to a global agricultural powerhouse—producing an approximately 347.44 million tonnes of food grains in 2024–25—we now face the triple challenge of climate change, nutritional security, and farmer prosperity. Today's agenda focuses on how we can bridge the gap between tradition and technology to build a resilient, value-driven agricultural ecosystem. (A) The Innovation Frontier: Beyond Productivity: Innovation in 2026 is no longer just about yield; it is about intelligence. We are moving from a quantity-led approach to a value-driven growth model. 1. Artificial Intelligence (AI) as a Utility: AI is being harnessed to turn satellite and soil data into actionable insights, helping farmers decide exactly when to sow and harvest. Tools like Bharat-VISTAAR and the Kisan e-Mitra chatbot now handle over 8,000 daily queries in 11 regional languages, democratising expert advice. 2. Precision Agriculture: Startups like Fasaland CropIn are bringing IoT and satellite imagery to smallholders, allowing for targeted application of water and fertilisers that can cut costs and improve yields by 20–30%. 3. The Drone Revolution: Under schemes like NAMO Drone Didi, over 15,000 women-led Self-Help Groups are being equipped with drones for crop monitoring and liquid fertiliser spraying, creating new rural livelihoods. (B) Integration: Connecting the "Phygital" Ecosystem. Successful innovation requires the seamless integration of physical hardware with digital intelligence—a "phygital" model. 1. Digital Public Infrastructure (DPI): The Digital Agriculture Mission has already surveyed 23.5 crore crop plots and created over 7.63 crore Farmer IDs, providing a foundation for data-driven governance. 2. Unified Markets: Platforms like e-NAM have networked existing mandis to create a transparent, pan-India electronic trading portal, ensuring better price discovery for the individual farmer. 3. Value Chain Resilience: We must align our domestic standards with global Codex benchmarks to reduce trade rejections and tap into high-value export markets. Technologies like blockchain are now providing the "farm-to-fork" traceability required by international buyers. (C) Sustainability: Reimagining Our Resource Footprint Sustainability is no longer optional; it is the prerequisite for future survival. 1. Climate-Smart Agriculture (CSA): With projections showing that climate change could reduce major crop productivity by 24% by 2080, we must shift toward resilient practices. This includes promoting "Shree Anna" (millets) which are drought-tolerant and nutrient-dense. 2. Regenerative Practices: The National Mission on Natural Farming aims to bring one crore farmers under chemical-free cultivation, supported by 10,000 Bio-Input Resource Centres. 3. Water Management: Initiatives like PMKSY (Pradhan Mantri Krishi Sinchai Yojana) are driving "more crop per drop" through micro-irrigation, which has been shown to improve water efficiency by up to 40% in arid regions. A Human-Centric Transformation The roadmap for Indian agriculture must remain farmer-centric. Our goal is to move from fragmented interventions to a connected ecosystem where the farmer is not just a user of technology, but a co-creator of the future of food. If the Green Revolution fed India, this "Intelligent Revolution" must empower it, ensuring that agriculture is not just a means of survival, but a thriving, sustainable business.

PRECISE AND SPEED BREEDING APPROACHES IN VEGETABLE CROPS

Dr. A.C. Mishra

Professor, Department of Vegetable Science

Banda University of Agriculture and Technology, Banda (U.P.)-210 001

Vegetable crops constitute an essential component of global agriculture, contributing significantly to human nutrition, health, and economic security. They are rich sources of dietary fiber, vitamins, minerals, antioxidants, and phyto-nutrients that help prevent chronic diseases and malnutrition. Traditional breeding techniques-including mass selection, pedigree breeding, and backcrossing have been effective in improving yield, disease resistance, and quality traits. Nonetheless, these methods are time-consuming, labor-intensive, and limited by the genetic complexity of traits and environmental interactions. Furthermore, the narrow genetic base in many elite cultivars, driven by repeated selection and inbreeding, has resulted in increased vulnerability to biotic and abiotic stresses. The global demand for vegetable crops is expected to increase by at least 30-40% by 2050, as a consequence of population growth, urbanization, and the shift toward plant-based diets. This escalating demand places immense pressure on breeding programs to accelerate the development of improved varieties with higher productivity, resilience to climate change, enhanced nutritional profiles, and reduced input requirements. However, conventional breeding alone is insufficient to meet these multidimensional goals within the required timeframe. Recent advances in molecular genetics, genomics, and data science have led to the development of next-generation precision breeding tools that allow for more efficient, targeted, and predictive approaches to crop improvement. These include marker-assisted selection (MAS), genomic selection (GS), Genome-wide association Studies (GWAS), genome editing e.g., CRISPR/Cas9 (SDN-1 &2), speed breeding i.e. rapid generation enhancement and doubled haploids techniques, transcriptomics, metabolomics, phenomics and high throughput phenotyping techniques. Such tools facilitate the rapid identification and manipulation of genes or quantitative trait loci (QTLs) associated with complex traits and thus, enhancing selection accuracy and reducing breeding cycle time. Vegetable crops are particularly suitable for the application of advanced breeding technologies due to their short life cycles, diverse reproductive systems, and availability of genomic resources. For instance, high-quality reference genomes and transcriptomic data are now available for major vegetable crops such as tomato (*Solanum lycopersicum*), cucumber (*Cucumis sativus*), carrot (*Daucus carota*), cole crops and lettuce (*Lactuca sativa*). Coupled with high-throughput genotyping platforms and phenotyping technologies, these tools offer unprecedented opportunities to dissect complex traits and accelerate the development of climate-smart, nutrient-dense, and resilient vegetable varieties. Application of such advanced breeding tools in vegetable crops and integration of these technologies can help overcome current breeding limitations and contribute to sustainable vegetable production in the face of growing global challenges.

**ECONOMIC EMPOWERMENT OF RURAL WOMEN AS AGRIPRENEURS IN
UTTARAKHAND HILLS**

Dr. Sanjay Sachan
Professor and Head
KVK, Rudraprayag (GBPUAT, Pant Nagar)

Economic empowerment of rural women through agripreneurship has emerged as a transformative pathway for sustainable development in the hill regions of Uttarakhand. The unique agro-climatic conditions, rich biodiversity, and traditional knowledge systems of the region provide immense opportunities for women to engage in diversified agricultural enterprises such as organic farming, mushroom cultivation, beekeeping, medicinal and aromatic plant cultivation, and value addition of local produce. Despite their significant contribution to agriculture, rural women often face constraints including limited access to credit, technology, training, and market linkages. This study explores the role of agripreneurship in enhancing the socio-economic status of rural women in the Uttarakhand hills. It highlights successful models of women-led enterprises, self-help groups (SHGs), and cooperatives that have contributed to income generation, employment creation, and improved decision-making power at household and community levels. The paper also examines the impact of capacity-building initiatives, government schemes, and institutional support in promoting women agripreneurs. The findings suggest that strengthening skill development programs, improving access to financial services, promoting market-oriented production, and fostering public-private partnerships can significantly enhance women's participation in agribusiness. Agripreneurship not only contributes to economic independence but also plays a crucial role in reducing migration, ensuring food security, and achieving inclusive rural development in the fragile hill ecosystem of Uttarakhand.

Keywords: Rural Women, Agripreneurship, Economic Empowerment, Uttarakhand Hills, Self-Help Groups (SHGs), Sustainable Agriculture, Livelihood Diversification, Women Entrepreneurship, Value Addition, Rural Development

Fish Diversity of the North-Western Himalayas: Patterns, Threats, and Sustainable Management Approaches

Dr. Harinder Singh Banyal

Associate Professor, Department of Biosciences, Himachal Pradesh University
Summer Hill, Shimla (H.P.) – 171005, India

Email: dr.harinderbanyal@gmail.com

The North-Western Himalayas support rich freshwater fish diversity influenced by altitudinal gradients, hydrological variability, and habitat heterogeneity. Cold-water species, particularly snow trout, dominate upper reaches, while mid- and lower-altitude rivers sustain diverse indigenous and migratory fishes. However, this diversity is increasingly threatened by hydropower development, habitat fragmentation, overfishing, pollution, riverbed mining, invasive species, and climate change. These pressures alter flow regimes, degrade habitats, and disrupt breeding and migration patterns, leading to declines in native populations. Sustainable management is essential to conserve ichthyofaunal resources and maintain ecosystem services. Key approaches include habitat restoration, environmental flow regulation, control of exotic species, responsible fishing practices, community participation, and integration of traditional ecological knowledge with scientific conservation. Strengthening monitoring programs and adopting basin-level management strategies are crucial for long-term sustainability. This study emphasizes the need for coordinated conservation efforts to protect fish diversity and ensure ecological integrity in the North-Western Himalayan freshwater ecosystems.

Keywords: Fish diversity, North-Western Himalayas, cold-water fishes, hydropower, habitat fragmentation, climate change, invasive species, sustainable management, freshwater conservation.

INTEGRATING GWAS AND FUNCTIONAL GENOMICS TO UNLOCK MICRONUTRIENT BIOFORTIFICATION IN TETRAPLOID POTATO

Dr. Umesh Goutam

Professor, Department of Molecular Biology & Genetic Engineering,
School of Bioengineering and Biosciences, Lovely Professional University, Punjab, India.

[*umeshbiotech@gmail.com](mailto:umeshbiotech@gmail.com), umesh.14691@lpu.co.in

Micronutrient malnutrition is also referred to as hidden hunger and the issue continues to be a significant problem in the world, demanding sustainable solutions to the problem using crops. The third food crop that is eaten world wide, the potato (*Solanum tuberosum* L.), offers a strategic chance, which can be enhanced nutritionally. However, polyploidy, allelic dosage effects and non-additive genetic interactions complicate genetic control of micronutrient concentration in tetraploid potatoes making use of conventional breeding methods less efficient. The current study uses the high-resolution genomics model to comprehend the genetic organization of phenotypes of micronutrients through genome-wide association studies (GWAS), which involves a combination of high-density SNP genotyping and multi-environment phenotypic analysis. The tuber mineral composition (iron, zinc, manganese), dry matter content and attributes related to yield were described using a diverse association panel. These models (additive and dominance) were utilized in solving marker-trait associations, which may be utilized in the determination of significant genomic locus that governs the accumulation of micronutrients and other related agronomic phenotypes. In the present study, the GWAS for different nutrients and tuber dry matter content identified highly significant Marker Trait Associations (MTAs). These MTAs could be used for the screening of nutrient-rich potato breeding lines. Based upon these MTAs, Allele Specific PCR markers can be developed for improving nutritional traits. The identified and validated MTAs are the potential tool to develop bio fortified potato cultivars through marker-assisted breeding or other modern genetic approaches like genome editing.

Keywords: Tetraploid potato; GWAS, Micronutrient biofortification, Nutritional security, Genomics assisted breeding, Hidden hunger, Sustainable agriculture.

ALLELOPATHIC PLANTS OF HIMACHAL PRADESH AND THEIR SIGNIFICANCE IN AGRICULTURE AND ECOLOGICAL SUSTAINABILITY

Dr. Nitesh Kumar

Assistant Professor Botany, Department of Biosciences, HPU Shimla, Himachal Pradesh

Plants release allelochemicals into the environment, such as phenolics, terpenoids, and sesquiterpene lactones, which have an impact on the germination, growth, and reproduction of nearby species. This process is known as allelopathy. The Western Himalayan state of Himachal Pradesh is endowed to a rich floristic diversity influenced by human activity, microclimates, and altitudinal gradients. Allelopathic plants have therefore become a major concern for forestry, agriculture, and biodiversity protection in Himachal Pradesh (HP). Allelopathy, the release of phytotoxic substances that affect the germination, growth, and community dynamics of nearby plants, is exhibited by a specific subset of species within this flora. Local ecosystems are shaped by allelochemical cycles that are influenced by both aggressive invasives and native trees, shrubs, and plants. *Lantana camara*, *Ageratum conyzoides*, *Parthenium hysterophorus*, *Eupatorium adenophorum*, *Artemisia* spp., *Juglans regia*, *Pinus roxburghii*, *Eucalyptus* spp., and *Acacia* spp. are among the frequently reported allelopathic taxa in the area and adjacent Himalayan zones. Many of these species predominate in forest understories, grasslands, fallows, and roadsides. Phenolics, terpenoids, alkaloids, and flavonoids are released by leaf leachates, root exudates, and litter decomposition. These compounds inhibit seedling establishment, lower biomass and chlorophyll, and cause oxidative stress in vulnerable crops and wild species. These allelopathic interactions have two functions in ecology. They control species composition in natural communities, encourage the dominance of particular trees and shrubs, and affect patterns of forest regeneration by preventing forest cover replenishment. Allelopathic weeds decrease crop vigor, change soil microbial groups, and increase production losses in agroecosystems in the districts of Kangra, Mandi, Hamirpur, Solan, and Shimla, particularly in areas where invasive *Lantana camara*, *Ageratum conyzoides*, and *Parthenium hysterophorus* dominate in thick populations. Road construction, fire, grazing, and other disturbances that promote the spread of invaders exacerbate the effects. Researchers and farmers can better balance productivity, biodiversity conservation, and long-term sustainability in delicate alpine ecosystem of Himachal Pradesh through analyzing allelopathic plants and their ecological roles.

Keywords: Allelopathy, Invasive species, Phytotoxicity, Ecosystem dynamics, Himachal Pradesh.

NATURAL FARMING IN FRUIT CROPS

Shivendu Pratap Singh Solanki

District Horticulture officer, Govt. Of Haryana, Kurukshetra

E-mail: shivenducstf@gmail.com

Natural farming is a chemical-free farming method with Indian roots that has been enhanced by contemporary ecological knowledge, resource recycling, and on-farm resource optimization. It is regarded as a diversified farming system based on agro-ecology that incorporates livestock, trees, and crops with functional biodiversity. With a focus on biomass mulching, using on-farm cow dung-urine formulations, keeping soil aeration, and avoiding synthetic chemical inputs, it is primarily centered on on-farm biomass recycling. It is anticipated that natural farming will lessen reliance on purchased inputs. It is regarded as an economical farming method that has the potential to boost rural development and employment. By promoting natural farming methods and concurrently stimulating market growth, the Awareness of Natural Farming System in fruit Production initiative seeks to raise the productivity and standard of living of smallholder farmers engaged in fruit farming.

Keywords: Natural Farming, Fruits, Agro-ecology, Biodiversity

COMMERCIAL, STABILITY AND REGULATORY ASPECTS IN BIOLOGICAL FORMULATIONS FOR AGRICULTURE: KEY CHALLENGES AND LIMITATIONS

Dr. Abhishek Mathur

Sr. Scientist and GM – R&D and Techno-commercials
OMNI Agrochemicals Pvt Ltd, Panchkula, Haryana, India
E-mail: drabhishekmathur123@gmail.com

The rapid transition toward sustainable agriculture has accelerated the commercialization of biological formulations for crop nutrition and crop protection. However, successful market adoption of such products depends not only on bio-efficacy but also on regulatory compliance, formulation stability, and scalable manufacturing. In India, biological inputs—including biofertilizers, biostimulants, and certain microbial products—are primarily regulated under the Fertilizer (Control) Order, 1985 (FCO), while biopesticides fall under the Central Insecticides Board & Registration Committee (CIBRC) framework. Internationally, regulatory benchmarks are guided by organizations such as FAO, OECD, and EPA, emphasizing product consistency, safety, and performance validation. Under FCO, biological formulations must comply with prescribed specifications related to viable cell count, contamination limits, pH, carrier quality, moisture content, and shelf life, with typical expiry periods 12 months to 24 months for carrier based and liquid formulations. Additionally, mandatory provisions include product registration, labelling, packaging standardization, and adherence to notified nutrient or microbial standards before commercialization. Recent amendments (2025–2026) have further strengthened regulatory oversight by introducing structured guidelines for biostimulants, microbial consortia, nano-formulations, and standardized pack sizes to ensure uniformity and traceability. In parallel, CIBRC mandates rigorous data on toxicity, bio-efficacy, shelf life, and environmental safety for microbial pesticides, aligning with global pesticide regulatory frameworks. From a commercial perspective, key challenges include maintaining microbial viability during storage and distribution, ensuring batch-to-batch consistency, optimizing carrier or liquid delivery systems, and achieving cost-effective large-scale production. Stability is influenced by formulation type (carrier-based vs liquid), choice of stabilizers, packaging materials, and environmental conditions such as temperature and humidity. International standards further demand validated shelf-life data, GLP-compliant studies, and compatibility with integrated nutrient and pest management systems. This study highlights that the success of biological formulations lies at the intersection of regulatory compliance, scientific formulation design, and commercial scalability. Harmonization between Indian regulations (FCO and CIBRC) and international guidelines is essential to enhance product credibility, facilitate exports, and ensure sustainable agricultural productivity.

Keywords: Biological Formulations, FCO, CIBRC, Stability and Regulatory aspects, regulatory compliance

Abstract Index

S.N.	Authors	Affiliation	Title	Page No.
001	Abstract ID- 8001 <i>¹Rahul Kumar Jat and ²Roshan Choudhary</i>	¹ SKN Agriculture University Jobner, Rajasthan, India ² SKN Agriculture University Jobner, Rajasthan, India	Organic, Natural and Integrated Farming Systems: Implications for Soil Health, Productivity and Farm Sustainability	1
002	Abstract ID- 8002 <i>Ronak Sharma</i>	Msc.(PG)-Soil Science & Agricultural Chemistry Dr. Rammanohar Lohia Avadh University Ayodhya	Wheat Biofortification to Enhance Production and Nutritional Quality in genomic era	2
003	Abstract ID- 8003 <i>Anshika Singh¹, K.N. Shah², D.K. Rana³ and Vivek Singh⁴</i>	¹ Research Scholar, ² Assistant Professor, ³ Associate Professor, ⁴ Guest Faculty; Department of Horticulture, School of Agriculture and Allied Science, Hemvati Nandan Bahuguna Garhwal University, Srinagar Garhwal	INFLUENCE OF EXOGENOUS APPLICATION OF NANO-CALCIUM AND HUMIC ACID ON DIFFERENT HORTICULTURAL TRAITS OF CABBAGE (<i>Brassica oleracea var. capitata L.</i>) UNDER VALLEY CONDITIONS OF GARHWAL	3
004	Abstract ID- 8004 <i>Aalok kumar</i>	Himalayan Institute of Technology; Asthal Dehradun	Agriculture and Agribusiness in India: An Entrepreneurial Development of Agriculture	4
005	Abstract ID- 8005 <i>*Sheetal Koranga¹, Preeti Chaturved² and Lalit M. Tewari¹</i>	¹ Department of Botany, D.S.B. Campus, Kumaun University, Nainital, 263001, Uttarakhand, India; ² Department of Biological Sciences, College of Basic Sciences and Humanities, G.B. Pant University of Agriculture and Technology, Pantnagar, 263145, Uttarakhand, India.	Rescuing a Rare Endemic: In Vitro Seed Germination Strategies for the Critically Endangered <i>Meizotropis pellita</i> (Hook.f. ex Prain) Sanjappa	5
006	Abstract ID- 8006 <i>Mahesh Palakuru,</i>	Vellore Institute of Technology, Vellore, TamilNadu, 632014, India	MULTI-SENSOR MICROWAVE AND OPTICAL FUSION FOR RICE PHENOLOGY MAPPING AND YIELD ESTIMATION	6
007	Abstract ID- 8007 <i>Deeksha Dhiman</i>	M.Sc. Plant Science (Botany) Central University of Himachal Pradesh	Medicinal and Aromatic Plants: Role in Sustainable Agriculture and Human Health	7
008	Abstract ID- 8008 <i>Shailza</i>	M.Sc. Student Department of Plant Sciences, School of Life sciences Central University of Himachal Pradesh	Role of Bamboo as a Sustainable Plant Resource in Environmental Conservation: A Review	8
009	Abstract ID- 8009 <i>Abhijeeta Nandha^{1*}, Harsha Patil²</i>	¹ Assistant Professor, Department of Biotechnology, Kalinga University, Kotni, Naya Raipur, C.G.-(492001); ² Professor, Research Department, Kalinga University, Kotni, Naya Raipur, C.G.- (492001)	Phytochemical analysis and therapeutic activity of <i>Curcuma zedoaria</i> (White turmeric)	9
010	Abstract ID- 8010 <i>Raushan Kumar*, Ajaya Srivastava and Raj Bahadur</i>	Department of Soil Science: College of Agriculture; G.B. Pant University of Agriculture and Technology, Pantnagar- 263145, U.S. Nagar, Uttarakhand, India.	DEVELOPMENT AND STATISTICAL VERIFICATION OF SOIL FERTILITY GRADIENTS FOR MAJOR NUTRIENTS (N, P AND K) USING SORGHUM EXHAUSTION IN MOLLISOLS OF NORTH WESTERN PLAIN ZONE OF INDIA	10
011	Abstract ID- 8011 <i>Manchyla Divya^{1*}, P. Naveen Kumar¹, Cherukula Mallika¹, E. Naveen¹</i>	^{1*} Department of Floriculture and Landscaping, Dr. Y. S. R. Horticultural University ¹ Division of flower and medicinal crops, Indian Institute of Horticultural Sciences, Bengaluru; ¹ Department of Plantation Spices Medicinal and Aromatic Crops, TNAU, Coimbatore;	Assessment of morphological variability in Dahlia	11

012	Abstract ID- 8012 <i>Enugula Naveen¹, G Thanuja Sivaram¹, Manchyala Divya², Muruguvele E³</i>	^{1,3} Ph.D. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, HC&RI, Tamil Nadu Agricultural University, Coimbatore-641003.; ¹ Senior scientist, RHRs, Dr. YSRHU, Tirupathi; ² Ph.D. Scholar, Department of Floriculture and Landscaping, Dr. Y. S. R. Horticultural University;	Artificial Intelligence and Machine Learning for Advanced Genebank Management of Medicinal Crops	12
013	Abstract ID- 8013 <i>Rahul Singh Jaiswar</i>	B.V.Sc. & A.H.College of Veterinary and Animal Sciences; G.B. Pant University of Agriculture and Technology, Pantnagar – 263145	Functional and Behavioural Indicators for Early Disease Recognition in Animals	13
014	Abstract ID- 8014 <i>Kishan Singha^b, Kapil Deva^{b,1}</i>	^a Phytochemistry Division, CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow-226015, India; ^b Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, Uttar Pradesh, India	Cheilanthenetetraol, a new sesterterpenoid isolated from <i>Aleurites bicolor</i> Roxb., with anti-hepatocellular carcinoma and anti-inflammatory activities	14
015	Abstract ID- 8015 <i>Bahaar Anjum¹, Vivekanand², Aashish Kumar Sagar³, Inder Singh Rana⁴, Ritika Bhatt⁵</i>	¹⁻⁵ G.B.Pant University of Agriculture and Technology, Pantnagar 263145, U.S.Nagar, Uttarakhand	Metal Complexation of Ferulic Acid: Coordination Chemistry, Structural Insights, and Biological Implications	15
016	Abstract ID- 8016 <i>Dr. J. Sumalatha¹, Dr. G. Bhavan², Dr. J. Chandrakala³, Dr. B. Sravankumar⁴, Dr. P. Madhav⁵, Dr. Pallavi Bhatt⁶</i>	¹ Assistant professor-ENTO. Chaitanya Deemed to be University, Himayath nagar; ² SMS- Agril. Ext. ICAR (YFA), Mahabubnagar	Bio pesticides – Their Role in Modern Agriculture	16
017	Abstract ID- 8017 <i>Poornima and D. S. Rawat</i>	G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.	Micromorphological diversity and distribution of trichomes in <i>Lepidagathis</i> Willd. (<i>Acanthaceae</i>) and its taxonomic significance	17
018	Abstract ID- 8018 <i>*Tarannum Jahan, Ashok Kumar Verma², Ashutosh Dubey³</i>	^{1,2,3} Department of Biochemistry, College of Basic Sciences and Humanities, G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, India	A Preliminary Study on the Energy Content and Fuel Potential of Waste Biomass	18
019	Abstract ID- 8019 <i>Garima Bora* and Mrinal Kumar Das</i>	Ph.D. Scholar, Botany, Assam down Town University, Guwahati, Assam ; Professor, Botany, Assam down Town University, Guwahati, Assam	Preserving Roots, Growing Futures: Tribal Communities of Dimoria Block, Assam and Sustainable Biodiversity Conservation	19
020	Abstract ID- 8021 <i>Sakshi</i>	Department of Plant Sciences, Central University of Himachal Pradesh, Shahpur Kangra, HP, India.	A Review on Ethnobotanical knowledge, Traditional uses, and Conservation of medicinal plant <i>Picrorhiza kurroa</i> Royle ex Benth.	20
021	Abstract ID- 8022 <i>Swati*, Subhash Chandra², Saurabh Guleri¹</i>	¹ Department of Botany, School of Basic and Applied sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001; ² Department of Chemistry, School of Basic and Applied sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001	Phytochemistry and Pharmacological Application of <i>Ficus auriculata</i>, <i>Ficus benjamina</i>, and <i>Ficus variegata</i> Blum	21
022	Abstract ID- 8023 <i>Mukesh Kumar Sahu, Dr. Sandeep Kumar</i>	B.Sc (Hons) Botany, Delhi University	AI-Enabled GIS Decision Support System for Pest Risk Assessment and Crop Suitability Mapping of Mustard (<i>Brassica juncea</i> L. Czern & Coss.) in Delhi NCR	22

023	Abstract ID- 8024 <i>Kuntal Saha¹, Ranjana Negi², Saurabh Guleri^{1*}</i>	1Department of Botany, School of Basic & Applied Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand 248001, India; ² Systematic Botany Discipline, Forest Botany Division, Forest Research Institute (FRI), Dehradun, Uttarakhand 248006, India.; Conference Tracks: Medicinal & Aromatic Plants, Ethnobotany & Traditional Knowledge	Ethnobotanical Significance of Medicinal and Aromatic Plants from the Northwestern Himalaya, India	23
024	Abstract ID- 8025 <i>Shalu¹, Sachin Upmanyu*</i>	Department Of Plant Science, School of Life Sciences, Central University of Himachal Pradesh, Shahpur, Kangra HP, INDIA	Green Extraction Technologies for Mushroom Bioactives: Integrating Sustainability and Functionality	24
025	Abstract ID- 8026 <i>Amit Bhatt</i>	School of Agricultural Sciences, Department of Horticulture; Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001	Zero Waste Approach through value addition in Horticultural crops	25
026	Abstract ID- 8027 <i>Sarvesh Suyal</i>	Department of Botany, DBS (PG) College, Dehradun	Innovation, Integration and Sustainability of Medicinal and Aromatic Plants in the Uttarakhand Himalaya: Pathways toward a Resilient Future India	26
027	Abstract ID- 8028 <i>Ankita Aswal</i>	M.Sc. Agronomy, Himalayan Institute of technology, Dehradun.	Practices and technologies for environmentally friendly farming.	27
028	Abstract ID- 8029 <i>Himanshu Sharma</i>	MSc Agriculture (Horticulture) Shree Guru Ram Rai University Dehradun	Agri-innovation and Smart Farming for Sustainable and Climate Resilient Agriculture	28
029	Abstract ID- 8030 <i>Abdul Warrishaa and Jaspal Singh Chauhana*</i>	^a Aquatic Ecology Lab, Department of Himalayan Aquatic Biodiversity, Hemvati Nandan Bahuguna Garhwal University, Srinagar (Garhwal), Uttarakhand-246174, India	Leaching Potential of Heavy Metals from Common Plastic Polymers: A Lab Based Study	29
030	Abstract ID- 8031 <i>Kanika Issar</i>	Assistant Professor Dolphin PG Institute of Biomedical and Natural sciences, Dehradun	Utilization of apple pomace fibre for the preparation of fibre enriched acidophilus yoghurt	30
031	Abstract ID- 8032 <i>Manish Semwal</i>	M.Sc. (Agri), Soil Science, Shri Guru Ram Rai University, Pathribagh, Dehradun	CLIMATE-SMART AGRICULTURE	31
032	Abstract ID- 8033 <i>Chandan Thakur Barahi¹, and Mr. Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee	Physiological and Commercial Maturity: Concepts and Determination	32
033	Abstract ID- 8034 <i>Sahil Kumar Singh¹ and Naveen Chandra Bahuguna²</i>	¹ Student B.Sc. (Hons.) Agriculture; ² Associate Professor, Department of Agricultural Studies; Quantum University, Roorkee	Cold Storage – Principles, Design, and Management	33
034	Abstract ID- 8035 <i>Anju Tharu¹ and Naveen Chandra Bahuguna²</i>	¹ Student B.Sc. (Hons.) Agriculture; ² Associate Professor, Department of Agricultural Studies; Quantum University, Roorkee	Physiological, Mechanical, and Pathological Causes of Post-Harvest Losses	34
035	Abstract ID- 8036 <i>Soni Kumari¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Post-Harvest Treatments: Chemicals, Edible Coatings, and Irradiation	35
036	Abstract ID- 8037 <i>Mihir Kashyap¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Transpiration and water loss after harvest	36
037	Abstract ID- 8038 <i>Aman Yadav¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Extent, Types and Estimation Methods of Post-Harvest Losses	37
038	Abstract ID- 8039 <i>Akash Kumar¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Introduction to Post-Harvest Technology of Fruits and Vegetables	38

039	Abstract ID- 8040 <i>Monika Yadav</i>	Research Scholar, Department of Plant Pathology, Rajasthan Agricultural Research Institute, Durgapura, Jaipur	Investigation on Collar Rot Disease (<i>Sclerotium rolfsii</i>) of Lentil (<i>Lens culinaris L.</i>) and Its Management	39
040	Abstract ID- 8041 <i>Shagun Sharma and Naveen Chandra</i>	Department of Agricultural Studies Roorkee Uttarakhand	Value Addition, Processing and Marketing: Farmer Groups, Cold Chain, Branding and Market Linkages	40
041	Abstract ID- 8042 <i>Chitra Rawat and Naveen Chandra</i>	Department of Agricultural Studies Quantum University, Roorkee Uttarakhand	Vegetable and human nutrition : Nutrient profiles, dietary recommendations and role in public health	41
042	Abstract ID- 8043 <i>Lakshya Malik¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Planting Distance, Row Geometry and Plant Population Optimization	42
043	Abstract ID- 8044 <i>Akash Kashyap and Naveen Chandra</i>	Department of Agricultural Studies Quantum University, Roorkee Uttarakhand	Agro-Ecological Zoning and Strategic Vegetable Suitability in the Central Himalayas	43
044	Abstract ID- 8045 <i>Ashad Malik, Naveen Chandra Bahuguna</i>	Department of Agricultural Studies Quantum University, Roorkee Uttarakhand	Important Commercial Vegetables of Uttarakhand Potato, Tomato, Beans, Leafy Greens, Gourds, Root Crops and Mountain Specialties	44
045	Abstract ID- 8046 <i>Aditya kumar¹, Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Overview of Vegetable Production in Uttarakhand: History, Area, and Production Patterns	45
046	Abstract ID- 8047 <i>MOHD AHMAD¹, Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Nutrient Management: Fertilizer Requirement, Scheduling, and Organic Alternatives	46
047	Abstract ID- 8048 <i>Riya Saini¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Harvesting, Post-Harvest Handling and Yield Estimation: techniques to reduce losses and improve quality	47
048	Abstract ID- 8049 <i>Babu Lal Yadav</i>	M.Sc.Ag. Horticulture (Fruit science); Department of fruit science; K.N.K. College of Horticulture Mandsaur RVSKVV Gwalior M.P.	Transforming Indian Agriculture through Innovation, Integration, and Sustainability: The Emerging Role of Horticulture	48
049	Abstract ID- 8050 <i>Ayush saini</i>	G.B. Pant University of Agriculture and Technology,	Spices and Herb Crops of the Region: Local Uses, Value and Safety Considerations	49
050	Abstract ID- 8051 <i>Jayant Kumar Roy, Naveen Chandra</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Seed and Nursery Management: quality seed sources, nursery techniques and hardening-off	50
051	Abstract ID- 8052 <i>Ashish Negi</i>	(Phd scholar) SCHOOL OF AGRICULTURAL SCIENCES AND TECHNOLOGY RIMT NIVERSITY, MANDI GOBINDGARH, PUNJAB	Natural Farming: A Key to Sustainable and Chemical-Free Agriculture	51
052	Abstract ID- 8053 <i>Ritika Bhattacharjee and Naveen Chandra</i>	Department of Agricultural Studies Quantum University, Roorkee Uttarakhand	Integrated Pest and Disease Management (IPM) for Mountain Vegetables	52
053	Abstract ID- 8054 <i>Raunak Singh ¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Weed Management : cultural, mechanical and Integrated approach for smallholders	53
054	Abstract ID- 8055 <i>Aliya Haque</i>	Department of Agricultural Studies; Quantum University, Roorkee, Uttarakhand;	Classification of Vegetables: By Edible Part, Life Cycle, Season and Method of Culture	54
055	Abstract ID- 8056 <i>Alok Bais¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Wild and Indigenous Hill Vegetables of Uttarakhand: Diversity, Uses and Conservation	55
056	Abstract ID- 8058 <i>Ebanroiki Pasi</i>	Department of Agricultural Studies, Quantum University, Roorkee, Uttarakhand;	Origin, Historical Spread and Genetic Resources of Key Vegetable Crops	56
057	Abstract ID- 8059 <i>Kartik saini</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Post-Harvest Treatments: Chemicals, Edible Coatings, and Irradiation	57
058	Abstract ID- 8060 <i>SK Abu Yusuf Faridul Hoque ¹, and Mr. Naveen Chandra ²</i>	Department of Agricultural Studies; Quantum University, Roorkee	Hypobaric Storage and Its Applications in Shelf-Life Extension	58
059	Abstract ID- 8061 <i>Kanhaiya kr¹ and Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Time of Sowing and Crop Calendar: season-wise schedules for hill and valley zones	59

060	Abstract ID- 8062 <i>Prachi Sharma</i>	MSc Agriculture (Agronomy) Shree Guru Ram Rai University Dehradun	AGRI-ENTREPRENEURSHIP, EXTENSION & RURAL DEVELOPMENT	60
061	Abstract ID- 8063 <i>Kavita Pun</i>	SHRI GURU RAM UNIVERSITY	Cultivating Resilience: Integrating Climate-Smart Agriculture for Global Environmental Sustainability	61
062	Abstract ID- 8064 <i>Sachin Sharma¹ and Harinder Singh Banya²</i>	^{1&2} Department of Biosciences Himachal Pradesh University, Summer Hill Shimla (H.P.)	Linking Environmental Pollution to Neuroendocrine Stress in Aquatic Fauna: A Review from the Sutlej River	62
063	Abstract ID- 8066 <i>Devansh</i>	Quantum University, Roorkee, Uttarakhand	Vegetables and the National / Regional Economy: Income, Employment and Market Linkages	63
064	Abstract ID- 8067 <i>Abdul Rehman and Mohd Asgher*</i>	Plant physiology and Biochemistry Laboratory, Department of Botany, Baba Ghulam Shah Badshah University, Rajouri-185234	Hydrogen sulfide promotes photosynthesis and growth under drought through increased sulfur metabolism and antioxidant defense system in common bean (<i>Phaseolus vulgaris L.</i>)	64
065	Abstract ID- 8068 <i>Vansh Kumar¹ and Naveen Chandra²</i>	Quantum University, Roorkee Uttarakhand	Crop Principles and Methods of Value Addition.	65
066	Abstract ID- 8069 <i>Rashaid Ali Mustafa, M.A. Hannan Khan</i>	Parasitology Lab, Department of Zoology, Baba Ghulam Shah Badshah University Rajouri, Jammu and Kashmir, India; Introduction	Exploration of Ethnoveterinary Plants commonly used by Pahari Ethnic Tribe of Mendhar region in District Poonch of Jammu and Kashmir, India	66
067	Abstract ID- 8070 <i>KARTIK SAINI¹, Naveen Chandra²</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Sowing and Transplanting Techniques: Direct Sowing, Raised Beds, Polyhouse Transplants, and Manual Mechanization	67
068	Abstract ID- 8071 <i>Aditya Raturi*, Dr. Hemraj Meena, Dr. Anoop Badoni</i>	¹ School of Agricultural Science and Technology, RIMT University, Mandi Gobindgarh, Punjab; ² PLANTICA-Indian Academy of Rural Development, Dehradun Uttarakhand	An Agronomic Review of Finger Millet (Ragi) (<i>Eleusine coracana (L.) Gaertn.</i>): Adaptability, Productivity and Nutritional Importance.	68
069	Abstract ID- 8072 <i>Aditya*, Neeraj, J.N. Bhatia</i>	¹ Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship and Management (NIFTEM-K; An Institute of National Importance of India), Kundli- 131028, Sonapat, Haryana, India; ; ² Department of Plant Pathology, Chaudhary Charan Singh Haryana Agricultural University (CCS HAU), Hisar- 125004, Haryana, India	Elm Oyster Mushroom (<i>Hypsizygos ulmarius</i>): High Value Edible, Medicinal and Nutraceutical Mushroom Species for Trans-Gangetic Plains of India	69
070	Abstract ID- 8073 <i>Mahima</i>	Uttaranchal College of Science and Technology	Sustainable Management of Natural Resources in Agriculture	70
071	Abstract ID- 8074 <i>Abhijeet Tiwari</i>	Uttaranchal College of Science and Technology;	Agri- Tourism- Connecting Urban People to Rural Roots	71
072	Abstract ID- 8075 <i>Priyanshu Saklani</i>	Uttaranchal College of Science and Technology	Natural Farming: A Pathway to Sustainable Agriculture and Eco-friendly Food Production	72
073	Abstract ID- 8076 <i>Aditya Sheershwali, Vani Sharma</i>	¹ Faculty of Science, Motherhood University, Roorkee, Uttarakhand	Isolation, Screening and Functional Characterization of Plant Growth-Promoting Rhizobacteria (PGPR) for Sustainable Crop Productivity with Prospects for Nano Integration	73
074	Abstract ID- 8077 <i>Swati Jamwal*, Neelam Kaushik and Kailash Chandra Naga</i>	¹ Department of Biotechnology, Himachal Pradesh University, Shimla; ² ICAR- Central Potato Research Institute, Shimla; ^{1*} Department of Biotechnology, Himachal Pradesh University, Shimla	EVALUATION OF THE BIOACTIVE POTENTIAL OF SECONDARY METABOLITES DERIVED FROM AN ENTOMOPATHOGENIC FUNGUS	74
075	Abstract ID- 8078 <i>Deepak Awasthi</i>	M.Sc. (Soil Science) Shri Guru Ram Rai University, Dehradun	Climate-Smart Agriculture & Environmental Sustainability	75

076	Abstract ID- 8079 <i>Ashok Kumar Parida , Priya , Sanhita Chowdhury , Katta Subramanya Sai Teja , Sanjay Kumar Sahoo *</i>	¹ Department of Entomology, Post Graduate College of Agriculture, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India, 848125	PERSISTENCE AND RESIDUAL EFFECT OF CYANTRANILIPROLE IN MAIZE AND ITS IMPACT ON SOIL ENZYMATIC ACTIVITY	76
077	Abstract ID- 8080 <i>Priya, Marri Keerthana, Pushpa Singh, M. S. Sai Reddy</i>	Dr. Rajendra Prasad Central Agricultural University, Pusa, Samatipur, Bihar, 263145	Assessing the interactive effects of aphid infestation and heat stress on wheat physiology and yield	77
078	Abstract ID- 8081 <i>Minakshi rani</i>	Research Scholar, Department of Horticulture, School of Agriculture Sciences, Shri Guru Ram Rai University, Dehradun- 248001, Uttarakhand, INDIA; Minakshimandhan6@ gmail.com	Organic, natural and integrated farming systems	78
079	Abstract ID- 8082 <i>Smriti</i>	Research Scholar, Department of Horticulture, School of Agriculture Sciences, Shri Guru Ram Rai University Dehradun - 248001, Uttarakhand INDIA; Smritithakur758@ gmail.com	Integrated farming natural and organic	79
080	Abstract ID- 8083 <i>Sakshi , Nisha Kumari , Sachin Upmanyu*</i>	Central University of Himachal Pradesh, Shahpur Campus- 176206, Kangra (HP); Department of Plant Sciences, School of Life Sciences	Prevalence of Major Onion Diseases in Kangra Region of Himachal Pradesh	80
081	Abstract ID- 8084 <i>Geetanjali Thakur¹, Pardeep Kumar*</i>	Central University of Himachal Pradesh,; Shahpur Campus- 176206, Kangra (HP); Department of Plant Sciences, School of Life Sciences:	Morphological and Genetic Diversity in Brugmansia in Kangra region	81
082	Abstract ID- 8085 <i>Radheshyam^{1*}, Ajay Semalty²</i>	¹ Praduman Singh SPS Pharmacy College, Basti, U.P. 272001 ² Department of Pharmaceutical Sciences, HNB Garhwal University (A Central University), Srinagar (Garhwal), Uttarakhand, India	From Himalayan Biodiversity to Economic Value: Tinospora cordifolia as a Sustainable Antiobesity Innovation.	82
083	Abstract ID- 8086 <i>Srijana Saha¹, Pranab Hazra¹, Ranit Roy², Arup Chattopadhyay² and Kiran Mary Kandir³</i>	¹ Department of Vegetable Science, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand 263 145, India; ² Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur-741 252, Nadia, West Bengal, India ³ Krishi Vigyan Kendra Pakur, Birsa Agricultural University, Ranchi, Pakur-816 016 Jharkhand, India;	INHERITANCE OF RIPENING MUTANT “NON- RIPENING (nor)” GENE IN TOMATO	83
084	Abstract ID- 8087 <i>Sakshi Chauhan</i>	Shri Guru Ram Rai University, Pathribagh, Dehradun	Soil Health: The Foundation of Sustainable Agriculture	84
085	Abstract ID- 8088 <i>Haripriya</i>	Shri Guru Ram Rai University, Pathribagh, Dehradun	Harnessing Hydroponics for Sustainable Food Production	85
086	Abstract ID- 8089 <i>Sumit Gahlot</i>	PG Scholar (SOIL SCIENCE); Department of Soil Science, Shri Guru Ram Rai University (SAS) Dehradun-248001, Uttarakhand India	Regenerative Soil Futures: Integrating Climate Signals with Biological Fertility Design	86

087	Abstract ID- 8090 <i>Bharti Sharma and Manisha Gahlot</i>	Department of Apparel and Textile Science, College of Community Science; G.B. Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand	Sustainable dyeing of cotton fabric with walnut (<i>Juglans regia</i>) Green Husk dye	87
088	Abstract ID- 8091 <i>Nikhil Priyadarshi, K.N. Shah, D.K. Rana, Abhay Singh* and Sweta Kumari</i>	Department of Horticulture, HNBGU Srinagar-246174, Uttarakhand India	Estimation of Correlation and Path Coefficients in Brinjal (<i>Solanum melongena</i> L.)	88
089	Abstract ID- 8092 <i>Simran , Shikha Devi</i>	Department of Microbiology, Himachal Pradesh University Summerhill, Shimla	Plant-Derived Antimicrobials and Nanotechnology: A Sustainable approach to Combat the Global increase of Drug-Resistant Pathogens.	89
090	Abstract ID- 8093 <i>Sweta Kumari, K.N. Shah, D.K. Rana, Abhay Singh*, Shailesh Goyam</i>	Department of Horticulture, HNBGU Srinagar-246174, Uttarakhand India	Assessment of Genetic Variability and Trait Interrelationships Among Yield in Chilli (<i>Capsicum annum</i> L.)	90
091	Abstract ID- 8094 <i>Simran Chauhan and Shikha Devi</i>	Department of microbiology, Himachal Pradesh University Summerhill, Shimla -171005.	Eco-Friendly Development of Water-Soluble Metallic Nanoparticles from Medicinal Plant Extracts: Antimicrobial, Cytotoxic, Enzyme Inhibition, Phytochemical, and Antioxidant Properties	91
092	Abstract ID- 8095 <i>Antima</i>	B.sc Agriculture Shree Guru Ram Rai University Dehradun; Mail id – antimaydv070@gmail.com	Smart Farming's Transformative Role in Modern Agriculture	92
093	Abstract ID- 8096 <i>Purna Dhyani , Mohammad Faisal , Shagun Lodhi</i>	School of Agriculture, Forestry and Fisheries, Jigyasa University, Dehradun, Uttarakhand, 248011	Hatching Success and Early Larval Development Following Captive Spawning of the Siamese Fighting Fish, <i>Betta splendens</i>, in a Controlled Aquarium Environment	93
094	Abstract ID- 8097 <i>Ankit Yadav, K.N. Shah, D.K. Rana, V. Singh & Pragya Pancholi</i>	Department of Horticulture, HNBGU, Srinagar, Uttarakhand-246174	Influence of Novel Bio-stimulants on Growth Dynamics, Root Yield and Quality Attributes of Carrot cv. Pusa Nayan Jyoti	94
095	Abstract ID- 8098 <i>Kritika Jaiswal</i>	M.Sc. (Agri), Seed Science and technology; Shri Guru Ram Rai University, Pathribagh, Dehradun	Enhancing Seed Viability Assessment: A Multi-Approach Strategy	95
096	Abstract ID- 8099 <i>Shagun Lodhi¹ , Maneesh bhatt² , Nikita Kohli² , Mohammad Faisal¹ , Purna Dhyani¹</i>	¹ School of Agriculture, Forestry and Fisheries, Jigyasa University, Dehradun, Uttarakhand, India; ² School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India. ³ School of Natural Science, Dolphin (PG) Institute, Dehradun.	Effect of Sowing Methods and Levels of Phosphorus on Growth and Yield of Wheat (<i>Triticum aestivum</i> L.)	96
097	Abstract ID- 8100 <i>Sagar Chaudhary^{1*}, Sneha Dobha²</i>	¹ Department of Silviculture and Agroforestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan-173230, Himachal Pradesh, India; ; ² Department of Silviculture and Agroforestry, V.C.S.G. University of Horticulture and Forestry, Ranichauri-249199, Tehri Garhwal, India	Growth and physiology of parasitic Sandalwood in association with host species in partly reclaimed sodic soils	97
098	Abstract ID- 8101 <i>Smriti Joshi* and Munesh Kumar</i>	Department of Forestry and Natural Resources, HNB Garhwal University, Srinagar Garhwal, Uttarakhand, India	The carbon sequestration potential of <i>Alnus nepalensis</i> forest stands at different altitudes of Chopta Tungnath Region in the Garhwal Himalaya.	98
099	Abstract ID- 8102 <i>Anjali Sharma and Dr. Deepali Joshi</i>	M.Sc Student, Department of Agriculture Agronomy, Dehradun Uttarakhand, India Principal, Department of Agriculture, HIT Dehradun Uttarakhand, India	Evaluation of Nano Urea Fertilizer for Enhancing growth, quality, yield and post-harvest Attributes in Sugarcane Plant	99
100	Abstract ID- 8103 <i>AmanBandhani</i>	M.Sc.(Ag)Soil Science; Shri Guru Ram Rai University, Dehradun	Climate-Smart Agriculture & Environmental Sustainability	100

101	Abstract ID- 8104 <i>Mahendra Pal Singh Parmar, Reena Shah and Kiran Negi</i>	Department of Botany R. College, Uttarkashi- 249 193 (Uttarakhand)	Ethno-veterinary medicinal plants and their conservation for animal diseases protection at Uttarakhand State.	101
102	Abstract ID- 8105 <i>Mayank Tiwari¹ and N.K Singh²;</i>	¹ Ph.D Scholar Genetics and Plant Breeding G.B Pant University of Agriculture and Technology Pantnagar Uttarakhand India 263145 ² Professor Department of Genetics and Plant Breeding G.B Pant University of Agriculture and Technology Pantnagar Uttarakhand India 263145	Harnessing Genetic Diversity for Fodder Biomass Improvement in Maize and Teosinte Germplasm;	102
103	Abstract ID- 8106 <i>SUSHMITA UNIYAL[*], A. N. SINGH², AMIT PANDEY³</i>	¹ Forest Pathology Discipline, Forest Protection Division, ICFRE- Forest Research Institute, Dehradun; ² Indian Council of Forestry Research and Education (ICFRE), Dehradun ³ ICFRE-Institute of Forest Productivity, Ranchi	Enhancing Vegetative Propagation of <i>Oroxylum indicum</i> through Trichoderma-Mediated Root Cutting Treatment for Sustainable Conservation"	103
104	Abstract ID- 8107 <i>Pramod Chandra Khanduri and Pushpendra Kumar Sharma</i>	Insect Biodiversity and Behaviour Laboratory, Department of Zoology; D.A.V. (P.G.) College Dehradun (Affiliated to HNBGU Srinagar Garhwal Uttarakhand)	Regional Study of Lady Beetle Diversity in Rishikesh: Natural Allies in Pest Management	104
105	Abstract ID- 8108 <i>Shivangi Negi and Rekha Dhanai</i>	Department of Agriculture, Tula's Institute, Dehradun	Doon Basmati Rice: A Hidden Heritage of Uttarakhand	105
106	Abstract ID- 8109 <i>Shruti Kumari</i>	Uttaranchal College of science and technology	Precision farming for sustainable agriculture	106
107	Abstract ID- 8110 <i>Dr. Soniya Singh, Dr. Mohd. Irfan,</i>	Assistant Professor. Department of Botany. Motherhood University, Roorkee; ; Assistant Professor. Department of Botany, Chaman Lal Degree College, Landhoura	Organic, Natural, and Integrated Farming Systems: Prospects and Difficulties for Agriculture in the Future	107
108	Abstract ID- 8111 <i>Srishti Manikpuri, Dr Amit Pandey, Dr Shailesh Pandey</i>	Forest Pathology Discipline, Forest Protection Division, Forest Research Institute, Dehradun	Unveiling a New Host Record of <i>Curvularia pseudobranchyspora</i> from <i>Dalbergia sissoo</i>	108
109	Abstract ID- 8112 <i>Anita Trivedi, Girish Chandra</i>	Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun 248 001, Uttarakhand, India;	Yield and quality enhancement of French bean (<i>Phaseolus vulgaris</i>) genotypes by using bio- priming agents: Empowering Uttarakhand women through economic inclusion	109
110	Abstract ID- 8113 <i>Prakriti Dadial[*], MS Jangra¹, SK Bhardwaj¹, Purnima Mehta¹, Kartikey Sahil¹ and Nitin Sharma²</i>	¹ Department of Environmental Science, ; ² Department of Basic Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP)173230	Impact of weather parameters on crop growth and development of capsicum in mid-hills of Himachal Pradesh	110
111	Abstract ID- 8114 <i>Abhinav Singhal¹, Abhishek Maurya¹, Ritu Pal¹ & Sugam Gupta²</i>	¹ Dept. of Computer Science & Engg. Tula's Institute, Dehradun, Uttarakhand, India; ² Dept. of Applied Science & Humanities, Tula's Institute, Dehradun, Uttarakhand, India	Agro-Entrepreneurship and Value-Added Innovations for Sustainable Rural Change in India	111
112	Abstract ID- 8015 <i>Bahaar Anjum¹, Vivekanand², Aashish Kumar Sagar³, Inder Singh Rana⁴, Ritika Bhatt⁵</i>	¹⁻⁵ G.B.Pant Univeristy of Agriculture and Technology, Pantnagar 263145,U.S.Nagar,Uttarakhand	Metal Complexation of Ferulic Acid: Coordination Chemistry, Structural Insights, and Biological Implications	112

113	Abstract ID- 8116 <i>Funchok Norbu Negi</i>	Department of Silviculture and Agroforestry, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan-173230, Himachal Pradesh, India	Studies on fodder resources and ethnoveterinary practices prevalent in Kinnaur region of Himachal Pradesh	113
114	Abstract ID- 8117 <i>Dr. Neha Uniyal</i>	Assistant Professor; Department of Journalism and Mass Communication; Tula's Institute, Dhoolkot,; Dehradun, Uttarakhand, 248001	Title: Integrated Environmental Assessment of Climate Stress, Resource Degradation, Waste Dynamics, and Biodiversity Decline for Sustainable Agricultural Systems	114
115	Abstract ID- 8118 <i>Anshit Verma</i>	M.Sc. (Soil science) Shri Guru Ram Rai University Dehradun; ; Gmail- anshitverma122@gmail.com	Soil Health, Water Management & Natural Resource Conservation	115
116	Abstract ID- 8120 <i>Dr. Richa Punetha</i>	Deptt. of Botany, PNG Govt PG College Ramnagar Nainital (Uttarakhand)	Environmental sustainability in agriculture	116
117	Abstract ID- 8121 <i>Madhuri Bhatt, Lalit Bhatt and Mahima Sanodiya</i>	Department of Vegetable Science, G.B. Pant University of Agriculture and Technology, Pantnagar- 263145, Udham Singh Nagar (Uttarakhand)	Response of Okra [<i>Abelmoschus esculentus</i> (L.) Moench] to Different Levels of Boron and Zinc under Field Conditions	117
118	Abstract ID- 8122 <i>Sonu Saurav¹, Moly Saxena², Mohammad Akram³, D. R. Saxena², Deepender Kumar³</i>	¹ School of Agriculture Science, Sandip University, Madhubani, Bihar- 847235, India ² Department of Plant Pathology, R. A. K. College of Agriculture, Sehore- 466001, India	MOLECULAR CHARACTERIZATION OF YELLOW MOSAIC DISEASE- ASSOCIATED VIRUSES AND THEIR IMPACT ON YIELD IN PIGEONPEA (<i>Cajanus cajan</i> L.) IN SEHORE DISTRICT OF MADHYA PRADESH	118
119	Abstract ID- 8123 <i>Hema Rawat¹ and Anita Trivedi²</i>	¹ Department of Agriculture (Horticulture), Uttaranchal University, Dehradun, Uttarakhand, India; ² Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand, India;	Vase life of gerbera flower	119
120	Abstract ID- 8124 <i>Pratik N. Moghe</i>	Assistant Professor(CHB);; Department of Agriculture Business Management; ; School of Agriculture Business Management(SABM),Nagpur; Dr.P.D.K.V,Akola	A Study on Export Potential and Challenges of Indian Agricultural Products in Global Markets	120
121	Abstract ID- 8125 <i>Shivam Kumar¹, Shubra Kala², Pooja Saklani¹</i>	¹ Department of Biotechnology HNB Garhwal University Srinagar ² Department of Physics HNB Garhwal University Srinagar	Green synthesized Nanocomposite using invasive plant extract for improving growth and physiological performance of Brassica oleracea	121
122	Abstract ID- 8126 <i>Aksh Tyagi</i>	Masters Scholar, Department of Rural Technology (School of Agriculture & Allied Sciences), Hemvati Nandan Bahuguna Garhwal University, Uttarakhand (A Central University)	Impact Assessment of Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Scheme on Rural Farming Communities: A Micro-Level Study in Kirti Nagar Block, Tehri Garhwal, Uttarakhand	122
123	Abstract ID- 8127 <i>Vikas Jha,</i>	<i>Assistant Professor</i> ; S.M.T School of Agricultural Sciences, Sandip University, Madhubani, Bihar	Development of Salt Tolerant and Early Maturing Mustard Varieties Through Speed Breeding for Semi-Arid Regions of India	123
124	Abstract ID- 8128 <i>Saksham Choudhary¹, Shweta²</i>	¹ Department of Genetics and plant Breeding, School of Agriculture, Lovely professional University, Phagwara, Punjab; ; ² Department of Horticulture, School of Agriculture, Lovely professional University, Phagwara, Punjab	Minimal RNA-Guided Genome Editors: TnpB and the Future of Compact CRISPR Technologies	124

125	Abstract ID- 8129 Shailendra Tiwari ¹ , J.S. Chauhan ¹ , Vinay Chamoli ² , Sonali Rajput ¹ , Meenakshi Joshi ¹	¹ : Department of Seed Science and Technology, HNBGU, Srinagar Garhwal; ² : Department of Agriculture, JB Institute of Technology (JBIT), Dehradun	Comparative Evaluation of Nanoparticles Seed Priming on Seed Quality and Early Seedling Growth of Lentil (<i>Lens culinaris Medik</i>) Varieties VL-126 and VL- 148	125
126	Abstract ID- 8130 Abdul Wajid Malik	M.Sc. Agriculture (Soil Science), Shri Guru Ram Rai University, Dehradun	SOIL HEALTH, WATER MANAGEMENT AND NATURAL RESOURCE CONSERVATION	126
127	Abstract ID- 8131 Kavita Yadav ¹ , Sweta Yadav ¹ and Prashant Khare ¹	¹ Xenesis, Absolute, 5th floor, Plot 68, Sector-44, Gurugram 122003, Haryana, India	Development of a Multifunctional Anti-Transpirant Biostimulant for Enhancing Plant Growth and Physiological Efficiency;	127
128	Abstract ID- 8132 Arti Gairola and Manoj Raghava	Department of Vegetable Science G. B Pant University of Agriculture and Technology, Pantnagar – 263145, Udham Singh Nagar (Uttarakhand)	Evaluation of Nano Urea and Nano DAP for Enhancing Quality and Yield of Okra (<i>Abelmoschus esculentus L.</i>)	128
129	Abstract ID- 8133 Vandana Bhakuni	Assistant Professor, DSB Campus; Kumaun University, Nainital	STUDIES ON SEED LONGEVITY OF SOYBEAN [<i>Glycine max (L.) Merrill</i>] WITH PACKAGING MATERIALS AND PRIMING AGENTS	129
130	Abstract ID- 8134 Neeta Arya	Department of Forestry, Kumaun University, Nainital	Species Composition and Diversity of Tree Species in Bhimtal Forest Division in Uttarakhand, Himalaya	130
131	Abstract ID- 8135 Doctor of Philosophy in Agronomy; Maya Devi University, Selaqui; 2024-2027	Doctor of Philosophy in Agronomy, Maya Devi University, Selaqui	Role of biofertilizer Rhizobium in organic chickpea production Aditi Chauhan	131
132	Abstract ID- 8136 Anjay Singh Bisht, Pooja Barthwal, Rakesh Kumar and Naveen Chandra	School of Agricultural Studies, Quantum University, Roorkee, Uttarakhand, 247667	Effect of Organic Farming Inputs on Growth and Yield of Beans (<i>Phaseolus vulgaris L.</i>)	132
133	Abstract ID- 8137 Saba Tanveer, Rajat Mohan Bhatt, Ruchira Tiwari	Department of Entomology, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, 263145.	Essential Oil Mediated Insecticidal Activity and Detoxification Enzyme Inhibition in <i>Callosobruchus chinensis (L.) (Coleoptera: Bruchidae)</i>	133
134	Abstract ID- 8138 Sarthak Raturi	Bsc (hons.) Agriculture; Department – School of Agricultural Sciences, SGRRU Pathribagh	Advancements in Post-Harvest Technology and Agro-Processing for Sustainable Food Security	134
135	Abstract ID- 8139 Aparna Pant	Kumaun University (D.S.B Campus) Nainital, Department of Agriculture and Agroforestry	Enhancement of Seed Germination and Quality improvement in Kiwi	135
136	Abstract ID- 8140 Aarti Gauni ¹ , Anoop Badoni ² , Vandana Petwal ² and Neha Joshi ¹	¹ Kumaun University D.S.B Campus Nainital Uttarakhand ; ² PLANTICA -Indian Academy Rural Development, Dehradun Uttarakhand	Effect of Phosphorus on plant Growth, quality of Lentil Crop (<i>Lens culinaris Medik</i>)	136
137	Abstract ID- 8141 Dr. Priyanka	Assistant Professor; Department of Agriculture; JB Institute of Technology, Dehradun;	Influence of Irrigation Methods and NPK Levels on Nutrient Uptake, Efficiency, and Yield Performance of Broccoli (<i>Brassica oleracea var. italica</i>)	137
138	Abstract ID- 8142 Kavita ² , Balkar Singh ²	¹ Research scholar, Department of Botany, Kurukshetra University, Kurukshetra, Haryana, India; ² Associate professor, Department of Botany, Arya P.G. College, Panipat, Haryana, India	Comparative phytochemical profiling of <i>Catharanthus roseus (L.)G. Don</i> through GC-MS analysis	138
139	Abstract ID- 8143 ¹ Hardik sain, ² Anoop Badoni, ³ Vandana petwal	Shekhawati institute, SKNAU Agriculture University, jobner; Plantica -Indian Academy Rural Development, Dehradun Uttarakhand	Study of organic and chemical farming and Their impact on soil health and crop productivity	139
140	Abstract ID- 8144 Ikramjeet Maan and Ashish Tewari,	Department of Forestry, D.S.B. Campus, Kumaun University, Nainital.	Impact of Ecophysiological Factors on Regeneration of <i>Quercus floribunda Lindl. ex A. Camus.</i> Dominated Forest in Uttarakhand	140

141	Abstract ID- 8145 <i>Anchal and Anita Kumari</i>	Department of Tree Improvement and Genetic Resources, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, HP, India 173230	Identification of drought-tolerant Populus ciliata genotypes for climate resilient forestry in the north-western Himalayas	141
142	Abstract ID- 8146 <i>Anjali Oli and Ashish Tewari,</i>	Department of Forestry, D.S.B. Campus, Kumaun University, Nainital.	Tree Vegetation Analysis and Physical Indicators of Seed Maturity in Acer oblongum Wall ex. DC in Nainital and the Surrounding Areas”	142
143	Abstract ID- 8147 <i>Vandana Petwal</i>	Plantica -Indian Academy Rural Development, Dehradun, Uttarakhand	Reviving Lingda (Diplazium esculentum): An Underutilized Nutrient-Rich Vegetable for Sustainable Livelihoods in Uttarakhand	143
144	Abstract ID- 8148 <i>Vandana Petwal ,Anoop Badoni</i>	Plantica -Indian Academy Rural Development, Dehradun, Uttarakhand	Emerging Role of Women and Youth in Strengthening Sustainable Rural Agriculture Systems	144
145	Abstract ID- 8149 <i>Ankit Rawat</i>	Tula's Institute, Dehradun	Smart Agricultural Research through Smart Libraries	145
146	Abstract ID- 8150 ¹ <i>Kalpna Gairola and</i> ² <i>Archana Kuniyal</i>	¹ Department of Plant Pathology, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun, India; ² Department of Botany, Balganga Degree College,Sendul-Kemar,Tehri Garhwal, Uttarakhand	Molecular Insights For Sustainable Plant Disease Management	146
147	Abstract ID- 8151 <i>Rajender Pal and Harinder Singh Banyal *</i>	Vertebrate Biology and Animal Physiology Laboratory, Department of Biosciences,; Himachal Pradesh University, Shimla- 171005, India	Impact of Biotic and Abiotic Stressors on Fish Health and Productivity	147
148	Abstract ID- 8152 <i>Ashish Tewari & Shruti Shah</i>	Department of Forestry; Kumaun University, Nainital	Biomass and Carbon stock in Kranteshwar (Champawat) Sacred Forest of Kumaun Himalaya	148
149	Abstract ID- 8153 <i>Abhay Singh , Khulakpam Naseeruddin Shah *, Deepak Kumar Rana and Vivek Singh</i>	Department of Horticulture, School of Agriculture & Allied Science, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India, 246174.	Genetic Variability Assessment and Development of F1 Hybrids in Brinjal (Solanum melongena L.) for Garhwal Himalayan Conditions	149
150	Abstract ID- 8154 <i>S. Muthulakshmi¹, M.R.Backiyavathy²</i>	¹ PG Scholar Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University; Coimbatore - 641 003; ; ² Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University; Coimbatore - 641 003	Smart Fertilization for Nutritional Security: Precision Fertigation Strategies in Hybrid Brinjal	150
151	Abstract ID- 8155 <i>I Mohammed Wajid¹, K Sathya Bama¹*, S Meena¹, P Kathirvelan²& P C Prabu³</i>	¹ Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore 641 003; ² Department of Millets, Centre for Plant Breeding & Genetics, Tamil Nadu Agricultural University, Coimbatore 614 003 ³ Centre for Water and Geospatial Studies, Tamil Nadu Agricultural University, Coimbatore 614 003	Prediction of GreenHouse Gas emission in maize crop as influenced by different nutrients levels	151
152	Abstract ID- 8156 <i>Ramavath Umadevi *, Yuvraj Yadav , Kartik Panchal and Rahul Sandhu</i>	School of Agricultural Sciences, Geeta University, Naultha, Panipat (132 145), Haryana (India)	Integrated Nutrient Management in Chickpea (Cicer arietinum L.): A Review on Productivity, Soil Health and Profitability	152

153	Abstract ID- 8157 <i>Nikita^a, Shekhar Agnihotri^{a,b}</i>	^a Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship and Management, Kundli, Sonapat, Haryana, 131028, India; ; ^b Centre for Advanced Translational Research in Food NanoBiotechnology, National Institute of Food Technology Entrepreneurship and Management, Kundli, Sonapat, Haryana, 131028, India	Nanozyme-Driven Active Nanofibrous Packaging for Controlled Antimicrobial Protection and Shelf-Life Extension of Fresh-Cut Apples	153
154	Abstract ID- 8158 <i>1Ashish negi, 2Anoop Badoni, 3Vandana Petwal</i>	PLANTICA- Indian Academy Rural Development, Dehradun Uttarakhand	Modern Trends and Research in Floriculture	154
155	Abstract ID- 8159 <i>1Kunal Shakya, 2Anoop Badoni, 3Vandana Petwal</i>	PLANTICA- Indian Academy Rural Development, Dehradun Uttarakhand	Soil Testing and its Importance in Sustainable Agriculture	155
156	Abstract ID- 8160 <i>Rajat Mohan Bhatt, Saba Tanveer, Ruchira Tiwari</i>	Department of Entomology, College of Agriculture, Govind Ballabh Pant University of; Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, 263145.	Evaluation of medicinal Plant Extracts Against <i>Callosobruchus chinensis</i> (Coleoptera: Bruchidae) in Storage Conditions Using Integrated Bioassay and Gut Enzymatic Analysis	156
157	Abstract ID- 8161 <i>Ayush Rohilla, Vishwanath Singh & Dr. Sugam Gupta</i>	Dept. of Applied Science & Humanities, Tula's Institute ,Dehradun, Uttarakhand	Man-Powered Wheel-Type Harvesting Implement for Wheat and Rice	157
158	Abstract ID- 8162 <i>Dr. Twinkle Razdan, Dr. Divyanshi Sharma, Dr. Anushree Srivastava, Dr. Mamta Gautam</i>	Department of Applied Sciences & Humanities; ABES Engineering College, Ghaziabad (U.P), India	DaLa Application in India: A Review of Case Study Integration	158
159	Abstract ID- 8163 <i>Ruchi Jalal¹; Saraswati Bish²</i>	¹ Department of Botany, Surajmal Agarwal Private Kanya Mahavidyalaya, Kichha; ; ² Department of Botany, Indira Priyadarshini Govt. Girls P.G. College of Commerce, Haldwani;	ANTIFUNGAL ACTIVITY OF WATER BORNE CONIDIAL FUNGI AGAINST SOME PLANT PATHOGENS	159
160	Abstract ID- 8164 <i>Anil Kumar¹, A.K. Pant¹, Jai Paul¹, Veer Singh¹, Shri Ram¹ and Sunita T. Pandey²</i>	¹ Deptt. of Soil Science ² Deptt. of Agronomy G. B. Pant University of Agriculture & Technology, Pantnagar.	Influence of Organic Fertilisation and Natural Farming Practices on Growth Attributes, Green Seeker-Based NDVI and Soil Quality in Rice Crop	160
161	Abstract ID- 8165 <i>Aarti¹, Jyoti Chauhan², Balkar Singh³, Ranjeet Singh*</i>	¹ Research Scholar, Department of Botany, Kurukshetra University Kurukshetra- 136119,; Haryana India ² Assistant Professor, Department of Botany, Institute of Integrated & Honors Studies, Kurukshetra University Kurukshetra- 136119, Haryana ³ Department of Botany, Arya P.G. College, Panipat- 132103, Haryana, India; *Professor, Department of Botany, Pt. CLS Government College, Karnal, Kurukshetra University Kurukshetra-136119, Haryana India	Phytochemical profiling and GCMS Characterization of <i>Heliotropium curasavicum</i> L. with Ethnomedicinal Perspectives	161
162	Abstract ID- 8166 <i>Sakshi kandpal and Manoj Raghava</i>	Department of Vegetable Science G.B Pant University of Agriculture and Technology, Pantnagar- 263145, Udham Singh Nagar (Uttarakhand)	Influence of nano-urea application on growth and yield of tomato (<i>Solanum lycopersicum</i> L.)	162

163	Abstract ID- 8167 <i>Aastha Adhikari¹, Sneha Tiwari¹</i>	¹ Department of Molecular Biology and Genetic Engineering, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India	Computational Investigation of Plant-Based Bioactives Against Psoriasis-Associated Inflammatory Proteins: Molecular Docking and ADMET Analysis;	163
164	Abstract ID- 8168 <i>Khushi Tehri, Umesh Goutam</i>	¹ Department of molecular biology and genetic engineering, School of bioengineering and biosciences, Lovely Professional University, Phagwara, Jalandhar, Punjab	Sewage-Derived Bacteriophages as Emerging Therapeutics Against Multi-Drug-Resistant Clinical Pathogens	164
165	Abstract ID- 8169 <i>Adarsh Dangwal¹, Rajeew Kumar¹, Anil Shukla¹, Ajeet Pratap Singh², Kuldip Chandra Verma³ and Priyanka Pandey⁴</i>	¹ Department of Agronomy, College of Agriculture, GBPUAT, Pantnagar; ² Department of Soil Science, College of Agriculture, GBPUAT, Pantnagar ³ Department of Biochemistry, CBSH, GBPUAT, Pantnagar ⁴ Department of Molecular Biology and Genetic Engineering, CBSH, GBPUAT, Pantnagar	Enhancing wheat yield and grain quality through Nano DAP under reduced Phosphorus fertilization	165
166	Abstract ID- 8170 <i>Ashok Kumar¹, Tejpal Singh Bish²</i>	¹ Ph.D. Research Scholar, Department of Horticulture, School of Agriculture and Allied Science, H.N.B. Garhwal University, Srinagar (Garhwal) Uttarakhand India.; ² Assistant Professor, Department of Horticulture, School of Agriculture and Allied Science, H.N.B. Garhwal University, Srinagar (Garhwal) Uttarakhand India.	Synergistic Effect of Microbial Inoculants, Nanoparticles and Biochar on Vegetative Growth of Strawberry Cultivated Under Shade Net Conditions	166
167	Abstract ID- 8171 <i>Juhi Khanal</i>	Independent Researcher, Kumaun, Uttarakhand	Trichoderma-Based Biological Seed Treatment for Enhancing Germination and Vigor in Garden Pea (<i>Pisum sativum</i> L.): A Sustainable Approach to Climate-Resilient Agriculture Juhi Khanal	167
168	Abstract ID- 8172 <i>Bhagwati Prashad Sharma*</i>	*Department of Botany, Sidharth Government College Nadaun, Himachal Pradesh, India	Ethnomedicinal plants in Kangra District of Himachal Pradesh, India: A Study	168
169	Abstract ID- 8173 <i>Rupinder Kaur, Sugam Gupta, Suresh Kumar, Ankur Kumar, Simrat Kaur</i>	1,3,4 Department of Agriculture, Tula's institute, Dehradun (UK)-248001, India. ; 2 Department of Applied Science and Humanities, Tula's institute, Dehradun (UK)-248001, India.	Evaluation of growth and production behaviour of <i>Pisum sativum</i> L. under an existing Agroforestry system in mid hills of Himachal Pradesh	169
170	Abstract ID- 8174 <i>Suraj Joshi¹, Anoop Badon² and Deepali Joshi²</i>	¹ Himalayan Institute of Technology (HIT), Dehradun; ² PLANTICA- Indian Academy of Rural Development (IARD), Dehradun	Kiwi- A Cash Crop & Key Of Diversification For Uttarakhand Hill Agriculture	170
171	Abstract ID- 8175 <i>Harshal Gaikwad¹, Dr. Umesh Goutam¹</i>	¹ Department of Molecular Biology and Genetic Engineering, School of Bioengineering and Biosciences, Lovely Professional University, Phagwara, Jalandhar, Punjab, India	Engineering Bacteriophages for Precision Biocontrol in Wastewater Systems: Advances and Translational Challenges	171
172	Abstract ID- 8176 <i>Amit Kishore, Girish Chandra and Ummed Singh</i>	Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University Patel Nagar Dehradun-248001, Uttarakhand	Effect of Plant Based Priming Agents on Germination Performance of Mung Bean (<i>Vigna radiata</i>)	172

173	Abstract ID- 8177 <i>Vijender Rana, Harish Purohit</i>	Shree Dev Bhoomi Institute of Education Science & Technology, Dehradun	Effect of different row spacing and seed rates on growth and seed yield of lentil (<i>Lens culinaris</i> L)	173
174	Abstract ID- 8178 <i>Anushka Trivedi</i>	M.Sc. Plant Pathology; Department of Agricultural Sciences, SGRRU Pathribagh, Dehradun	CLIMATE CHANGE AND ITS IMPACT ON EMERGING PLANT DISEASES IN SUSTAINABLE AGRICULTURE	174
175	Abstract ID- 8179 <i>Sumit Gaur, Sumit Chaturvedi, V. C. Dhyan, Sambita Bhattacharyya</i>	Department of Agronomy, COA, GBPUA&T, Uttarakhand	“Sustainable Crop Residue Management through Biochar Application for Enhancing Soil Health and Reducing Emissions in Rice-Wheat Cropping System”	175
176	Abstract ID- 8180 <i>Saurabh Kumar Rai and Naveen Chandra</i>	Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand	Structural Planning and Design of Greenhouses: Materials, Layout, and Orientation	176
177	Abstract ID- 8181 <i>Prateek kashyap , shikha sharma</i>	Student, School of Agriculture, Forestry & Fisheries, Jigyaasa university, Dehradun, INDIA	Climate Resilient Smart Integrated Agriculture: A Sustainable Approach for Future Farming	177
178	Abstract ID- 8182 <i>Savi Saini¹ and Isha²</i>	Department of agricultural studies, Quantum University, Roorkee, Uttarakhand	Design Criteria for Greenhouse Cooling and Heating Systems for Climate Control	178
179	Abstract ID- 8183 <i>Sambita Bhattacharyya^{1*}, Sumit Gaur¹, Gurvinder Singh¹ and Sumit Chaturvedi²</i>	1,2 Department of Agronomy, COA, GBPUA&T, Uttarakhand	Enhancing Productivity and Water-Use Efficiency of Japanese Mint (<i>Mentha arvensis</i> L.) through Establishment Methods, Mulching, and Biostimulants under Summer Season Conditions of the Tarai Region of Uttarakhand	179
180	Abstract ID- 8184 <i>Meenakshi Joshi*, Sonali Rajput, Shailendra Tiwari</i>	Dept. of Seed Science and Technology, H.N.B. Garhwal University	Optimizing Linseed Productivity through Combined Application of Phosphorus, Potassium and Vermicompost.	180
181	Abstract ID- 8185 <i>Himanshu Malhotra¹, Rajeev Kumar²</i>	Doon University, Dehradun, Uttarakhand	Millet Cultivation and Institutional Ecosystems: A Study of Farmer Motivation in Uttarakhand	181
182	Abstract ID- 8186 <i>Sanjeev Kumar*, Garima</i>	Department of Basic Sciences, College of Forestry, Dr. Yashwant Singh University of Horticulture and Forestry Nauni Solan, Himachal Pradesh, India	Unravelling Chilling Requirements and Yield Dynamics of Selected Apple Cultivars in Mid- Hill Regions of Himachal Pradesh, India	182
183	Abstract ID- 8187 <i>Dr. Neeru Kaushal</i>	Gautam College Hamirpur	Heat stress in medicinal flora	183
184	Abstract ID- 8188 <i>Dr Sunita Saklani*</i>	Department of Zoology, Sidharth Govt. Utkrisht College Nadaun, District Hamirpur, Himachal Pradesh, India	Climate change and its impact on the honeybee population.	184
185	Abstract ID- 8189 <i>Kartik Panchal^{1*}, Ramavath Umadevi¹, Yuvraj Yadav¹ and Rahul Sandhu¹</i>	¹ School of Agricultural Sciences, Geeta University, Naultha, Panipat (132 145), Haryana (India)	Integrated Nutrient Management for Enhancing Productivity, Soil Health and Sustainability of Field Pea (<i>Pisum sativum</i>): A Review	185
186	Abstract ID- 8190 <i>Neha Tiwari</i>	Department of Botany, Indira Gandhi National Tribal University, Amarkantak, M.P., India	Nutraceutical Value of Traditional Medicinal Plants of Amarkantak, India	186
187	Abstract ID- 8191 <i>Manibhushan Kumar^{1*}, Pramod K Prabhakar², and Brijesh Srivastava¹</i>	¹ Department of Food Engineering and Technology, Tezpur University, Tezpur Assam, India ² Department of Food Science and Technology NIFTEM, Kundli Haryana, India	Energy and Exergy evaluation of developed ohmic heating pressure cooker (OHPC)	187
188	Abstract ID- 8192 <i>Saraswati Bisht^{1*}; Ruchi Jala²</i>	² Department of Botany, Indira Priyadarshini Govt. Girls P.G. College of Commerce, Haldwani ¹ Department of Botany, Surajmal Agarwal Private Kanya Mahavidyalaya, Kichha	<i>In-Vitro</i> and <i>In-Vivo</i> Efficacy of Aquatic Hyphomycetes Against <i>Xanthomonas Oryzae</i>	188
189	Abstract ID- 8193 <i>¹Neha Chauhan & ²Chhaya Singh</i>	¹ Department of Microbiology, School of Paramedical & Allied Health Sciences, Shri Guru Ram Rai University, Patel	Occurrence of Multidrug-Resistant Bacteria in the Environment: A Serious Concern in Environmental	189

		Nagar, Dehradun, Uttarakhand. ² Department of Botany, Govt. PG College, Thallisain, Pauri Garhwal, Uttarakhand.	Sustainability	
190	Abstract ID- 8194 <i>*¹Papiya Sinha, ²N. Seema Devi</i>	¹ Assistant Professor, Department of Medical Lab Technology & Medical Microbiology, School of Paramedical & Allied Health Sciences; Shri Guru Ram Rai University, Patel Nagar, Dehradun. ² Assistant Professor & Head IQAC, Pratap University Jaipur, Rajasthan.	Climate-Driven Antimicrobial Resistance: A One Health Approach within Climate-Smart Agricultural Systems	190
191	Abstract ID- 8195 <i>Rafiqi Mohammed Abdul Rahman¹, Mahendran Peyandi Paraman¹, Sharmila Rahale Christopher², Kannan Pandian²</i>	¹ Department of Soils and Environment, Agricultural College and Research Institute, Madurai 625 104, Tamil Nadu, India ² Centre for Agricultural Nanotechnology, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India	Design and Evaluation of Rice Husk-Derived Mesoporous Silica as a Carrier System for Controlled Delivery of NPK Nutrients with Molecular Interaction Analysis	191
192	Abstract ID- 8196 <i>Shagun¹, Megha Sumar²</i>	¹ Assistant Professor, Department of Agronomy, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun Uttarakhand. ² Assistant Professor, Department of Plant Pathology, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun Uttarakhand.	Impact of Integrated Nutrient Management on Nutraceutical properties of Finger millet	192
193	Abstract ID- 8197 <i>Prava Kiran Dash^{1,2*}, Antaryami Mishra^{1,3}</i>	¹ Department of Soil Science and Agricultural Chemistry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India-751003 ² Regional Research and Technology Transfer Station, Mahisapat, Dhenkanal, Odisha, India-759013 ³ Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India-751029	Soil Variability Across Topographic Gradients of North-Eastern Coastal Plains Agroclimatic Zone of Odisha	193
194	Abstract ID- 8198 <i>¹Deepali Rana, ²Skalzang Dolkar, ³Rahul Rana, ⁴Dhyal Singh, ⁵Shefalee Singh and ⁶Ganesh Datt Bhatt</i>	* ^{1,2} Department of Zoology, Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehradun, India ³ Wildlife Institute of India, Dehradun, ⁴ Department of Zoology, School of Life & Applied Sciences, SGRR University, ⁵ School of Applied and Life Science, Uttaranchal University, Dehradun, India. ⁶ College of Agriculture Sciences Teerthanker Mahaveer University Moradabad Uttar Pradesh.	A Comprehensive Survey of Fish Markets in Doon Valley, District Dehradun	194

195	Abstract ID- 8199 <i>Shivendra Kumar Mishra, Vanshika, Ankit Kumar Gupta, A.B. Riyansh, Hariom</i>	Department of Agriculture , Tulas Institute Dehradun	SMART AGRICULTURE vs SMART VILLAGES	195
-----	--	---	--	-----

Abstract ID 8001

Organic, Natural and Integrated Farming Systems: Implications for Soil Health, Productivity and Farm Sustainability

¹Rahul Kumar Jat and ²Roshan Choudhary

¹SKN Agriculture University Jobner, Rajasthan, India;

²SKN Agriculture University Jobner, Rajasthan, India

Abstract

Organic, natural and integrated farming systems have emerged as promising alternatives to conventional input-intensive agriculture due to their potential to enhance soil health, maintain productivity and ensure long-term farm sustainability. Organic farming emphasizes the application of farmyard manure, compost, green manuring and biofertilizers, which has been reported to improve soil organic carbon by 5-10%, microbial activity by 10-20% and nutrient availability by 5-15% compared to conventional systems. Although crop yields under organic farming are generally 5-10% lower during initial years, yield stability improves with continued adoption and enhanced soil biological processes. Natural farming, particularly Zero Budget Natural Farming (ZBNF), is based on the use of indigenous cow-based inputs such as Jeevamrit and Beejamrit, along with mulching and soil aeration practices. Adoption of natural farming has resulted in a 20-35% reduction in input costs, improvement in soil microbial population by 10-25% and crop yields comparable to conventional farming after two to three cropping seasons. These practices also contribute to improved soil moisture conservation and reduced chemical dependency. Integrated Farming Systems (IFS) integrate crop production with allied enterprises such as livestock, poultry, fisheries and composting units, facilitating efficient recycling of farm residues and nutrients. IFS models have demonstrated 10-20% higher system productivity, 15-30% increase in net returns and employment generation of about 200-250 man-days ha⁻¹ year⁻¹ compared to monocropping systems. Nutrient recycling in IFS can substitute approximately 20-30% of recommended fertilizer nitrogen. Overall, organic and natural farming systems contribute to soil health restoration and environmental sustainability, while integrated farming systems enhance economic stability and productivity. The site-specific integration of these systems can play a crucial role in achieving sustainable agriculture and long-term farm sustainability.

Keywords: *Organic farming, Natural farming, Integrated farming system, Soil health, Farm sustainability, Productivity*

Abstract ID 8002

Wheat Biofortification to Enhance Production and Nutritional Quality in genomic era

Ronak Sharma

Msc.(PG)-Soil Science & Agricultural Chemistry

Dr. Rammanohar Lohia Avadh University Ayodhya

Abstract

Wheat is used as staple food in many parts of the world. it is making the product like chapati, bread, pasta etc. wheat provides essential carbohydrate, fiber, vitamins and minerals like iron, zinc and magnesium.it is also contribute economically through large scale cultivation. wheat product also contain gluten which found to be intolerant to some individuals. some concerned about wheat because it is anti-nutrient because it contains phytic acid which impairs the absorption of minerals (Fe, Zn) in humans .in order to increase the absorption of Fe& Zn a new strategy i. e , Biofortification is applied. Biofortification of wheat is a strategy to combat micronutrient deficiency of Fe& Zn. Many method of Biofortification like conventional breeding, genetic engineering and agronomical practice are applied to enhance nutritional quality and production of wheat. Genetic biofortification efforts lead to a 74% and 79% increase Zn and Fe content, respectively. Effects of biofortification were larger in Asia and Africa, where micronutrient deficiency and hidden hunger are widespread. many Fe& Zn content biofortified varieties are developed and grown all over the world. Varieties like WB-02, Pusa tejas,HD-3171,DBW-173,DDW-47,HD-3298,DBW-303.this approach offers long term benefits like increase nutritional quality ,improve health outcome ,increase productivity and reduce malnutrition in wheat.

Keywords: *Wheat, Micronutrient, Biofortification , Nutritional quality, Micronutrient deficiency.*

Abstract ID 8003

INFLUENCE OF EXOGENOUS APPLICATION OF NANO-CALCIUM AND HUMIC ACID ON DIFFERENT HORTICULTURAL TRAITS OF CABBAGE (*Brassica oleracea* var. *capitata* L.) UNDER VALLEY CONDITIONS OF GARHWAL

Anshika Singh¹, K.N. Shah², D.K. Rana³ and Vivek Singh⁴

¹Research Scholar, ²Assistant Professor, ³Associate Professor, ⁴Guest Faculty

Department of Horticulture, School of Agriculture and Allied Science, Hemvati Nandan Bahuguna Garhwal University, Srinagar Garhwal

Abstract

Grown all throughout the world for its compact, leafy heads, cabbage (*Brassica oleracea* var. *capitata* L.), belongs to family Brassicaceae, is a cool-season cruciferous vegetable that plays a significant role in fresh, cooked, and processed meals. It is acknowledged as a nutrient-dense, high-yielding crop with significant economic value in both subtropical and temperate vegetable production systems. An experiment was conducted to investigate the “Influence of Exogenous Application of Nano-Calcium and Humic Acid on Different Horticultural Traits of Cabbage (*Brassica oleracea* var. *capitata* L.) under Valley Conditions of Garhwal Region”, during winter season, 2023-24 at Horticultural Research Centre, Department of Horticulture, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand. The experiment was laid out in randomized block design with three replications having 9 treatments viz., T0 (Control), T1 (Humic acid @ 2.5g/l), T2 (Humic acid @ 4g/l), T3 (Nano-calcium @ 2.5ml/l), T4 (Nano-calcium @ 4ml/l), T5 (Nano-calcium @ 2.5ml/l + Humic acid @ 2.5g/l), T6 (Nano-calcium @ 2.5 ml/l + Humic acid @ 4g/l), T7 (Nano-calcium @ 4ml/l + Humic acid @ 2.5g/l) and T8 (Nano-calcium @ 4ml/l + Humic acid @ 4g/l). The result of the investigation showed that, the treatment T7 (Nano-calcium @ 4ml/l + Humic acid @ 2.5g/l) gave the best outcome for growth parameters i.e., plant height, plant spread and number of unwrapped leaves, and yield parameters i.e., plant weight (2126.67 g), head weight (1494.67 g), head diameter (17.35 cm), polar diameter (16.45 cm) and core diameter (3.53 cm). For quality parameters, i.e., total soluble solid (6.43 °Brix), ascorbic acid (43.20 mg) and dry weight (7.769 g), and core length (7.35 cm), the treatment T6 (Nano-calcium @ 2.5ml/l + Humic acid @ 4g/l) gave the superior result which was followed by the treatment T7 (Nano-calcium @ 4ml/l + Humic acid @ 2.5g/l), while yield per plot (26.93 kg), yield per hectare (401.78 q), head compactness (35.73 %) and total soluble solid (6.43 °Brix) were found best under the treatment T8 (Nano-calcium @ 4ml/l + Humic acid @ 4g/l) followed by the treatment T7 (Nano-calcium @ 4ml/l + Humic acid @ 2.5g/l). Therefore, it is feasible to suggest that in the valley conditions of the Garhwal region, a combination of treatments, such as 4 ml/l of nano-calcium and 2.5 g/l of humic acid, could potentially be applied to boost the production of cabbage cv. Golden Acre.

Keywords: *Cabbage, exogenous, horticultural traits, humic acid, nano-calcium.*

Abstract ID 8004

Agriculture and Agribusiness in India: An Entrepreneurial Development of Agriculture

Aalok kumar

Himalayan Institute of Technology; Asthal Dehradun

Abstract

Agriculture business (agribusiness) in India is a core pillar of the economy, linking farm production with input supply, processing, logistics, and marketing, and it is rapidly evolving with technology and policy support. It contributes a significant share to GDP and jobs while facing structural challenges like low productivity, fragmented landholdings, and weak infrastructure that new agribusiness models aim to address. Agriculture and agriculture-related sectors are important sources of revenue in India. It is especially critical for persons living in rural regions. In light of technical improvements, several service and manufacturing industries have emerged. Agribusiness has profited immensely from technical advancements as well. Agriculture is an important element of the Indian economy, contributing to more and over 17 percent of the total GDP and supporting more than 60 percent of the workforce. Agribusiness encompasses a wide variety of commercial operations that occur from farm to fork. It entails the supply of agricultural inputs as well as the production and processing of farm commodities. Agribusiness comprises all activities in the agricultural, food, and natural resource industries that are connected to food manufacturing and fibre. There goal is to highlight the sustainability of agricultural progress and development in the field of the business sector. Transformation of Agriculture to Agribusiness is a big move for farmers to become entrepreneurs in the Agribusiness as Agri-Entrepreneurs.

Abstract ID 8005

Rescuing a Rare Endemic: In Vitro Seed Germination Strategies for the Critically Endangered *Meizotropis pellita* (Hook.f. ex Prain) Sanjappa

*Sheetal Koranga¹, Preeti Chaturvedi² and Lalit M. Tewari¹

¹Department of Botany, D.S.B. Campus, Kumaun University, Nainital, 263001, Uttarakhand, India;

²Department of Biological Sciences, College of Basic Sciences and Humanities, G.B. Pant University of Agriculture and Technology, Pantnagar, 263145, Uttarakhand, India.

Abstract

Meizotropis pellita (Hook.f. ex Prain) Sanjappa is an endemic legume of Uttarakhand, India, currently listed as Critically Endangered by the IUCN, owing to its extremely restricted distribution, poor natural regeneration, and severe seed dormancy constraints. This study systematically investigated multiple pre-treatment strategies to improve in vitro seed germination and support conservation efforts for this rare species. A comparative analysis of three basal culture media (MS, WPM, and Gamborg B5) using seeds of varying ages (fresh, one-year-old, two-year-old, and three-year-old) revealed significant age-dependent viability decline, with fresh seeds achieving optimal germination on MS medium. Imbibition curves were constructed to elucidate the relationship between seed age, water uptake kinetics, and germination potential. To overcome both physical and physiological dormancy, seeds were subjected to different scarification treatments using concentrated acids (98% H₂SO₄, 35% HCl, and 70% HNO₃) under controlled laboratory conditions, along with stratification, and light regime manipulations. Among all treatments, seed priming proved most effective, resulting in a high germination percentage (97.77%), representing a 46.6% increase over untreated controls. This breakthrough treatment also dramatically reduced mean germination time to 4.62 days and elevated the seed vigor index to 1671.11, indicating superior seedling quality and vigor. Successfully germinated seedlings were acclimatized through a hardening process to ensure survival during field transfer. Overall, this study establishes a reproducible propagation method from dormant seeds to field-ready plants, supporting *M. pellita* reintroduction and broader conservation of threatened endemic plant species.

Keywords: *Meizotropis pellita*, Endemic, Dormancy, Seed priming, Hardening, Conservation

Abstract ID 8006

MULTI-SENSOR MICROWAVE AND OPTICAL FUSION FOR RICE PHENOLOGY MAPPING AND YIELD ESTIMATION

Mahesh Palakuru,

Vellore Institute of Technology, Vellore, TamilNadu, 632014, India

Abstract

This Ph.D. research presents a perspective study on rice crop dynamics using multi-polarized SCATSAT-1 Ku-band scatterometer, Sentinel-1 C-band SAR, Sentinel-2 multispectral, SMAP L-band soil moisture, and MODIS NDVI data to enable accurate, large-area monitoring of rice phenology and yield for global food security. Rice, a staple feeding over 3 billion people and covering 11% of global cropland, demands precise growth stage detection and productivity assessment to optimize water use, inputs, and production forecasts, particularly in cloudy monsoon regions where optical data fails. Focused on short-duration irrigated rice in Chittoor district, Andhra Pradesh, India, the research develops a multi-sensor framework for mapping puddling, transplanting, heading, and harvesting stages, alongside biophysical parameters and yield from field to national scales. The methodology leverages complementary microwave and optical sensitivities. SMAP-derived Soil Wetness Index (SWI) anomalies detect puddling via peak flooding signals. SCATSAT-1 dual-polarization (HH, VV) sigma-0 time series, converted to dB, use anomaly detection for transplanting breakpoints during early canopy growth. MODIS NDVI/EVI combined with SCATSAT-1 and Sentinel-1 backscatter undergo two-parameter Gaussian fitting and hypothesis tests (t-test, F-test, chi-square) to pinpoint heading (max vegetation) and harvesting via curve intersections and minima. Sentinel-1 10m VV/VH refines phenology, revealing backscatter sensitivity (−15 to −16 dB at heading) to structure and panicles. Results validate operational viability: SCATSAT-1 retrieves stages with RMSEs of 4.11 days (puddling), 2.72–4.11 days (transplanting), 8 days (heading), and 3 days (harvesting) against 20 ground plots. SWI anomalies capture puddling onset; sigma-0 anomalies mark transplanting; Gaussian models align heading with peak biomass, though errors rise from soil variability or stress. Biophysical retrievals (LAI, canopy water, chlorophyll, fCOVER, fPAR) confirm healthy growth profiles. Field yields average 2.585 tonnes/acre over 4046.86 m²; SCATSAT-1 phenology-based regression models predict area-wide yields ($R^2 \approx 0.84$), passing statistical tests for scalability via MODIS/SCATSAT-1 mosaics. This work pioneers Ku-band scatterometer utility in agriculture, integrating multi-frequency microwave (Ku/C/L) with optical indices for cloud-agnostic phenology and yield mapping within ~1-week accuracy, suitable for agronomy and policy. Limitations tie to agronomic factors, improvable via finer data or management inputs. The scalable, sensor-fusion approach advances precision agriculture, water management, and food security in rice systems, adaptable to other crops and regions.

Abstract ID 8007

Medicinal and Aromatic Plants: Role in Sustainable Agriculture and Human Health

Deeksha Dhiman

M.Sc. Plant Science (Botany)

Central University of Himachal Pradesh

Abstract

Medicinal and aromatic plants (MAPs) have traditionally played an important role in healthcare systems and are now widely valued for their ecological sustainability, economic potential, and therapeutic properties. The increasing problems related to environmental degradation, excessive use of chemical fertilizers and pesticides in agriculture, and growing health challenges, showed the need for innovative and integrated approaches that connect agriculture with applied and life sciences. In this context, medicinal and aromatic plants offer a sustainable way to support both environmental protection and human well-being. This abstract focuses on the role of medicinal and aromatic plants in sustainable agriculture and their contribution to human health. Evidences suggests that MAPs are generally low-input crops, and grow well in organic and integrated farming systems. Cultivation of these plants helps in maintaining soil fertility, conserve biodiversity, and reduces dependence on synthetic fertilizers and pesticides. Additionally, MAPs provide economic benefits to farmers by offering alternative income sources. Beyond their agricultural importance, medicinal and aromatic plants are rich sources of bioactive chemical compounds such as alkaloids, flavonoids, phenolics, and essential oils. These compounds are responsible for various pharmacological properties, including antioxidant, anti-inflammatory, antimicrobial activities, which play an important role in improving overall human health and preventing diseases. This has led to a growing demand for plant-based medicines and natural healthcare products. In conclusion, medicinal and aromatic plants offer a sustainable approach to agriculture by minimizing environmental degradation and enhancing ecosystem stability, while also benefiting human health. Their integration into modern agricultural practices can play a vital role in achieving sustainable development goals and ensuring a healthy future for both agriculture and society.

Abstract ID 8008

Role of Bamboo as a Sustainable Plant Resource in Environmental Conservation: A Review

Shailza

M.Sc. Student

Department of Plant Sciences, School of Life sciences
Central University of Himachal Pradesh

Abstract

Environmental conservation has become a primary concern because of the increasing challenges of deforestation, soil degradation, climate change, and loss of biodiversity on a large scale. Sustainable plant resources play an important role in overcoming these challenges. Bamboo is considered as one of the important sustainable plant resource because its growth is fast, it is renewable, its carbon sequestration capacity is more than trees, and it can grow with minimal resources. Bamboo is a perennial, fast-growing woody grass that belongs to the family Poaceae. It majorly plays the role of a carbon sink that helps to mitigate the climate change. A dense mat formed by the fibrous roots of bamboo conserves the water and prevents the soil erosion. India is the second largest producer of bamboo, with maximum production comes from Northeast states. Due to its fast tendency to grow, bamboo is considered a more sustainable option than wood. It is revolutionizing the global trade, boosting the economy, and generating employment for rural communities. By replacing plastics, biodegradable and environmentally safe bamboo products are developed. It is a sustainable option for infrastructures, textiles, paper, furniture, crafts, and many more, which helps in controlling deforestation. Bamboo forests provide a diverse flora and fauna because of nutrient-rich soil, large biomass, and improved air and water quality. It is a great alternative to fossil fuels due to its faster growth than other plants, and its biomass can be processed into biofuels, which don't pollute the environment on burning. Considering these advantages, bamboo is rightly said to be a "Green Gold" and this review aims to highlight the importance of bamboo in sustainable development and environmental conservation.

Keywords: *Bamboo, Sustainability, Environmental conservation, Carbon sequestration.*

Abstract ID 8009

Phytochemical analysis and therapeutic activity of *Curcuma zedoaria* (White turmeric)

Abhijeeta Nandha^{1*}, Harsha Patil²

¹ Assistant Professor, Department of Biotechnology, Kalinga University, Kotni, Naya Raipur, C.G.- (492001)

² Professor, Research Department, Kalinga University, Kotni, Naya Raipur, C.G.-(492001)

White turmeric (*Curcuma zedoaria*), a rhizomatous herb which belongs to the Zingiberaceae family, has long been recognized for its immense medicinal usage in various traditional practices. In this study, we have undertaken a comprehensive phytochemical screening of white turmeric to identify different bioactive compounds. Using standard qualitative methods and solvent extractions (methanol), the analysis revealed a rich presence of phenolic compounds, flavonoids as well as terpenoids, which are known for their antioxidant, anti-inflammatory, and antimicrobial properties. Additionally, alkaloids and saponins were detected, indicating potential for pain relief and immune modulation, while tannins suggest applications in wound healing and gastrointestinal treatments. The presence of different carbohydrates were also detected in some of the variety which were used in the study. The anti-microbial activity was also checked against different gram +ve and gram -ve bacterial species as well as fungi. These findings gives the valuable insights of components of white turmeric which was less explored and it is also supported by it's traditional medicinal uses. This study clears the way to further research on identification and study of different bioactive components.

Keywords: *Curcuma zedoaria*, White turmeric, Phenolic compounds, Alkaloids, Phytoconstituents, anti-microbial

Abstract ID 8010

"DEVELOPMENT AND STATISTICAL VERIFICATION OF SOIL FERTILITY GRADIENTS FOR MAJOR NUTRIENTS (N, P AND K) USING SORGHUM EXHAUSTION IN MOLLISOLS OF NORTH WESTERN PLAIN ZONE OF INDIA"

Raushan Kumar, Ajaya Srivastava and Raj Bahadur*

Department of Soil Science: College of Agriculture; G.B. Pant University of Agriculture and Technology, Pantnagar- 263145, U.S. Nagar, Uttarakhand, India.

Abstract

Field experiments were conducted under the All India Coordinated Research Project (AICRP) on Soil Test Crop Response (STCR) at the D7 block of the Norman E. Borlaug Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand (29°02' N latitude, 79°30' E longitude, and 243.84 meters above mean sea level), to develop soil test crop response correlations. To evaluate the influence of soil fertility gradients on crop yield, nutrient uptake, and soil fertility status, a field study using sorghum as an exhaustive crop was carried out during the kharif season of 2024-25. The experimental field was divided into three uniform strips: Strip I without fertilizer (N₀P₀K₀), Strip II a medium fertilizer dose (N₁₀₀P₁₀₀K₁₀₀), and Strip III a high fertilizer dose (N₂₀₀P₂₀₀K₂₀₀). Nitrogen, phosphorus, and potassium were supplied through urea, complex fertilizer (NPK 12:32:16), and muriate of potash. Sorghum was grown following standard agronomic practices and harvested at maturity. Soil and plant samples were collected from each strip to determine nitrogen, phosphorus, and potassium concentrations, and total nutrient uptake was computed. The cultivation of the exhaustive crop facilitated the transformation and utilization of applied fertilizers through plant uptake and microbial activity, thereby enabling the development and assessment of soil fertility gradients for STCR analysis.

Keywords: *Exhaust crop, Fertilizer doses, Mollisol, Nitrogen, Nutrient uptake, Phosphorus, Potassium, Soil fertility gradient, Sorghum, STCR.*

Abstract ID 8011

Assessment of morphological variability in Dahlia

Manchyala Divya^{1*}, P. Naveen Kumar¹, Cherukula Mallika¹, E. Naveen¹

^{1*} Department of Floriculture and Landscaping, Dr. Y. S. R. Horticultural University;

¹Division of flower and medicinal crops, Indian Institute of Horticultural Sciences, Bengaluru;

¹Department of Plantation Spices Medicinal and Aromatic Crops, TNAU, Coimbatore;

Abstract

The present research was being conducted at the ICAR–Indian Institute of Horticultural Sciences, Bengaluru, on Dahlia, a genus belonging to the family Asteraceae, which comprises herbaceous, tuberous-rooted perennial plants native to Mexico and Central America and is renowned for its remarkable diversity in floral morphology and pigmentation. Among the cultivated species, *Dahlia variabilis* holds particular prominence as an ornamental crop, widely appreciated for its aesthetic appeal, adaptability, and economic importance in the global floriculture industry. Dahlias are characterized by their composite inflorescences, with capitula consisting of ray and disc florets that exhibit remarkable variation in size, form, and color. This morphological plasticity has made them a preferred subject for breeding programs aimed at developing novel cultivars with enhanced ornamental traits. Crop improvement requires evaluation, which will offer a quick, accurate, and effective method of information to increase the utilization of germplasm. Forty accessions were characterized for morphological characters like vegetative, flower yield and quality parameters. Among the different accessions, there were flowers of different colors (white, yellow, orange, red, pink) and degree of flower duration (early, late) assessed. Accession IIHRDV21 has recorded maximum in plant height (87.90 cm), number of branches per plant (13.46), flower head diameter (23.5 cm), flower weight (61.93g) and Number of flowers per plant (42.30). The accessions identified will be beneficial in future dahlia breeding program. The ultimate goal of dahlia breeding is to meet the demands of the global floriculture industry by producing cultivars that combine aesthetic appeal, adaptability, and commercial value.

Keywords: *Dahlia, Crop improvement, Flower traits, Asteraceae and Variation*

Abstract ID 8012

Artificial Intelligence and Machine Learning for Advanced Genebank Management of Medicinal Crops

Enugula Naveen^{1*}, G Thanuja Sivaram¹, Manchyala Divya², Muruguvele E³

^{1*,3} Ph.D. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, HC&RI, Tamil Nadu Agricultural University, Coimbatore- 641003

¹Senior scientist, RHRS, Dr. YSRHU, Tirupathi; ²Ph.D. Scholar, Department of Floriculture and Landscaping, Dr. Y. S. R. Horticultural University

Abstract

Medicinal crops gene banks serve as vital repositories of genetic diversity, supporting pharmaceutical innovation, traditional medicine systems, crop improvement and biodiversity conservation. However, the effective management of medicinal plant germplasm is increasingly challenged by large accession numbers, complex datasets, phenotypic plasticity and the need for precise characterization and utilization. Machine learning algorithms facilitate clustering and classification of accessions to identify genetic redundancy, improve accession authentication and develop representative core and mini-core collections. Predictive models support the estimation of economically important traits such as bioactive compound concentration, stress tolerance and adaptive potential, thereby enhancing targeted germplasm utilization. Deep learning techniques applied to image-based datasets further strengthen high-throughput phenotyping, seed viability assessment, disease detection and regeneration monitoring in medicinal crops. AI-driven decision-support systems also aid in prioritizing conservation strategies, optimizing regeneration cycles and assessing risks associated with climate change and biotic stresses. Moreover, the integration of ML with genomics and metabolomics accelerates genotype–chemotype associations, supporting standardized medicinal crop development for pharmaceutical and nutraceutical applications. This paper reviews recent applications, key advantages and existing constraints of AI- and ML-based systems in medicinal crop gene banks, emphasizing their role in improving conservation efficiency, data-driven decision-making and sustainable utilization of medicinal plant genetic resources.

Keywords: *Artificial intelligence, Machine learning, Medicinal crops, Genebank management, Germplasm conservation*

Abstract ID 8013

Functional and Behavioural Indicators for Early Disease Recognition in Animals

Rahul Singh Jaiswar

B.V.Sc. & A.H.College of Veterinary and Animal Sciences

G.B. Pant University of Agriculture and Technology, Pantnagar

Abstract

Animal diseases are commonly identified only after the appearance of overt clinical signs or measurable losses in performance. However, animals often undergo subtle functional and behavioural changes during the early stages of health decline while still appearing outwardly normal. These early deviations are frequently overlooked or not interpreted as meaningful indicators of disease, leading to delayed intervention and increased disease severity. This work emphasizes the importance of recognizing early functional and behavioural indicators as part of routine health assessment in animals. Such indicators may include subtle alterations in movement, feeding and elimination patterns, behaviour, or recovery following routine stressors such as work, transport, or environmental challenges. Although these changes are commonly observable during daily handling and management, they are rarely integrated into systematic health evaluation or decision-making processes. By organizing these observable changes into practical indicators, this approach supports early disease recognition and facilitates timely preventive interventions such as management adjustment, nutritional correction, workload modification, or early veterinary attention. Examples across animal species demonstrate how similar functional deviations may precede diverse disease outcomes, highlighting the broad applicability of this approach across production and companion animal systems. Incorporating functional and behavioural indicators into routine observation enables earlier preventive intervention, supporting animal health, welfare, and productivity while limiting progression to overt disease.

Keywords: *Early disease recognition , Functional and behavioural indicators, Preventive interventions*

Abstract ID 8014

Cheilanthenetraol, a new sesterterpenoid isolated from *Aleuripteris bicolor* Roxb., with anti-hepatocellular carcinoma and anti-inflammatory activities

Kishan Singh^{a,b}, Kapil Dev^{a, b,*}

^aPhytochemistry Division, CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow-226015, India

^bAcademy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, Uttar Pradesh, India;

Abstract

Aleuripteris bicolor Roxb (Synonyms: *Cheilanthes bicolor* Roxb.) Fraser-Jenk is an edible fern in the family Pteridaceae, genus *Aleuripteris*. It is native to India, Nepal, China, Bangladesh, Pakistan and Sri Lanka. Ethnomedicinal practitioners from various ethnic tribes in North India and Nepal have traditionally used it to treat wounds, diarrhoea, and gastritis^{1,2}. However, scientific evidence supporting these efficacies remains limited until December 2024. In the present study, we aimed to perform phytochemical investigations of *n*-hexane and ethyl acetate extracts, which led to the isolation of one new sesterterpene cheilanthenetraol, together with thirteen known compounds (**2-14**) for the first time from *Aleuripteris bicolor*. The structures of the isolated compounds were established by extensive spectroscopic data, 1D and 2D NMR, HR-ESI-MS, and IR analysis. The isolated compounds (**2, 3, 6** and **9-14**), and (*n*-hexane, ethyl acetate, and aqueous methanol) extracts, were evaluated for cytotoxic activity against the HepG2 cancer cell line. All the tested compounds exhibited significant cytotoxic activity with an IC₅₀ ranging from 3.87 to 6.75 µg/mL. Extracts showed moderate activity with an IC₅₀ value of 315.68, 391.55, and 274.89 µg/mL, respectively. The anti-inflammatory activities of compounds **6, 9**, and **10** were assessed, and the results demonstrated that these compounds exhibited significant activity at 10 and 30 µM concentrations in LPS-stimulated macrophages.

Abstract ID 8015

Metal Complexation of Ferulic Acid: Coordination Chemistry, Structural Insights, and Biological Implications

*Bahaar Anjum*¹, *Vivekanand*², *Aashish Kumar Sagar*³, *Inder Singh Rana*⁴, *Ritika Bhatt*⁵

¹⁻⁵ G.B.Pant Univeristry of Agriculture and Technology, Pantnagar 263145,U.S.Nagar,Uttarakhand

Abstract

Ferulic acid, a naturally occurring hydroxycinnamic acid widely known for its antioxidant and pharmacological properties, is increasingly emerging as a versatile ligand in coordination chemistry. Its multifunctional oxygen-donor framework, comprising carboxylate and phenolate groups coupled with a conjugated π -electron system, enables effective coordination with a wide range of metal ions. Such metal–ligand interactions give rise to structurally diverse metal–ferulate complexes with varied geometries and coordination environments, significantly influencing their electronic structure, redox behavior, and overall functional performance. Recent studies demonstrate that metal complexation can markedly enhance the biological efficacy of ferulic acid, including antioxidant, antimicrobial, and pharmacological activities, compared to the free ligand. These improvements are often attributed to increased stability, modified redox pathways, and improved bioavailability imparted by metal coordination. Consequently, metal–ferulate systems offer an attractive platform for exploring structure–activity relationships at the interface of coordination chemistry and bioinorganic science. This contribution presents a focused overview of recent advances in the coordination chemistry of ferulic acid with transition and biologically relevant metal ions. Key aspects discussed include coordination modes, synthetic strategies, and spectroscopic and structural characterization techniques. Special emphasis is placed on emerging structure–activity correlations, green and sustainable synthetic approaches, and the growing relevance of metal–ferulate complexes in medicinal chemistry and functional materials. By highlighting current challenges and future research opportunities, this work aims to stimulate discussion and inspire further exploration of ferulic-acid-based metal complexes as functional and biologically relevant coordination compounds.

Keywords: *Ferulic acid; metal–ferulate complexes; coordination chemistry; metal–ligand interactions; antioxidant activity; bioinorganic chemistry; green synthesis*

Abstract ID 8016

Bio pesticides – Their Role in Modern Agriculture

Dr. J. Sumalatha¹, Dr. G. Bhavani², Dr. J. Chandrakala³, Dr. B. Sravankumar⁴, Dr. P. Madhavi⁵, Dr. Pallavi Bhatt⁶.

¹. Assistant professor-ENTO. Chaitanya Deemed to be University, Himayath nagar

². SMS- Agril. Ext. ICAR (YFA), Mahabubnagar

³. Research Associate- PL. PATH. Regional Sugarcane and Rice Research, Rudrur.

⁴. Assistant professor-HORTI. Chaitanya Deemed to be University, Himayath nagar.

⁵. Assistant professor- SSAC. Rajanna siricilla, PJTAU.

⁶. Assistant professor-GPBR. Chaitanya Deemed to be University, Himayath nagar

Abstract

Conventional chemical pesticides, although effective, have led to problems such as pest resistance, environmental pollution, and harm to non-target organisms. Biopesticides have emerged as an eco-friendly alternative, always offering sustainable pest management solutions with long lasting results. Biopesticides are pest control agents derived from natural sources such as microorganisms, plants, animals, or certain minerals. They control pests through biological or natural mechanisms rather than synthetic chemicals. Using biopesticides in modern agriculture it helps in Environmental stability, Targeted pest control, Reduced residual toxicity, Cross resistance management, Compatible with integrated pest management, Enhanced crop quality. Pyrethrum, Neem, and tobacco are known sources of botanical pesticides and have already been commercialized. Other sources of botanical pesticides include garlic, euphorbia, citrus, pepper among others. Important bacterial biopesticides include *Bacillus thuringiensis*, *Bacillus subtilis*, and *Pseudomonas fluorescens*, which are widely used to control insect pests and plant pathogens. Fungal biopesticides such as *Trichoderma* spp., *Beauveria bassiana*, *Metarhizium anisopliae*, and *Verticillium lecanii* target various pests and diseases through mechanisms like parasitism and competition. Viral biopesticides, particularly Nucleopolyhedrovirus (NPV) and Granulovirus (GV), offer highly specific control of lepidopteran pests. By integrating biopesticides into pest management strategies, India can reduce its dependency on chemical pesticides, enhance agricultural sustainability, and promote ecological balance, ultimately contributing to a healthier environment and safer food production. So that as agriculture continues to evolve, using biopesticides is a significant step towards a resilient and environmentally conscious future.

Keywords: *Biopesticide, Bacillus thuringiensis, parasitism, competition, sustainability.*

Abstract ID 8017

Micromorphological diversity and distribution of trichomes in *Lepidagathis* Willd. (*Acanthaceae*) and its taxonomic significance

Poornima and D. S. Rawat

G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

Abstract

The Genus *Lepidagathis* Willd. is a member of tribe Barlerieae Nees, subfamily Acanthoideae Eaton, in the angiosperm family Acanthaceae. This genus is represented by 162 species in the world and 29 species in India. Three species (*L. cuspidata*, *L. incurva*, *L. purpuricaulis*) are known in Uttarakhand. Trichome diversity and distribution in *Lepidagathis* species has not been studied earlier, particularly in the three species known in Uttarakhand. The present study was conducted to observe and record the micromorphology and distribution of trichomes on all aerial plant parts of ten species of *Lepidagathis* collected from different locations in Uttarakhand. Fresh plant material was used for trichome study under light microscope using standard anatomical procedures. Well established trichome terminology was adopted to describe different structural types of trichomes. Surfaces of all vegetative parts (stem, both surfaces of leaf and margin, petiole) were thoroughly examined for trichome study. The results show that a total of 15 types of glandular and non-glandular trichomes are present in this genus. It includes four types of glandular trichomes and 11 types of non-glandular trichomes. *L. purpuricaulis* has five distinct types of trichomes present on leaf margin, leaf veins and petiole. Sessile glandular trichomes were recorded on veins only, while stem, and either surfaces of leaf are glabrous. *L. cuspidata* has eight different types of trichomes which include three types of glandular and five types on non-glandular trichomes. Multicellular glandular trichomes are commonly present on all observed surfaces. *L. incurva* has seven different types of trichomes (one glandular, six non-glandular), with sessile glandular trichomes present on every surface. These three species of *Lepidagathis* can be easily differentiated on the basis of micromorphological characters when the plant lacks its floral structures. A dichotomous key based on trichome types present on vegetative plant parts is prepared to differentiate all three species.

Abstract ID 8018

A Preliminary Study on the Energy Content and Fuel Potential of Waste Biomass

*Tarannum Jahan , Ashok Kumar Verma² , Ashutosh Dubey³

^{1,2,3} Department of Biochemistry, College of Basic Sciences and Humanities, G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, India

Abstract

This study assesses the energy potential and pyrolytic suitability of waste biomass residues, including pine needles, lentil straw, rice straw, bamboo leaves, and mustard straw, through systematic preliminary characterization. Accurate estimation of the higher heating value (HHV) of biomass is essential for estimating its suitability in thermochemical conversion processes such as pyrolysis and incineration. The HHV of five agricultural biomass feedstocks was predicted using established empirical models, namely the Dulong, Modified Dulong, and Vandralek formulas, based on elemental analysis data. The predicted HHV values exhibited substantial variation across both biomass types and mathematical models. Among the feedstocks, pine needles consistently showed the highest HHV (up to 21.01 MJ kg⁻¹ by Dulong), while rice straw displayed the lowest values across all models. The Modified Dulong formula significantly overestimated HHV for all feedstocks, yielding unrealistically high values (48.00–51.08 MJ kg⁻¹), whereas the Dulong and Vandralek formulas produced estimates closer to experimentally reported calorific values. Relative error analysis confirmed that the Dulong model provided comparatively reliable HHV predictions for most feedstocks, while the Vandralek formula tended to underestimate HHV for straw- and leaf-based biomasses. The results highlight the strong dependence of HHV prediction accuracy on both biomass composition and model selection. Overall, this study emphasizes that preliminary elemental composition plays a decisive role in HHV estimation and that careful selection of predictive models is necessary for realistic energy potential assessment of agricultural residues in pyrolysis applications.

Keywords: *Bio-oil, Pyrolysis, Dulong, Vandralek, elemental analysis, Higher heating value (HHV).*

Abstract ID 8019

Preserving Roots, Growing Futures: Tribal Communities of Dimoria Block, Assam and Sustainable Biodiversity Conservation

Garima Bora* and Mrinal Kumar Das

Ph.D. Scholar, Botany, Assam down Town University, Guwahati, Assam

Professor, Botany, Assam down Town University, Guwahati, Assam

Abstract

India's future in agriculture, applied sciences, and life sciences depends on innovation that respects nature, integration that connects people and knowledge systems, and sustainability that ensures long-term well-being. The tribal communities of Dimoria, Assam, hold rich traditional knowledge developed over generations through close interaction with land, forests, and biodiversity. This knowledge plays a vital role in sustainable farming, livelihood practices, and traditional healing using medicinal plants. Traditional agricultural practices in Dimoria focus on mixed cropping, natural soil fertility, seed conservation, and climate-adaptive methods. These practices reduce dependency on chemical inputs, protect soil health, and enhance resilience against environmental changes. Alongside farming, tribal communities depend on medicinal plants for primary healthcare, using age-old healing practices that are affordable, accessible, and culturally rooted. Such knowledge contributes directly to biodiversity conservation, as communities protect forests and plant species essential for their survival and cultural identity. Innovation in this context does not replace traditional systems but strengthens them. By integrating traditional knowledge with modern scientific tools such as phytochemical analysis, ecological assessment, GIS mapping, and sustainable cultivation techniques these practices can be validated, improved, and scaled responsibly. Scientific validation of medicinal plants can support safe usage, value addition, and conservation strategies, while modern agricultural technologies can enhance productivity without harming ecosystems. Education and research play a crucial role in this integration process. Participatory research involving tribal communities ensures ethical knowledge sharing, protection of intellectual rights, and community empowerment. Sustainable livelihood opportunities, such as medicinal plant cultivation, organic farming, and community-based conservation models, can improve rural income while safeguarding biodiversity. This integrated approach highlights a clear vision for Future India—where traditional wisdom and modern science work together to create resilient agricultural systems, conserve biodiversity, empower rural and tribal communities, and promote sustainable development for generations to come.

Keywords: *Traditional Knowledge; Sustainable Agriculture; Medicinal Plants; Biodiversity Conservation; Scientific Integration*

Abstract ID 8021

A Review on Ethnobotanical knowledge, Traditional uses, and Conservation of medicinal plant *Picrorhiza kurroa* Royle ex Benth.

Sakshi

Department of Plant Sciences, Central University of Himachal Pradesh, Shahpur Kangra, HP, India.

Abstract

Indian Himalayan Region (IHR) is storehouse for many medicinally significant plant species. Plants growing in the higher altitudinal regions are of immense use in herbal and pharmaceutical industries. *Picrorhiza Kurroa* Royle ex Benth, commonly known as kutki, is one of the important endangered perennial medicinal herb among them that belongs to the family Plantaginaceae. Traditionally, it is one of the herb with therapeutic significance, mentioned in ethnobotanical system globally. In several studies, *Picrorhiza kurroa* had shown promising pharmacological potential due to phytochemicals documented in it. Different parts such as roots, rhizomes, leaves have been used by local communities and indigenous healers for long time to cure various ailments. Anthropogenic pressure due to harvesting of this endangered herb has brought *Picrorhiza kurroa* near extinction. The present study will highlight the traditional uses and ethnomedicinal significance based on the available literature and records. The findings of this study will also highlight the need for future research and conservation strategies for this medicinally important herb.

Keywords: *Picrorhiza kurroa*, Pharmacology, Ethnobotany, Traditional uses, Conservation.

Abstract ID 8022

Phytochemistry and Pharmacological Application of *Ficus auriculata*, *Ficus benjamina*, and *Ficus variegata* Blum

Swati *, Subhash Chandral², Saurabh Guleri¹

¹Department of Botany, School of Basic and Applied sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001

²Department of Chemistry, School of Basic and Applied sciences, Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001

Abstract

The objective of this investigation was to evaluate the phytochemical constituents and the total phenolic contents and total flavonoid contents of three species of *Ficus* (*Ficus auriculata*, *Ficus benjamina*, and *Ficus variegata* Blum). Plant material was extracted using the Soxhlet apparatus approach and solvents according to their polarity (P. Ether, chloroform, methanol, and water). Alkaloids, flavonoids, tannins, reducing sugar, cardiac glycosides, proteins, steroids, and phenols were all identified in preliminary phytochemical screening. The Folin-Ciocalteu procedure was used to calculate TPC, which is expressed as milligrams of gallic acid equivalent per gram of extract. TFC was calculated as mg of quercetin equivalent per gram of extract using the aluminum chloride colorimetric technique. The extract has a significant amount of flavonoids and phenolic components, exhibiting significant antioxidant potential, based on the findings. A substantial phenolic and flavonoid percentage indicates that the selected *Ficus* species could potentially be explored further for medicinal and pharmacological purposes. As well as further describing the diverse possibilities of *Ficus* species, this study highlights the necessity of conservation efforts for preserving these important plants.

Keywords: *Phytochemical Screening, Flavonoids, Phenolic Contents, Therapeutic Applications.*

Abstract ID 8023

AI-Enabled GIS Decision Support System for Pest Risk Assessment and Crop Suitability Mapping of Mustard (*Brassica juncea* L. Czern & Coss.) in Delhi NCR

Mukesh Kumar Sahu, Dr. Sandeep Kumar

B.Sc (Hons) Botany, Delhi University

Abstract

Mustard (*Brassica juncea*) is a crucial Rabi season oilseed crop in India, with Delhi NCR contributing significantly to national production. However, pest infestations—particularly mustard aphid (*Lipaphis erysimi*), white rust (*Albugo candida*), powdery mildew (*Erysiphe polygoni*), and Alternaria blight (*Alternaria brassicae*)—cause 15-30% yield losses annually[1][2]. Traditional calendar-based pest management strategies fail to account for real-time environmental variability, leading to economic losses and inefficient pesticide usage[3]. This study addresses the critical gap in farmer-accessible decision support tools by developing an integrated AI-enabled Geographic Information System (GIS) for spatiotemporal pest risk assessment and crop suitability mapping. The research leverages NASA POWER climate data (2023-2025 Rabi seasons), NBSS&LUP soil surveys (pH, organic carbon, texture), and satellite imagery from Sentinel-2 and Landsat platforms to create a comprehensive spatial database for Delhi, Gurgaon, Noida, and Ghaziabad districts[4][5]. Machine learning models—including Random Forest classifiers, Convolutional Neural Networks (CNN), and ensemble methods—were trained to predict pest outbreak probabilities based on temperature, humidity, rainfall, and growing degree-days[6][7]. The Analytical Hierarchy Process (AHP) integrated with GIS enabled multi-criteria decision analysis for soil suitability and thermal risk mapping[8][9]. Preliminary results from NASA POWER data analysis revealed 6-8 critical thermal risk weeks during mid-February when maximum temperatures (18-22°C) correlated positively with aphid population peaks[1]. Soil suitability classification identified Delhi and Ghaziabad as "High Risk" zones due to optimal pH (7.2-7.8) and moderate organic carbon (0.4-0.6%), while Gurgaon and Noida exhibited "Medium Risk" profiles[5]. Hyperspectral analysis demonstrated diagnostic wavelengths at 550-560 nm, 700-1250 nm, and 1950-2450 nm for early aphid damage detection before visual symptoms manifest[10]. The system architecture prioritizes transparency and interpretability over "black-box" deep learning models, ensuring recommendations are actionable for smallholder farmers with limited technical literacy. A web-based GIS platform built using Streamlit and PostgreSQL integrates real-time weather APIs (IMD), satellite imagery processing (Google Earth Engine), and interactive pest risk heatmaps[11]. The platform provides district-level weekly alerts, variety-specific crop recommendations based on soil-climate suitability, and precision pesticide application timings aligned with pest phenology models. This research uniquely synthesizes Remote Sensing (RS), Artificial Intelligence (AI), and GIS into a unified decision support framework—a critical advancement over fragmented single-methodology approaches prevalent in existing literature[3][12]. The system aligns with India's Digital Agriculture Mission 2024 goals by democratizing precision agriculture

technologies for resource-constrained farmers. Future work will incorporate IoT soil moisture sensors, expand the model to other Brassica species, and validate predictions through participatory farmer trials across heterogeneous agroclimatic zones.

Keywords: *Precision agriculture, Pest forecasting, Geospatial analysis, Machine learning, Crop suitability mapping, Brassica juncea, Decision support systems*

Abstract ID 8024

Ethnobotanical Significance of Medicinal and Aromatic Plants from the Northwestern Himalaya, India

Kuntal Saha¹, Ranjana Negi², Saurabh Guleri¹ *

¹Department of Botany, School of Basic & Applied Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand 248001, India

²Systematic Botany Discipline, Forest Botany Division, Forest Research Institute (FRI), Dehradun, Uttarakhand 248006, India.; Conference Tracks: Medicinal & Aromatic Plants, Ethnobotany & Traditional Knowledge

Abstract

The Northwestern Himalaya is one of the most important biodiversity hotspots of the world and harbors a rich diversity of medicinal and aromatic plants that have been traditionally used by local communities for healthcare, cultural practices, and livelihood support. Indigenous knowledge related to these plant resources has been transmitted orally through generations and plays a significant role in primary healthcare systems in remote Himalayan regions. However, rapid socio-economic changes, habitat degradation, and overexploitation of natural resources are causing a gradual loss of both plant diversity and associated traditional knowledge. The present study aims to document the ethnobotanical significance of medicinal and aromatic plants used by rural and tribal communities of the Northwestern Himalaya, with special reference to Uttarakhand and adjoining Himalayan regions. Field surveys were conducted in different altitudinal zones, and information was collected through interviews with local inhabitants, traditional healers, and elderly villagers using semi-structured questionnaires. Plant specimens were collected, identified using standard taxonomic literature, and preserved following herbarium techniques. A total of several medicinal and aromatic plant species belonging to different families were recorded, which are used for the treatment of common ailments such as fever, cough, digestive disorders, skin diseases, and joint pain. Some species also have cultural, religious, and architectural significance in Himalayan traditions. The study highlights the importance of documenting traditional knowledge for sustainable utilization and conservation of plant resources. The findings emphasize the urgent need for conservation strategies, community awareness, and scientific validation of traditional practices to ensure the sustainable management of medicinal and aromatic plant diversity in the Northwestern Himalaya. Such studies are essential for preserving indigenous knowledge and promoting its integration with modern scientific approaches for future healthcare and biodiversity conservation.

Abstract ID 8025

Green Extraction Technologies for Mushroom Bioactives: Integrating Sustainability and Functionality

*Shalu¹, Sachin Upmanyu**

Department Of Plant Science, School Of Life Sciences, Central University Of Himachal Pradesh, Shahpur, Kangra HP, INDIA

Abstract

Green extraction technologies have emerged as a sustainable and efficient alternative to conventional methods for recovering bioactive compounds from mushrooms. Since Conventional techniques such as maceration and Soxhlet extraction, require prolonged extraction time, high solvent consumption, and high energy requirements, which leads to degradation of heat sensitive compound and poses environmental concerns. Green techniques such as Ultrasound-Assisted Extraction (UAE), Microwave-Assisted Extraction (MAE), Supercritical Fluid Extraction (SFE), Enzyme Assisted Extraction (EAE), Pressurized Liquid Extraction (PLE) and use of Deep Eutectic Solvents (DES) offer enhanced extraction yields, lower solvent usage, and reduced environmental footprint. These methods maintain the chemical integrity and bioactivity of diverse mushroom bioactives- including polysaccharides, phenolics, terpenoids, sterols, proteins, which possess notable anti-inflammatory, antimicrobial, antioxidant and anticancer properties, thereby supporting functionality in nutraceutical, pharmaceutical and food applications. Hybrid approaches combining these methods, such as UAE-MAE or MAE-DES, further enhance the yield and selectivity of bioactive compounds. Integration of green extraction techniques into biorefinery and circular economy frameworks promotes valorization of mushroom by-products. Despite challenges in industrial scale-up, process standardization, and cost, green extraction aligns with global sustainability goals, advancing the sustainable production of mushroom -derived bioactives.

Abstract ID 8026

Zero Waste Approach through value addition in Horticultural crops

Amit Bhatt

School of Agricultural Sciences, Department of Horticulture; Shri Guru Ram Rai University, Dehradun, Uttarakhand-248001

Abstract

Post-harvest losses in horticultural crops, particularly fruits and vegetables, account for a significant proportion of total production, especially in developing countries. A large quantity of waste is generated during harvesting, handling, processing, and marketing stages in the form of peels, seeds, pomace, and overripe or damaged produce. These by-products, though often discarded, are rich in valuable nutrients such as dietary fiber, antioxidants, vitamins, minerals, and bioactive compounds. The zero waste approach emphasizes the complete utilization of these resources through efficient value addition, thereby minimizing losses and enhancing sustainability. This study explores various strategies for converting horticultural waste into value-added products such as jams, jellies, beverages, dehydrated products, pickles, bakery items, and fermented products. Techniques including drying, fermentation, extraction, and minimal processing were employed to improve shelf life and retain nutritional quality. Special emphasis was given to the extraction of pectin, essential oils, and natural colorants from fruit and vegetable waste, which have significant industrial applications. The developed products were evaluated for physicochemical properties, sensory acceptability, and storage stability, indicating high consumer acceptance and economic feasibility. Adoption of a zero waste approach not only reduces environmental pollution and disposal issues but also provides additional income opportunities for farmers, processors, and entrepreneurs. In conclusion, value addition through innovative and sustainable technologies offers a viable solution to minimize post-harvest losses and supports the development of a circular economy in the horticulture sector. This approach contributes significantly to food security, resource efficiency, and environmental sustainability.

Keywords: *Zero waste, Value addition, Horticultural crops, Post-harvest losses, Sustainability, Circular economy*

Abstract ID 8027

Innovation, Integration and Sustainability of Medicinal and Aromatic Plants in the Uttarakhand Himalaya: Pathways toward a Resilient Future India

Sarvesh Suyal

Department of Botany, DBS (PG) College, Dehradun

Abstract

The Uttarakhand Himalaya, a key part of the Indian Himalayan Region, is rich in medicinal and aromatic plants (MAPs) that support traditional healthcare and emerging bio-economies. Under the theme of innovation, integration, and sustainability, this study explores how MAP resources can contribute to a resilient and future-ready India. Technological innovations such as biotechnology, artificial intelligence, and improved cultivation practices are enhancing species identification, productivity, and value addition. At the same time, integrating traditional knowledge systems, particularly Ayurveda, with modern science provides a holistic framework for conservation and utilization. However, these resources face increasing threats from overexploitation, habitat degradation, and climate change in fragile Himalayan ecosystems. Sustainable harvesting, conservation strategies, and cultivation-based approaches are therefore essential. Strengthening community participation, value chains, and policy support can enhance livelihoods while ensuring ecological balance. A multidisciplinary approach combining ecological, technological, and socio-economic perspectives is crucial for sustainable management. Promoting MAP-based entrepreneurship and conservation will help position Uttarakhand as a leading hub for sustainable bioresource development, contributing to biodiversity conservation and the vision of a self-reliant future India.

Keywords: *Medicinal and Aromatic Plants (MAPs), Uttarakhand Himalaya, Sustainability Innovation, Livelihood Development*

Abstract ID 8028

Practices and technologies for environmentally friendly farming.

Ankita Aswal

M.Sc. Agronomy, Himalayan Institute of technology, Dehradun.

Abstract

The significance of environmentally sustainable agricultural methods has increased because of worldwide issues which include climate change and soil erosion and water scarcity and the extinction of various species. The research paper presents different sustainable agricultural methods together with new agricultural technologies which minimize environmental harm while sustaining farm productivity and profitability. The research targets to achieve two objectives which involve protecting the environment and satisfying the rising requirements for food production. The paper presents some traditional environmentally friendly farming practices such as organic farming, crop rotation, intercropping, and the use of natural fertilizers such as compost and bio-manure. These practices help in maintaining improved soil fertility. The practice of integrated pest management operates as a sustainable environmental solution which utilizes three different techniques to control pests without damaging ecological systems. The research demonstrates that current environmental farming methods depend on both historical agricultural methods and contemporary technological advancements. Through their implementation of precision farming methods and drip irrigation systems and remote sensing technology and data analysis techniques farmers can achieve better results in managing their requirements for water and fertilizers and energy resources. The process enables better resource management which leads to increased agricultural production. The research demonstrates that traditional knowledge should be combined with contemporary technological advancements to develop agricultural systems that are environmentally sustainable. The study demonstrates that sustainable agriculture requires government-backed policies together with training initiatives and financial support programs for its successful implementation. The practice of sustainable agriculture functions as the essential method to maintain both food security and environmental protection. The development of sustainable agricultural systems requires the integration of traditional knowledge together with contemporary technological solutions.

Abstract ID 8029

Agri-innovation and Smart Farming for Sustainable and Climate Resilient Agriculture

Himanshu Sharma

MSc Agriculture (Horticulture) Shree Guru Ram Rai University Dehradun

Abstract

Agriculture is the backbone of India's economy, but it faces significant challenges like climate change, soil degradation, water scarcity, labor shortages, and rising cultivation costs. To overcome these hurdles, adopting agri-innovation and smart farming practices has become crucial for sustainable and climate-resilient agriculture. Agri-innovation involves developing and using improved crop varieties, modern production technologies, mechanization, biotechnology, and efficient resource management. This approach enhances crop productivity, quality, and reduces production costs. Protected cultivation methods like greenhouses and polyhouses also play a key role in smart farming by creating favorable growing conditions. Agri-innovation provides farmers with vital information on weather forecasts, market prices, and technical support, improving farm management and profitability. It promotes biofertilizers, biopesticides, and organic farming materials, contributing to sustainable crop production. The adoption of smart farming technology is essential for improving agricultural productivity, conserving resources, and ensuring food security for the growing global population. It also helps develop climate-resilient agriculture and improves the socio-economic status of farmers. Given its benefits, smart agriculture is poised to be the future of sustainable agriculture in the 21st century.

Abstract ID 8030

Leaching Potential of Heavy Metals from Common Plastic Polymers: A Lab Based Study

*Abdul Warrisha^a and Jaspal Singh Chauhana**

^aAquatic Ecology Lab, Department of Himalayan Aquatic Biodiversity, Hemvati Nandan Bahuguna Garhwal University, Srinagar (Garhwal), Uttarakhand-246174, India

Abstract

The leaching of heavy metals from plastic has emerged as a critical environmental concern due to its potential impacts on aquatic ecosystems and human health. This study investigates the leaching of heavy metals from commonly used plastic polymers under environmental conditions. Representative plastic types, including polyethylene terephthalate (PET), polystyrene (PS), high-density polyethylene (HDPE), polyvinyl chloride (PVC), polypropylene (PP), and low-density polyethylene (LDPE), were subjected to leaching experiments using deionized water. The concentrations of leached metals: Lead (Pb), Titanium (Ti), Chromium (Cr), Cadmium (Cd), Arsenic (As), Manganese (Mn), Iron (Fe), Nickel (Ni), Cobalt (Co), Copper (Cu), and Zinc (Zn) were quantified using inductively coupled plasma mass spectrometry (ICP-MS). The results revealed that all polymers released detectable levels of metals, with notable variability among plastic types. Iron (Fe) and Manganese (Mn) were consistently detected across all samples, with Fe concentrations ranging from 0.018 to 0.126 ppm and Mn from non-detectable levels up to 0.084 ppm. Titanium (Ti) was detected in trace amounts (0.001 ppm) in LDPE and PS, suggesting the release of pigment-derived additives such as titanium dioxide. PVC exhibited comparatively higher leaching of Mn and Zn, while PET and PS showed moderate Fe release. Trace levels of toxic metals such as Pb and Cr were observed, whereas Cd and As remained below detection limits. These findings highlight that plastic debris acts not only as a physical pollutant but also as a secondary source of heavy metal contamination, highlighting potential ecological risks and the need for stricter regulation of plastic additives.

Abstract ID 8031

Utilization of apple pomace fibre for the preparation of fibre enriched acidophilus yoghurt

Kanika Issar

Assistant Professor Dolphin PG Institute of Biomedical and Natural sciences, Dehradun

Abstract

The suitability of utilization of apple pomace fibre for the preparation of fibre enriched acidophilus yoghurt was studied. Appropriate quantity of apple pomace fibre in different proportions (0, 2.5, 5, 7.5 and 10%) after rehydration in water was added to the pre-pasteurised milk, heated and cooled prior to aseptic inoculation with mixed cultures of *Lactobacillus acidophilus* and *Bifido longum* @1%. After inoculation, milk was poured into plastic cups (200 ml) and kept under incubation at 43°C to allow setting of yoghurt. The optimized method consisting of addition of 5% apple pomace fibre in the whole milk followed by inoculation with *Lactobacillus acidophilus* and *Bifido longum* @1% and incubation at 43°C resulted in a fibre enriched yoghurt with desirable physico-chemical and sensory attributes. The yoghurt was found to contain total soluble solids ranging from 6.50 to 7.000 Brix. The moisture content in yoghurt was recorded to be 81.74%. pH in the yoghurt did not experience any change with the addition of fibre. Ash content of the fibre enriched yoghurt ranged between 1.08 to 1.10%. The fat content ranged between 1.59 to 1.65%. On the basis of sensory evaluation, the yoghurt prepared by using 5% apple pomace fibre was found to be most appropriate with respect to appearance, body/consistency, flavor and overall acceptability. Thus, addition of fibre to the milk brought about significant improvement in the quality of fibre in the finished product and can successfully be used for preparation of fibre enriched acidophilus yoghurt. The addition of apple pomace fibre in the yoghurt, because of its nutritional and therapeutic attributes adds palatability to the yoghurt.

Keywords: *apple, pomac, fibre, yoghurt*

Abstract ID 8032

CLIMATE-SMART AGRICULTURE

Manish Semwal

M.Sc. (Agri), Soil Science, Shri Guru Ram Rai University, Pathribagh, Dehradun

Abstract

Climate-smart agriculture (CSA) is a comprehensive and adaptive approach, combined challenges of climate change, food production, and environmental sustainability. It aims to increase agricultural productivity while building resilience and reducing greenhouse gas emissions through the efficient use of natural resources. CSA encourages practices such as conservation farming, integrated pest management, agroforestry, and improved water management. Together, these methods create sustainable farming systems and help farmers adapt to climate variability and extreme weather. By linking productivity with ecological balance, CSA supports soil health, water conservation, and biodiversity protection. This approach is especially important for smallholder farmers and vulnerable communities, who face greater risks from climate change and limited resources. CSA also contributes to food and nutrition security by ensuring stable and sustainable production under changing climatic conditions. Overall, CSA provides a transformative pathway for sustainable development by combining adaptation, mitigation, and productivity goals in agriculture.

Keywords: *Climate-Smart Agriculture, Sustainable Farming, Climate Change Adaptation, Resource Efficiency, Agroforestry, Food Security, Smallholder Farmers*

Abstract ID 8033

Physiological and Commercial Maturity: Concepts and Determination

Chandan Thakur Barahi ¹, and Mr. Naveen Chandra ²

Department of Agricultural Studies; Quantum University, Roorkee

Abstract

Physiological and commercial maturity are key concepts in the post-harvest management of fruits and vegetables, determining the appropriate stage for harvesting to ensure optimum quality and marketability. Physiological maturity refers to the stage at which a fruit or vegetable has completed its growth and development on the plant and is capable of continuing the ripening process after harvest. At this stage, the produce attains maximum dry matter, proper internal development, and seed viability. In contrast, commercial maturity is defined by market requirements and consumer preferences, including factors such as size, color, firmness, shelf life, and transportability. It may occur before, at, or after physiological maturity depending on the purpose of use, distance to market, and storage conditions. For instance, fruits intended for distant markets are often harvested at an earlier stage to withstand transportation and extend shelf life. The determination of maturity involves various methods, including physical indices such as size, shape, and color; chemical parameters like total soluble solids (TSS), sugar-acid ratio, and starch content; physiological indicators such as respiration rate and ethylene production; and time-based indices like days from flowering or fruit set. Accurate assessment of maturity is essential to reduce post-harvest losses, maintain quality, and improve economic returns. Thus, understanding and properly identifying both physiological and commercial maturity stages play a vital role in ensuring better storage, transportation, processing, and overall efficiency in the supply chain of horticultural produce.

Keywords: *Crop Maturity, Physiological Maturity, Commercial Maturity Harvest Timing, Dry Matter Accumulation, Maturity Indices, Post-Harvest Quality, Shelf Life, Respiration Rate, Ethylene Production, Total Soluble Solids (TSS).*

Abstract ID 8034

Cold Storage – Principles, Design, and Management

Sahil Kumar Singh¹ and Naveen Chandra Bahuguna²

¹ Student B.Sc. (Hons.) Agriculture

²Associate Professor, Department of Agricultural Studies; Quantum University, Roorkee

Abstract

In order to maintain the quality, safety, and shelf life of perishable agricultural products, cold storage is an essential part of post-harvest management. Following harvest, Fruits and vegetables continue to deteriorate quickly due to physiological and biochemical processes like respiration, transpiration, and microbial activity. To slow down these processes and reduce losses, cold storage systems are made to regulate environmental elements like temperature, relative humidity, and atmospheric composition. The basic concepts of cold storage are covered in this chapter, including temperature control, respiration control, humidity management, and ethylene regulation. Additionally, it describes various cold storage systems, including frozen storage, modified atmosphere storage, controlled atmosphere storage, and refrigerated storage. Important elements of cold storage design are also covered in this chapter, such as air circulation, insulation, refrigeration systems, and site selection. Pre-cooling, monitoring, inventory control, hygiene, and energy management are examples of effective management techniques that are crucial for preserving product quality and guaranteeing financial sustainability. The chapter also discusses the storage needs unique to commodities, economic factors, and difficulties the cold storage industry faces, particularly in developing nations. There is also discussion of recent technological developments like solar-powered systems and Internet of Things-based monitoring. All things considered, cold storage is essential for lowering post-harvest losses, enhancing food quality, maintaining market supply, and raising farmers' profits. Building a sustainable and effective food supply chain requires a thorough understanding of and application of cold storage principles and management techniques.

Keywords: Pre-cooling, food preservation, cold chain, energy efficiency, storage design, post-harvest management, temperature control, relative humidity, respiration rate, ethylene management, refrigeration system, controlled atmosphere storage, modified atmosphere storage, cold chain, and agricultural storage

Abstract ID 8035

Physiological, Mechanical, and Pathological Causes of Post-Harvest Losses

Anju Tharu¹ and Naveen Chandra Bahuguna²

¹ Student B.Sc. (Hons.) Agriculture

² Associate Professor, Department of Agricultural Studies; Quantum University, Roorkee

Abstract

Particularly in developing nations, post-harvest losses in horticultural produce pose a serious threat to resource efficiency, economic stability, and food security. The three main types of post-harvest losses—physiological, mechanical, and pathological—are critically assessed in this chapter. Inherent metabolic processes like respiration, transpiration, ripening, and senescence cause physiological losses, which persist after harvest and cause a slow decline in quality. Physical harm sustained during harvesting, handling, transportation, and storage causes mechanical losses, which frequently serve as a catalyst for additional physiological and microbial deterioration. Because fungi, bacteria, and other microorganisms can spread quickly and make produce completely unmarketable, pathological losses are the most damaging. Because physiological weakening speeds up both damage and decay and mechanical injuries increase vulnerability to microbial infection, the combination of these factors greatly increases overall losses. Physiological losses are inevitable, but they can be effectively controlled by storage conditions. While pathological losses can be reduced through environmental control and sanitation, mechanical losses can be mostly avoided with better handling techniques. Therefore, a thorough and integrated post-harvest management strategy is necessary to minimise losses, improve shelf life, and guarantee the sustainable use of agricultural products.

Keywords: Food security, respiration, transpiration, ethylene, senescence, microbial spoiling, mechanical damage, pathological infection, post-harvest losses, physiological deterioration, and storage management

Abstract ID 8036

Post-Harvest Treatments: Chemicals, Edible Coatings, and Irradiation

Soni Kumari¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Fruit and vegetable post-harvest losses continue to pose a serious threat to global food security, especially in developing nations where poor handling, transportation, and storage practices result in large quantitative and qualitative losses. Many post-harvest treatment strategies, including chemical treatments, edible coatings, and irradiation, have been widely used to address these problems. Chemical treatments, such as the application of fungicides, disinfectants, and ethylene inhibitors, are crucial for postponing ripening, managing microbial growth, and preserving the structural integrity of food. However, worries about chemical residues and their effects on the environment have prompted the creation of safer substitutes. By creating semi-permeable barriers that control moisture loss, gas exchange, and microbial activity, edible coatings which are made from natural polymers including polysaccharides, proteins, and lipids offer a sustainable and biodegradable method of preservation. Furthermore, food irradiation has become a very successful non-thermal method that prolongs shelf life and improves food safety by eradicating pathogens and postponing physiological processes without substantially compromising nutritional quality. The methods, uses, benefits, and drawbacks of various post-harvest treatments are all covered in detail in this chapter. It also emphasizes how crucial integrated strategies like hurdle technology are to maximizing preservation effectiveness. In order to highlight the shift toward sustainable and creative post-harvest management techniques, future prospects such as nano-coatings, bioactive packaging, and smart storage systems are also covered.

Keywords: *Post-harvest losses, Edible coatings, Chemical treatments, Food irradiation and Sustainable preservation.*

Abstract ID 8037

Transpiration and water loss after harvest

Mihir Kashyap¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Transpiration and water loss are major factors influencing the post-harvest quality and shelf life of fruits and vegetables. Even after harvest, horticultural produce remains physiologically active and continues to lose water through transpiration. Since harvested commodities are no longer connected to the root system, the lost water cannot be replenished, resulting in progressive dehydration and quality deterioration. The rate of water loss is primarily governed by the vapour pressure gradient between the produce and the surrounding environment, making it highly sensitive to external conditions. Water loss significantly affects the physical, physiological, and economic attributes of fresh produce. A reduction of as little as 5–10% in weight can lead to visible symptoms such as wilting, shriveling, loss of firmness, and decreased freshness, thereby reducing market value and consumer acceptability. The extent of transpiration is influenced by internal factors such as surface area, cuticle characteristics, and maturity stage, as well as external factors including temperature, relative humidity, and air movement. Various methods have been developed to minimize transpiration and maintain post-harvest quality. These include temperature management, maintenance of high relative humidity, proper packaging, application of wax coatings, and careful handling practices. In addition, modern technologies such as modified atmosphere storage, nano-coatings, and smart packaging systems have shown promising results in reducing water loss and extending shelf life. Effective management of transpiration is essential to reduce post-harvest losses, improve storage efficiency, and enhance economic returns. Integration of traditional practices with advanced technologies can play a significant role in ensuring better preservation of horticultural produce and contributing to sustainable agricultural systems.

Keywords: *Transpiration, Water Loss, Post-Harvest, Vapour Pressure Deficit, Shelf Life, Relative Humidity, Packaging, Cold Storage, Quality Deterioration*

Abstract ID 8038

Extent, Types and Estimation Methods of Post-Harvest Losses

Aman Yadav¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Post-harvest losses (P.H.L) pose a serious threat to agricultural sustainability, global food security, and farmer income, especially in developing nations like India. Harvesting, handling, storage, shipping, processing, and marketing are just a few of the phases of the agricultural supply chain where these losses take place. The scope, kinds, and estimating techniques of post-harvest losses in agricultural commodities are all covered in detail in this chapter. The chapter emphasizes that a significant amount of food is lost before it reaches customers; estimates from the Food and Agriculture Organization show significant losses across many commodities and geographies. Perishable goods like fruits and vegetables suffer particularly significant losses in India as a result of poor handling techniques, a lack of cold chain facilities, and inadequate infrastructure. Food availability, quality, and market value are all impacted by post-harvest losses, which fall into four categories: quantitative, qualitative, economic, and nutritional. While qualitative losses lead to the decline of quality features including texture, color, and nutritional content, quantitative losses include the physical reduction of food. Nutritional losses affect food security and public health, whereas economic losses represent decreased market value. The chapter also covers a variety of methodologies for estimating post-harvest losses, such as survey-based methods, advanced modeling techniques, indirect methods (economic analysis, quality assessment), and direct measurement techniques (weight loss, sampling). Each methodology has benefits and drawbacks of its own, and accurate evaluation frequently necessitates a combination of methods. In order to lower post-harvest losses, the chapter concludes by emphasizing the significance of implementing better harvesting techniques, effective storage systems, cold chain development, enhanced transportation, and contemporary technologies. It is also essential to improve policy initiatives, farmer training, and institutional assistance. One economical way to increase food availability, boost farmer income, and encourage sustainable agricultural development is to reduce post-harvest losses.

Keywords: *Post-harvest losses; Food loss; Quantitative losses; Qualitative losses; Economic losses; Nutritional losses.*

Abstract ID 8039

Introduction to Post-Harvest Technology of Fruits and Vegetables

Akash Kumar¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

A crucial field of agricultural research, post-harvest technology for fruits and vegetables focuses on how to handle, store, process, and distribute product after harvest in order to preserve quality and minimize losses. Fruits and vegetables are extremely perishable and quickly deteriorate because of their high moisture content and active metabolic activities. Harvesting, handling, shipping, and storage are only a few of the stages when significant post-harvest losses happen, especially in impoverished nations. The nature and traits of fruits and vegetables, the reasons behind post-harvest losses, and important elements including harvesting, pre-cooling, grading, packaging, storage, and transportation are all covered in this chapter's summary of the basic ideas of post-harvest technology. Additionally, it emphasizes how crucial value addition, cold chain management, and post-harvest treatments are to increasing product quality and shelf life. The chapter also covers how post-harvest technology might improve food security, boost farmers' earnings, and assist agro-based businesses, particularly in India. There is also a brief discussion on post-harvest management developments, emerging trends, and future prospects. In general, the chapter highlights the necessity of effective post-harvest procedures to reduce losses, guarantee high -quality produce, and fortify the agricultural supply chain from farm to consumer.

Keywords: *Post-harvest technology, Fruits and vegetables, Shelf life, Cold chain management, Value addition*

Abstract ID 8040

Investigation on Collar Rot Disease (*Sclerotium rolfsii*) of Lentil (*Lens culinaris* L.) and Its Management

Monika Yadav

Research Scholar, Department of Plant Pathology, Rajasthan Agricultural Research Institute, Durgapura, Jaipur

Abstract

Lentil (*Lens culinaris* L.) is an important edible and source of protein for human diet, as well as enhances soil fertility. *Sclerotium rolfsii* is an important polyphagous pathogenic fungus beginning significant losses in quality and productivity in Hadoti region of Rajasthan. In this study a combination of management practices such as addition of organic amendments, bio-botanicals, oilcakes, biological control agents, and fungicides were tested for the management of collar rot disease of lentil. In present investigation, maximum mycelial growth of *S. rolfsii* and sclerotia production was recorded at 20°C to 30°C temperature. 90.00 mm diameter growth of *S. rolfsii* was recorded at pH level 6.5. Neem cake found highest mycelial growth inhibition @ 5 and 10%. Among bacterial bio-agents, maximum growth inhibition (64.26%) was recorded with *Pseudomonas fluorescens* and in fungal bioagents, *T. harzianum* 92.85%, *Trichoderma asperellum* 86.78% antagonistic effect against *S. rolfsii*. Brahmastra recorded significantly highest mycelial growth inhibition of 55.56, 65.74 and 75.00 at 5,10 and 15 per cent concentration followed by dashparni ark with 39.44, 58.70 and 60.37 and jeevamrut with 39.63, 55.00 and 59.08 per cent mycelial growth inhibition at 5,10 and 15 per cent concentration, respectively. tebuconazole 250 EC, difenconazole 25%, propiconazole 25 % EC, hexaconazole 5 SC, carboxin 37.5% + thiram 37.5% WS, penflufen 13.28% w/w + trifloxystrobin 13.28% w/w FS, and tebuconazole 50 WG + trifloxystrobin 25% at different tested concentrations completely inhibited mycelial growth of fungus. 21 genotypes of lentil were screened against collar rot and result revealed that RKL 603 11-1 and RKL 20-26 as resistant against collar rot of lentil. However, nine genotype viz., RKL 16-332, RKL 603 11-6, RKL 14-270, RKL 3-91, RKL 14-49, RKL 14-20, RKL 16-401, RKL 14-175, RKL 14-101 exhibited moderately resistant reaction. None of the genotype found moderately susceptible. Eight genotypes viz., RKL 58F 3715, RKL 14-29, RKL 14-35, L 4727, RKL 27C 12106, L 4076, RKL 16-324, Kota masoor 1 were found as susceptible. While, two genotype viz., JL- 3 and IPL 316 showed highly susceptible reaction against collar rot diseases.

Keywords: *Lentil (Lens culinaris L.), collar rot, Sclerotium rolfsii, biological control, integrated disease management, resistant genotypes.*

Abstract ID 8041

Value Addition, Processing and Marketing: Farmer Groups, Cold Chain, Branding and Market Linkages

Shagun Sharma and Naveen Chandra

Department of Agricultural Studies Roorkee Uttarakhand

Abstract

Agriculture is no longer limited to production alone; it now includes value addition, processing, and efficient marketing to enhance farmers' income and ensure food quality. This chapter explains how value addition increases the economic worth of agricultural produce through grading, packaging, and processing. It highlights the importance of post-harvest management and modern processing techniques in reducing losses. The role of farmer groups such as Farmer Producer Organizations (FPOs), cooperatives, and Self-Help Groups (SHGs) in strengthening collective bargaining and market access is discussed in detail. The chapter also emphasizes cold chain management as a critical factor for preserving perishable commodities. Branding and marketing strategies are explored to show how agricultural products can achieve better recognition and higher prices in competitive markets. Additionally, market linkages, including digital platforms and contract farming, are explained as tools for improving farmer profitability. Challenges and future opportunities in the agricultural value chain are also analyzed.

Keywords: Value Addition, Agricultural Processing, Farmer Producer Organizations (FPOs), Cold Chain, Branding, Packaging, Market Linkages, Post-Harvest Management, Agricultural Marketing, Supply Chain

Abstract ID 8042

Vegetable and human nutrition : Nutrient profiles, dietary recommendations and role in public health

Chitra Rawat and Naveen Chandra

Department of Agricultural Studies Quantum University, Roorkee Uttarakhand

Abstract

Vegetables are an essential component of a balanced human diet due to their high content of vitamins, minerals, dietary fiber, and bioactive compounds. They play a significant role in promoting health, preventing nutrient deficiencies, and reducing the risk of chronic diseases. This chapter provides a comprehensive overview of the nutritional importance of vegetables, focusing on their nutrient profiles, including macronutrients, micronutrients, and phytochemicals. It further examines dietary recommendations for vegetable intake based on age groups and established nutritional guidelines. The chapter also highlights the role of vegetables in disease prevention, particularly in relation to cardiovascular diseases, diabetes, obesity, and certain types of cancer. In addition, the impact of processing and cooking methods on nutrient retention is discussed, along with the presence of anti-nutritional factors and their management. From a broader perspective, the chapter explores the importance of vegetables in addressing public health challenges such as malnutrition, hidden hunger, and food insecurity. Furthermore, it outlines the role of vegetables in sustainable diets and emphasizes strategies to enhance their consumption through nutrition education, policy interventions, and community-based approaches. Overall, the chapter underscores the importance of increasing vegetable intake as a practical and effective approach to improving nutritional status and promoting public health.

Keywords: *Vegetables, Human nutrition, Micronutrients, Dietary recommendations, Public health, Phytochemicals, Malnutrition, Food security.*

Abstract ID 8043

Planting Distance, Row Geometry and Plant Population Optimization

Lakshya Malik¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Plant spacing is one of the most important decisions in crop production because it determines how efficiently a crop converts land, light, water, nutrients and labour into yield. Planting distance, row geometry and plant population together shape the size of the canopy, the rate of canopy closure, the amount of light intercepted, the movement of air and moisture, and the ease of intercultural operations. This chapter explains the concept of optimum plant population from both agronomic and economic viewpoints and shows how the same crop may require different spacing under rainfed, irrigated, mechanised, high-input or low-input conditions. It discusses the major row geometry systems used in field crops, vegetables and perennial plantations, including square, rectangular, triangular, paired-row, skip-row, ridge, bed and contour arrangements. The chapter also presents practical methods for calculating plant population, adjusting spacing for variety and season, and interpreting yield response to crowding or under-stocking. Special emphasis is given to crop-specific spacing trends, fieldlevel calculation methods, and modern precision tools that help farmers and agronomists match plant population with resource availability. The aim is to provide a clear, practical and scientifically sound guide for optimizing stand establishment and improving productivity per unit area.

Keywords: *plant spacing, row geometry, plant population, optimum stand, canopy development, crop productivity, precision planting*

Abstract ID 8044

Agro-Ecological Zoning and Strategic Vegetable Suitability in the Central Himalayas

Akash Kashyap and Naveen Chandra

Department of Agricultural Studies Quantum University, Roorkee Uttarakhand

Abstract

This study examines agro-ecological zoning and its role in determining strategic vegetable suitability in the Central Himalayan region of Uttarakhand. The state's unique topography, characterized by a sharp altitudinal gradient ranging from subtropical plains to alpine zones within a short horizontal distance, creates diverse climatic conditions that support a wide variety of vegetable crops across seasons. The research highlights how three key factors—thermal regimes (altitude-based temperature variation), physiography (valley versus slope cultivation), and edaphic conditions (soil characteristics)—collectively influence crop distribution and productivity. Based on these factors, Uttarakhand is divided into four major agro-ecological zones: Sub-Tropical Plains (Terai & Bhabar), Sub-Temperate Mid-Hills, Temperate High Hills, and Cold Arid/Alpine Zone. Each zone demonstrates distinct climatic and soil properties that determine crop suitability. The Terai region, with fertile alluvial soils and irrigation facilities, serves as the “vegetable basket,” supporting large-scale cultivation of solanaceous crops, cucurbits, and bulb crops, along with intensive cropping systems like the paddy–potato–wheat rotation. The Mid-Hills zone acts as a transition belt, promoting diversified agriculture with crops such as ginger, turmeric, legumes, and capsicum, supported by moderate climate and organic-rich soils. The High Hills region offers a significant comparative advantage in off-season vegetable production, enabling farmers to supply crops like cabbage, cauliflower, and tomatoes during periods of scarcity in the plains, thereby fetching premium market prices. In contrast, the Alpine zone focuses on niche and high-value production, including disease-free seed potatoes and short-duration crops, due to its limited growing season and harsh climatic conditions. The study also emphasizes variations in soil health and nutrient dynamics across zones. While plains soils are fertile but prone to waterlogging, hill soils are rich in organic matter but acidic, leading to challenges such as nutrient fixation and soil erosion. These conditions necessitate location-specific soil and crop management practices. Additionally, biological factors like nematode incidence in acidic soils highlight the need for integrated pest and nutrient management strategies. Case studies from different regions illustrate successful models of crop specialization and commercialization, demonstrating how farmers can enhance productivity and income through adaptive practices and market-oriented farming. The findings advocate for a zonal specialization or cluster-based approach, aligning crop selection with local agro-climatic conditions. Such precision-based agriculture can improve resource efficiency, reduce risks associated with climate variability, and enhance farmers' income. Overall, the study underscores the importance of agro-ecological planning in achieving sustainable and profitable vegetable production in mountainous regions.

Abstract ID 8045

Important Commercial Vegetables of Uttarakhand Potato, Tomato, Beans, Leafy Greens, Gourds, Root Crops and Mountain Specialties

Ashad Malik, Naveen Chandra Bahuguna

Department of Agricultural Studies Quantum University, Roorkee Uttarakhand

Abstract

Uttarakhand occupies a special place in Indian vegetable production because its farming systems range from warm foothills and river terraces to cool mid-hills and high mountain valleys. This chapter presents the important commercial vegetables of the state with emphasis on potato, tomato, beans, leafy greens, gourds, root crops, and selected mountain specialties. The discussion links crop selection with altitude, season, soil condition, water availability, and market demand. It explains why some crops perform better in the plains and lower hills, while others are better suited to temperate terraces, protected cultivation, or short-season mountain windows. The chapter highlights practical production points for each crop group, including varietal choice, nursery raising, spacing, transplanting, nutrient management, irrigation, weed control, and harvest planning. Special attention is given to the hill constraints of small land holdings, sloping fields, fragmented irrigation, and transport distance, as well as to the opportunities created by off-season vegetables, polyhouse cultivation, organic produce, and the rising demand for quality hill vegetables in nearby urban markets. The aim is to provide a compact but useful book chapter for students and practitioners working in the mountain agriculture of Uttarakhand.

Keywords: *Uttarakhand agriculture, commercial vegetables, potato, tomato, beans, leafy greens, gourds, root crops, mountain vegetables, protected cultivation, hill farming.*

Abstract ID 8046

Overview of Vegetable Production in Uttarakhand: History, Area, and Production Patterns

Aditya kumar¹/ Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

The diverse agro-climatic conditions of Uttarakhand provide a unique and highly favorable environment for the cultivation of a wide variety of vegetables, playing a pivotal role in the state's agricultural economy. Historically, agriculture in this Himalayan region was predominantly characterized by traditional subsistence farming. However, over the past few decades, there has been a significant transition toward commercial vegetable cultivation, driven by the need to enhance rural livelihoods and farm income. This paper provides a comprehensive overview of the historical evolution of vegetable farming in Uttarakhand, analyzing the progressive expansion of the total cultivated area despite the ongoing challenges of fragmented and undulating landholdings. Furthermore, it examines current production patterns, highlighting the state's strategic shift towards off-season vegetable cultivation—such as tomatoes, peas, cabbage, capsicum, and cauliflower. These off-season crops are particularly valuable as they fetch premium prices in the markets of the neighboring plains during the summer and monsoon seasons. While districts like Nainital, Dehradun, and Udham Singh Nagar have emerged as major vegetable production hubs, the sector continues to face infrastructural hurdles like inadequate irrigation facilities, poor post-harvest management, and climate variability. Ultimately, this overview emphasizes the necessity for sustainable agricultural interventions, modern technological adoption, and improved market linkages to maximize the region's vast horticultural potential.

Keywords: *Vegetable production, Uttarakhand agriculture, Off-season vegetables, Production patterns, Agro-climatic zones, Cropping history.*

Abstract ID 8047

Nutrient Management: Fertilizer Requirement, Scheduling, and Organic Alternatives

MOHD AHMAD¹, Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Effective nutrient management is a fundamental component of sustainable agriculture, directly influencing crop productivity, soil health, and environmental safety. This paper provides a comprehensive review of nutrient management strategies, with a specific focus on evaluating precise fertilizer requirements, optimizing application scheduling, and integrating organic alternatives. Determining exact fertilizer requirements through soil testing and crop-specific nutrient demand is essential to prevent both under-nourishment of crops and environmental degradation caused by excessive chemical runoff. Furthermore, optimized fertilizer scheduling—such as utilizing split applications and aligning nutrient supply with the critical growth stages of the plant—significantly enhances Nutrient Use Efficiency (NUE) and minimizes losses via leaching or volatilization. In response to the growing ecological and economic concerns associated with prolonged reliance on synthetic fertilizers, the adoption of organic alternatives like farmyard manure, vermicompost, green manure, and bio-fertilizers is gaining unprecedented momentum. These organic inputs not only supply essential macro and micronutrients but also improve soil structure, microbial activity, and long-term water retention. Ultimately, this review advocates for an Integrated Nutrient Management (INM) approach that harmonizes judicious use of synthetic fertilizers with organic amendments, ensuring long-term agricultural sustainability while mitigating adverse environmental impacts.

Keywords: *Nutrient Management, Fertilizer Scheduling, Organic Alternatives, Nutrient Use Efficiency (NUE), Integrated Nutrient Management (INM), Soil Health.*

Abstract ID 8048

Harvesting, Post-Harvest Handling and Yield Estimation: techniques to reduce losses and improve quality

Riya Saini¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Crucial elements of vegetable and spice production systems that have a direct impact on quality, shelf life, and financial returns are harvesting, post-harvest handling, and yield estimation. Because of their high moisture content and active physiological processes, vegetables and spices are highly perishable and susceptible to substantial post-harvest losses. These losses, which range from 20 to 40 percent in developing nations like India, pose significant obstacles to farmer profitability and food security. For maximum quality and storage potential, proper harvesting at the right point of maturity is crucial. In order to reduce both quantitative and qualitative losses, scientific post-harvest handling procedures — such as cleaning, sorting, grading, packing, storage, and transportation—are essential. The main sources of post-harvest losses include mechanical damage, microbial spoiling, physiological decline, and adverse environmental conditions. Pre-cooling, cold chain management, modified environment packing, and the application of edible coatings are examples of enhanced methods that can greatly lower losses and extend shelf life. Value addition by processing techniques like pickling, canning, and drying also helps to increase market value and decrease waste. An integrated strategy that includes appropriate pre-harvest procedures, cautious handling, and adherence to grading criteria is necessary for quality enhancement. Another crucial component that supports resource management, marketing, and planning is yield estimation. Reliable techniques for forecasting yield include crop cutting, sample plot analysis, and plant-based estimation. Smart sensors, the Internet of Things, and better storage systems are examples of recent technological developments that present potential options for effective postharvest management. In general, lowering losses, enhancing quality, and guaranteeing sustainable production of vegetables and spices depend on the use of scientific harvesting and post-harvest methods in conjunction with precise yield estimation.

Keywords: *Harvesting, Post-harvest handling, Yield estimation, Vegetables, Spices, Quality improvement, Post-harvest losses, Cold chain management, Storage, Value addition*

Abstract ID 8049

Transforming Indian Agriculture through Innovation, Integration, and Sustainability: The Emerging Role of Horticulture

Babu Lal Yadav

M.Sc.Ag. Horticulture (Fruit science); Department of fruit science; K.N.K. College of Horticulture Mandsaur RVSKVV Gwalior M.P.

Abstract

The transformation of Indian agriculture into a resilient, profitable, and climate-smart system necessitates a strategic convergence of innovation, integration, and sustainability, with horticulture emerging as a key driver of this transition. As a high-value sector contributing significantly to nutritional security, employment generation, and export potential, horticulture holds immense promise for shaping the future of Indian agriculture. Innovation in horticulture is redefining production systems through the integration of cutting-edge technologies such as precision agriculture, sensor-based irrigation, artificial intelligence, and protected cultivation structures. These advancements enable optimized input use, real-time decision-making, and enhanced productivity under resource-constrained conditions. The development of stress-tolerant, biofortified, and high-yielding varieties through modern breeding and biotechnological tools further strengthens the sector's resilience against climatic uncertainties. Emerging approaches such as vertical farming and hydroponics offer sustainable solutions for urban and peri-urban agriculture, addressing land and water limitations. Integration plays a pivotal role in enhancing system efficiency and farmer income. The convergence of horticulture with allied sectors—livestock, agroforestry, and beekeeping—creates diversified and risk-resilient farming systems. Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) promote balanced input use while reducing dependency on chemical inputs. Efficient water management through micro-irrigation systems like drip and sprinkler irrigation ensures higher water-use efficiency. Strengthening forward and backward linkages through Farmer Producer Organizations (FPOs), cold chain infrastructure, and agro-processing industries significantly reduces post-harvest losses and enhances market competitiveness. Sustainability remains central to long-term agricultural growth. The adoption of organic and natural farming practices, conservation agriculture, and biodiversity preservation ensures ecological balance and soil health improvement. Climate-smart horticulture practices—including mulching, rainwater harvesting, and carbon sequestration—help mitigate the adverse effects of climate change. The integration of renewable energy sources such as solar-powered irrigation systems further contributes to environmental sustainability. Moreover, capacity building, digital extension services, and supportive policy frameworks are crucial for scaling these innovations. Government initiatives, institutional support, and public-private partnerships can accelerate technology dissemination and adoption among farmers, particularly smallholders. The synergistic application of innovation, integration, and sustainability in horticulture offers a transformative pathway for achieving food and nutritional security, enhancing farmers' livelihoods, and ensuring

environmental resilience. A holistic, inclusive, and technology-driven approach will be instrumental in building a future-ready agricultural system for India.

Abstract ID 8050

Spices and Herb Crops of the Region: Local Uses, Value and Safety Considerations

Ayush saini

G.B. Pant University of Agriculture and Technology,

Abstract

The Himalayan foothills and mid-mountain ranges that constitute Uttarakhand harbour one of India's richest repositories of spice and aromatic herb diversity. This chapter provides a comprehensive account of the principal spice and herb crops cultivated and wildcrafted in the region, examining their botanical identity, traditional culinary and medicinal uses, agronomic profiles, economic value chains, and safety considerations. Crops discussed span the full altitudinal range of the state—from garlic, ginger, turmeric, and fenugreek cultivated in the Terai and lower hills, through the mid-hill specialities of large cardamom, timur (Himalayan pepper), ajwain, and gandrain (Himalayan celery), to the high-altitude aromatic herbs including Himalayan thyme (*Thymus serpyllum*), valerian, spikenard (*jatamansi*), and several species of *Angelica* and *Pleurospermum*. Special attention is given to the ethnobotanical knowledge systems of the Garhwali and Kumaoni communities, the growing commercial significance of regional spices in domestic and export markets, principles of quality and adulteration detection, and the safety dimensions of spice consumption—including toxicological considerations, drug-herb interactions, and responsible use of endangered wild-harvested species.

Keywords: *Uttarakhand spices, Himalayan herbs, ginger, garlic, large cardamom, timur, turmeric, jatamansi, ethnobotany, phytochemistry, food safety, medicinal plants, aromatic crops, value chain.*

Abstract ID 8051

Seed and Nursery Management: quality seed sources, nursery techniques and hardening-off

Jayant Kumar Roy, *Naveen Chandra*

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Seed and nursery management are essential for successful crop production. This chapter focuses on three key aspects: quality seed sources, nursery techniques, and hardening-off practices. High-quality seeds are crucial because they determine germination, seedling vigor, yield, and resistance to pests and diseases. Seeds should be selected from reliable sources and must have good genetic purity, high viability, and adaptability to local conditions. Proper storage and handling help maintain seed quality. Nursery techniques play an important role in raising healthy seedlings. Modern practices include the use of improved growing media, proper sowing methods, container systems (like trays and polybags), efficient irrigation, and pest management. Controlled environments such as greenhouses and shade nets help in uniform and healthy plant growth. Hardening-off is the process of gradually exposing seedlings to external conditions like sunlight, wind, and reduced water. This helps seedlings become stronger, reduces transplant shock, and improves survival and growth in the field. Overall, integrating quality seeds, scientific nursery practices, and proper hardening-off ensures better crop establishment, higher productivity, and sustainable agriculture.

Abstract ID 8052

Natural Farming: A Key to Sustainable and Chemical-Free Agriculture

Ashish Negi

(PHD SCHOLAR)SCHOOL OF AGRICULTURAL SCIENCES AND TECHNOLOGY RIMT
NIVERSITY, MANDI GOBINDGARH, PUNJAB

Abstract

Natural farming is becoming a revolutionary method in agriculture, focusing on ecological harmony, sustainable practices, and the production of food without chemicals. Based on the philosophy of working with nature instead of opposing it, this approach was first introduced by Masanobu Fukuoka and later modified to suit Indian conditions by Subhash Palekar. It emphasizes the removal of synthetic fertilizers and pesticides, instead depending on natural resources and biological methods to preserve soil fertility and ensure productive crop yields. This paper highlights natural farming's role in addressing key agricultural challenges, including soil degradation and declining biodiversity, and rising input expenses. Natural farming improves soil health over time by boosting microbial activity through methods such as mulching, intercropping, and the application of bio-inoculants like Jeevamrit and Beejamrit. It also decreases reliance on outside inputs, thus enhancing the financial situation of farmers, particularly in rural regions. In addition to environmental and economic advantages, natural farming enhances human health by providing food that is free of residues and high in nutrients. It also promotes sustainable water management by enhancing soil's ability to retain moisture and decreasing the need for irrigation. Moreover, natural farming supports global sustainable development objectives by lowering greenhouse gas emissions and encouraging agricultural systems that are resilient to climate change. Although it has many benefits, switching to natural farming needs awareness, education, and support from institutions to address issues like initial drops in yield and insufficient technical knowledge. In conclusion, natural farming provides a comprehensive approach to achieving sustainable agriculture, guaranteeing food security, and preserving the environment, positioning it as a viable option for the future of global farming.

Abstract ID 8053

Integrated Pest and Disease Management (IPM) for Mountain Vegetables

Ritika Bhattacharjee and Naveen Chandra

Department of Agricultural Studies Quantum University, Roorkee Uttarakhand

Abstract

Mountain vegetable farming face unique challenges, including high susceptibility to pest outbreaks due to cool, humid climates, limited access to modern inputs, and fragile ecosystems sensitive to chemical contamination. This study outlines a sustainable, multi-faceted Integrated Pest and Disease Management (IPDM) approach tailored for mountain conditions. Key components include strengthening plant resistance through cultural practices—such as crop rotation, use of disease-free seeds, and balanced fertilization—combined with biological control agents (e.g., *Trichoderma*, *Pseudomonas fluorescens*), physical methods (yellow sticky traps, pheromone traps), and judicious use of botanicals (neem-based products). IPM strategies in high-altitude zones emphasize early detection through regular field scouting and monitoring pest economic threshold levels (ETL) to minimize chemical reliance. Challenges to adoption, such as lack of technical knowledge and high labor requirements for manual methods, are addressed through community-level training and farmer field schools. The implementation of these IPM practices not only reduces pest outbreaks but also ensures higher yield quality and reduces residue risks, supporting safe and sustainable vegetable production in mountainous environments.

Keywords: *Cultural Management, Action Thresholds, Biological Control, Mechanical & Physical Control, Host Plant Resistance, Monitoring & Identification, Chemical Management*

Abstract ID 8054

Weed Management : cultural, mechanical and Integrated approach for smallholders

Raunak Singh¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Weed infestation remains a primary constraint to agricultural productivity, accounting for an estimated annual crop value loss of over 11 billion USD in India. For the nation's smallholder and marginal farmers, who constitute 86.2% of the farming population and manage landholdings of less than 2 hectares, maximizing yield per unit area is a socioeconomic necessity. This chapter examines the classification and management of the approximately 250 significant weed species—including notorious invasives such as *Phalaris minor*, *Cyperus rotundus*, and *Parthenium hysterophorus*—that plague Indian agroecosystems. The discussion evaluates traditional and modern control strategies, focusing on cultural methods (crop rotation, cover cropping, and mulching), mechanical techniques (hand hoeing and physical removal), and the synergy of Integrated Weed Management (IWM). By synthesizing these approaches, the chapter aims to provide smallholders with sustainable, cost-effective frameworks to mitigate weed-crop competition for nutrients, water, and light, thereby ensuring food security and economic stability for small-scale agricultural systems.

Keywords: *Smallholder Farmers, Integrated Weed Management, Cultural Control, Mechanical Weeding, Invasive Species, India Agriculture.*

Abstract ID 8055

Classification of Vegetables: By Edible Part, Life Cycle, Season and Method of Culture

Aliya Haque

Department of Agricultural Studies,; Quantum University, Roorkee, Uttarakhand;

Abstract

Vegetables play a crucial role in human nutrition, agricultural sustainability, and economic development, particularly in countries like India where demand for nutritious food is rapidly increasing. Due to the wide diversity in their morphology, growth habits, climatic requirements, and cultivation practices, a systematic classification of vegetables is essential for effective study and management. This document presents a comprehensive classification of vegetables based on four major criteria: edible plant parts, life cycle, season of cultivation, and method of culture. Classification based on edible parts includes root, stem, leafy, inflorescence, fruit, and seed vegetables, which helps in understanding their structure, nutritional value, and harvesting practices. Life cycle classification divides vegetables into annual, biennial, and perennial crops, providing insights into their growth duration and agricultural planning. Seasonal classification categorizes vegetables into cool season, warm season, and summer season crops, emphasizing the importance of temperature and climatic conditions for optimal growth. Additionally, classification based on method of culture—direct seeded, transplanted, and vegetative propagated—highlights different cultivation techniques and their impact on crop establishment and productivity. The study also emphasizes the significance of vegetable classification in crop rotation, soil fertility management, pest and disease control, resource utilization, and plant breeding. Overall, understanding vegetable classification enhances scientific knowledge, supports efficient farm management, and contributes to sustainable agricultural practices.

Keywords: Vegetable classification, edible plant parts, life cycle, seasonal crops, cultivation methods, crop management, sustainable agriculture

Abstract ID 8056

Wild and Indigenous Hill Vegetables of Uttarakhand: Diversity, Uses and Conservation

Alok Bais¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

The Himalayan state of Uttarakhand Harbour's a rich diversity of wild and indigenous hill vegetables that play a crucial role in the food systems, culture, and livelihoods of local communities. Owing to its varied altitudinal gradients, climatic conditions, and ecological niches, the region supports a wide range of wild edible plant species, many of which are traditionally used as vegetables. Ethnobotanical studies from the Garhwal Himalaya have documented dozens of such species across herbs, shrubs, climbers, and trees, reflecting significant floristic diversity and indigenous knowledge systems. These wild vegetables—such as nettles (*Urtica* spp.), fiddlehead ferns, yams, and aromatic herbs like jimbu—are commonly gathered from forests, alpine meadows, and agricultural margins. They are integral to local diets, providing essential nutrients including vitamins, minerals, proteins, and bioactive compounds, and often serve as supplementary food sources during periods of scarcity. Their use is deeply embedded in traditional culinary practices and seasonal food habits of indigenous communities such as the Bhotia, Anwal, and Gujjar, where they are consumed as vegetables, condiments, and medicinal foods. Beyond nutrition, these plant resources hold socio-cultural and economic significance. Many species possess medicinal properties and are used in traditional healthcare systems, while surplus collection contributes to household income. However, the increasing pressures of modernization, land-use change, overharvesting, and climate variability are threatening the availability and traditional knowledge associated with these resources. Conservation of wild and indigenous hill vegetables in Uttarakhand requires integrated approaches, including in situ and ex situ conservation, documentation of traditional knowledge, promotion of sustainable harvesting practices, and domestication of promising species. Strengthening community participation and linking traditional knowledge with scientific research can further enhance biodiversity conservation and food security in the region.

Keywords: *Wild edible plants, Indigenous hill vegetables, Uttarakhand, Garhwal Himalaya, Ethnobotany, Floristic diversity, Traditional knowledge, Food security, Nutritional diversity, Medicinal plants, Indigenous communities (Bhotia, Anwal, Gujjar), Biodiversity conservation, Sustainable harvesting, In situ and ex situ conservation, Altitudinal gradient*

Abstract ID 8058

Origin, Historical Spread and Genetic Resources of Key Vegetable Crops

Ebanroiki Pasi

Department of Agricultural Studies, Quantum University, Roorkee, Uttarakhand;

Abstract

Vegetable crops are fundamental to human nutrition, agricultural sustainability, and economic development, providing essential vitamins, minerals, dietary fiber, and bioactive compounds. This document explores the origin, historical spread, and genetic resources of major vegetable crops, highlighting their importance in modern agriculture and horticultural research. The study outlines key centres of origin such as Indo-Burma, Central America, the Andean region, the Mediterranean, and Central Asia, each contributing unique crop diversity and valuable traits like pest resistance, climatic adaptability, and nutritional quality. It also examines the historical dissemination of vegetable crops through processes like domestication, migration, trade, and major events such as the Columbian Exchange, which significantly influenced global agriculture and food systems. Detailed case studies of important crops such as tomato, potato, brinjal, chilli, carrot, and cabbage illustrate how genetic diversity and regional adaptation have shaped their evolution and utilization. The document further discusses genetic resources, including landraces, wild relatives, improved varieties, and germplasm collections, emphasizing their role in crop improvement and resilience. Conservation strategies, both in situ and ex situ, along with modern biotechnological approaches like marker-assisted selection and genomic tools, are highlighted as essential for preserving and utilizing genetic diversity. Additionally, the role of genetic resources in plant breeding, challenges in conservation such as genetic erosion and policy constraints, and future prospects including biotechnology, climate-smart agriculture, and digital farming are discussed. Overall, understanding the origin, spread, and genetic resources of vegetable crops is crucial for sustainable production, improved crop varieties, and global food security.

Keywords: Vegetable crops, centres of origin, genetic resources, germplasm, crop domestication, plant breeding, conservation, sustainable agriculture

Abstract ID 8059

Post-Harvest Treatments: Chemicals, Edible Coatings, and Irradiation

Kartik saini

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Fruit and vegetable post-harvest losses continue to pose a serious threat to global food security, especially in developing nations where poor handling, transportation, and storage practices result in large quantitative and qualitative losses. Many post-harvest treatment strategies, including chemical treatments, edible coatings, and irradiation, have been widely used to address these problems. Chemical treatments, such as the application of fungicides, disinfectants, and ethylene inhibitors, are crucial for postponing ripening, managing microbial growth, and preserving the structural integrity of food. However, worries about chemical residues and their effects on the environment have prompted the creation of safer substitutes. By creating semi-permeable barriers that control moisture loss, gas exchange, and microbial activity, edible coatings which are made from natural polymers including polysaccharides, proteins, and lipids offer a sustainable and biodegradable method of preservation. Furthermore, food irradiation has become a very successful non-thermal method that prolongs shelf life and improves food safety by eradicating pathogens and postponing physiological processes without substantially compromising nutritional quality. The methods, uses, benefits, and drawbacks of various post-harvest treatments are all covered in detail in this chapter. It also emphasizes how crucial integrated strategies like hurdle technology are to maximizing preservation effectiveness. In order to highlight the shift toward sustainable and creative post-harvest management techniques, future prospects such as nano-coatings, bioactive packaging, and smart storage systems are also covered.

Keywords: *Post-harvest losses, Edible coatings, Chemical treatments, Food irradiation and Sustainable preservation.*

Abstract ID 8060

Hypobaric Storage and Its Applications in Shelf-Life Extension

SK Abu Yusuf Faridul Hoque ¹, and Mr. Naveen Chandra ²

Department of Agricultural Studies; Quantum University, Roorkee

Abstract

Hypobaric storage, often referred to as low-pressure storage, is a sophisticated postharvest preservation technique that keeps perishable horticulture products at lower atmospheric pressure to increase their shelf life. The concepts, components, physiological effects, uses, benefits, drawbacks, and hopes for the future of hypobaric storage systems are all thoroughly covered in this book chapter. By reducing the overall air pressure, the technique slows respiration rate and proportionately lowers the partial pressure of oxygen. Continuous evacuation of storage air delays ripening, senescence, and physiological problems by preventing the buildup of ethylene and other volatile metabolites. The structural and operational elements of hypobaric systems, such as airtight chambers, vacuum pumps, gas monitoring units, humidification systems, and refrigeration mechanisms, are described in this chapter. When compared to traditional cold storage and controlled environment techniques, the combined control of pressure, temperature, humidity, and atmospheric composition greatly improves quality preservation. Improved firmness, decreased decay, postponed chlorophyll degradation, and increased marketability are highlighted in the discussion of applications spanning fruits, vegetables, floriculture goods, and planting materials. Although hypobaric storage provides better quality preservation and shelf-life extension, its high capital cost, energy needs, and technological complexity prevent broad implementation. The chapter also looks at new developments such the creation of affordable small-scale units, integration with IoT-based monitoring systems, and conjunction with modified atmosphere packaging. All things considered, hypobaric storage is an economically significant and technically sophisticated solution for contemporary postharvest management, especially in export-oriented horticulture supply chains where longer storage times and superior quality are essential.

Keywords: *Hypobaric storage, postharvest technology, shelf-life extension, low-pressure preservation, horticultural crop storage.*

Abstract ID 8061

Time of Sowing and Crop Calendar: season-wise schedules for hill and valley zones

Kanhaiya kr¹ and Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Agricultural productivity largely depends on the timely execution of farm operations, among which time of sowing is one of the most critical factors influencing crop establishment, growth, and yield. Proper sowing time ensures optimum utilization of environmental resources such as temperature, rainfall, soil moisture, and photoperiod, resulting in better germination, reduced pest and disease incidence, and improved crop performance. Due to significant differences in agro-climatic characteristics between hill and valley zones, region-specific sowing schedules and crop calendars are essential for sustainable crop production. Hill zones are characterized by higher altitude, lower temperatures, uneven rainfall, shallow soils, and short growing seasons, which restrict crop choices and demand precise sowing windows with short-duration varieties. In contrast, valley zones possess moderate climate, fertile deep soils, better irrigation facilities, and longer growing periods, allowing higher cropping intensity and multiple cropping systems. Seasonal crop planning in India is broadly categorized into Kharif, Rabi, and Zaid seasons, each having specific sowing and harvesting periods depending on climatic suitability. Several factors such as temperature, rainfall distribution, soil moisture, crop variety, altitude, topography, irrigation availability, soil fertility, and socio-economic conditions influence the optimum time of sowing in both regions. Proper sowing time plays a major role in ensuring uniform germination, efficient resource use, synchronization of crop growth with favorable climate, and reduction in crop failure risks. Therefore, scientifically planned crop calendars for hill and valley zones are essential tools for improving farm efficiency, maximizing land use, and enhancing crop productivity under varying agro-climatic conditions.

Keywords: *Time of sowing, Crop calendar, Hill zones, Valley zones, Agro-climatic conditions, Kharif season, Rabi season, Zaid season, Soil moisture, Irrigation, Cropping intensity, Temperature, Rainfall, Crop productivity, Sustainable agriculture*

Abstract ID 8062

AGRI-ENTREPRENEURSHIP, EXTENSION & RURAL DEVELOPMENT

Prachi Sharma

MSc Agriculture (Agronomy) Shree Guru Ram Rai University Dehradun

Abstract

Agri-entrepreneurship is revolutionizing rural areas by transforming traditional farming into a dynamic, market-oriented enterprise. It's encouraging farmers and rural youth to adopt innovative practices like value addition, agro-processing, and modern technologies, shifting the focus from mere production to profitability and efficiency. This approach enhances income opportunities, reduces rural unemployment, and promotes diversification into allied sectors like dairy, poultry, and horticulture, strengthening livelihood security. Agricultural extension plays a vital role in supporting agri-entrepreneurship by bridging the gap between research institutions, policymakers, and farmers. Extension services facilitate knowledge transfer, technology adoption, and skill development, empowering rural communities to improve productivity, manage risks, and respond to changing market demands. Digital extension tools and ICTs have further enhanced outreach and effectiveness. The integration of agri-entrepreneurship and extension services contributes significantly to rural development, fostering inclusive growth and resilience. It's generating employment opportunities, especially for women and youth, reducing poverty and migration, and promoting environmental conservation and long-term productivity.

Abstract ID 8063

Cultivating Resilience: Integrating Climate-Smart Agriculture for Global Environmental Sustainability

Kavita Pun

SHRI GURU RAM UNIVERSITY

Abstract

The intensifying impacts of climate change present critical challenges to global food security, environmental sustainability, and rural livelihoods (IPCC, 2022). Climate-Smart Agriculture (CSA) has emerged as an integrative framework that enhances agricultural productivity, strengthens adaptive capacity, and mitigates greenhouse gas emissions (FAO, 2013; Lipper et al., 2014). This paper examines the role of CSA in cultivating resilience within agricultural systems while contributing to long-term global environmental sustainability. The study explores key CSA practices such as precision farming, agroforestry, conservation agriculture, and efficient water management techniques, which collectively promote sustainable resource use and climate adaptation (Rockström et al., 2017). It further highlights the importance of technological innovation, climate-informed decision-making, and supportive policy mechanisms in enabling farmers to respond effectively to climate variability (World Bank, 2021). Special emphasis is placed on the inclusion of indigenous knowledge and community participation, which play a vital role in enhancing local resilience and ensuring context-specific solutions (Pretty et al., 2011). Through the analysis of diverse agro-ecological case studies, the paper identifies major drivers and constraints affecting CSA adoption, including financial limitations, knowledge gaps, and institutional barriers (Thornton & Lipper, 2014). It argues that coordinated efforts across sectors, along with increased investment in climate-resilient infrastructure, are essential to scale CSA practices effectively (United Nations, 2015). The findings suggest that integrating CSA into national and international development agendas can significantly contribute to achieving sustainability goals while safeguarding food systems against climate risks. Ultimately, cultivating resilience through Climate-Smart Agriculture offers a viable pathway toward balancing productivity, environmental conservation, and socio-economic well-being in a changing climate.

Abstract ID 8064

Linking Environmental Pollution to Neuroendocrine Stress in Aquatic Fauna: A Review from the Sutlej River

Sachin Sharma¹ and Harinder Singh Banyal²

^{1 & 2} Department of Biosciences Himachal Pradesh University, Summer Hill Shimla (H.P.)

Abstract

Environmental degradation of freshwater systems has become an increasing concern due to the growing impact of human activities. The Sutlej River, a major tributary of the Indus riverine system, is continuously exposed to pollutants from industrial discharge, agricultural runoff, and urban waste. Several studies have reported contamination in the river and have mainly focused on water quality and ecological status. However, much less attention has been given to how these pollutants affect the internal physiological processes of aquatic organisms. Pollutants such as heavy metals and pesticides can act as endocrine disruptors, interfering with the neuroendocrine system of fish. In particular, they can alter the functioning of the hypothalamic–pituitary–interrenal (HPI) axis, leading to changes in cortisol levels, reproductive hormones, metabolism, and behaviour. Over time, these disruptions may affect the overall health and survival of aquatic species. Although similar effects have been documented in other aquatic systems, there is a lack of a comprehensive synthesis that connects pollution in the Sutlej River with neuroendocrine stress responses in its aquatic fauna. This review aims to bring together existing studies to better understand how environmental stressors influence hormonal regulation in aquatic organisms, and to highlight key physiological biomarkers that can be used to assess stress. By focusing on the link between environmental pollution and physiological responses, this review attempts to provide a more integrated understanding of river health. It also highlights the need for interdisciplinary research approaches that combine ecology, physiology, and toxicology for more effective monitoring and conservation strategies.

Keywords: *Sutlej River, pollutants, Neuroendocrine system, HPI axis.*

Abstract ID 8066

Vegetables and the National / Regional Economy: Income, Employment and Market Linkages

Devansh

Quantum University, Roorkee, Uttarakhand

Abstract

Vegetable cultivation plays a vital role in strengthening both national and regional economies by contributing significantly to farmers' income, employment generation, and market development. Due to their high productivity per unit area and short crop cycles, vegetables provide quick and higher returns compared to many staple crops. The sector supports a wide range of stakeholders— from smallholder farmers to traders, processors, and retailers—thereby creating strong forward and backward market linkages. Additionally, vegetable production enhances nutritional security and promotes diversification in agriculture. This chapter explores the economic importance of vegetables with a focus on income generation, employment opportunities, and market linkages at national and regional levels.

Abstract ID 8067

Hydrogen sulfide promotes photosynthesis and growth under drought through increased sulfur metabolism and antioxidant defense system in common bean (*Phaseolus vulgaris* L.)

*Abdul Rehaman and Mohd Asgher**

Plant physiology and Biochemistry Laboratory, Department of Botany, Baba Ghulam Shah Badshah University, Rajouri-185234

Abstract

Common bean (*Phaseolus vulgaris* L.) is the most widely cultivated legume crop and serves as a major dietary protein source worldwide. However, climate change-induced drought poses a severe threat to its productivity by disrupting key physiological and biochemical processes. Therefore, identifying effective strategies to enhance drought resilience in common bean is of considerable importance. The present study investigates the regulatory role of hydrogen sulfide (H₂S) in improving drought tolerance. Drought stress (DS) markedly reduced phenotypic performance, photosynthetic efficiency (F_v/F_m), and photosynthetic pigment concentrations, while significantly elevating oxidative stress markers. Exogenous H₂S application as sodium hydrogen sulfide (NaHS) effectively alleviated drought-induced oxidative damage by boosting the sulfur metabolism and the antioxidant defense system, promoting reactive oxygen species (ROS) scavenging, and minimizing lipid peroxidation. Moreover, H₂S maintained photosynthetic efficiency by sustaining chlorophyll levels and stabilizing photosystem II functionality. Enhanced proline accumulation following NaHS application led to improved osmotic adjustment, thereby contributing to overall stress tolerance. These findings highlight the potential of H₂S as a regulatory molecule to enhance drought resilience in common bean under drought stress conditions.

Keywords: *Phaseolus vulgaris*; *Hydrogen sulfide*; *Proline metabolism*; *Sulfur assimilation*; *drought tolerance*

Abstract ID 8068

Crop Principles and Methods of Value Addition.

Vansh Kumar¹ and Naveen Chandra²

Quantum University, Roorkee Uttarakhand

Abstract

Horticultural crops play a vital role in improving nutritional security, farm income, and employment generation. However, these crops are highly perishable and prone to post-harvest losses. Value addition in horticulture refers to the process of enhancing the economic worth and shelf life of fruits, vegetables, flowers, and plantation crops through various processing, preservation, packaging, and marketing techniques. The principles of value addition include quality improvement, minimization of losses, diversification of products, and meeting consumer demand. Methods of value addition involve primary processing (cleaning, grading, sorting), secondary processing (drying, canning, pickling, juice extraction), and advanced techniques such as cold storage, minimal processing, and branding. These practices not only reduce wastage but also increase profitability and market opportunities for farmers and agribusiness sectors. Adoption of modern technologies and proper supply chain management further strengthens value addition in horticultural crops, contributing to sustainable agricultural development. Keywords Horticultural crops, Value addition, Post-harvest management, Processing, Preservation, Shelf life, Cold storage, Packaging, Agribusiness, Food processing, Crop diversification, Income enhancement

Abstract ID 8069

Exploration of Ethnoveterinary Plants commonly used by Pahari Ethnic Tribe of Mendhar region in District Poonch of Jammu and Kashmir, India

Rashaid Ali Mustafa, M.A. Hannan Khan

Parasitology Lab, Department of Zoology, Baba Ghulam Shah Badshah University Rajouri, Jammu and Kashmir, India; Introduction

Abstract

Ethnoveterinary medicine refers to the use of various plant species in traditional practices to prevent, manage, and treat animal diseases. Deeply rooted in indigenous cultures, this knowledge is passed down through generations and remains a vital component of animal healthcare in many regions around the world. Extensive fieldwork was conducted to document the use of ethnoveterinary plants among the Pahari tribes in Tehsil Mendhar, Jammu and Kashmir. Both in situ and ex situ surveys were carried out through interviews with 86 informants. The data collected were analyzed using use value (UV) and relative frequency of citation (RFC), with correlation and regression analyses applied to interpret the results. In our study, 65 medicinal plant species were identified for the treatment of 14 diseases, with leaves being the most commonly used plant part (28% of species). Herbs accounted for the largest proportion of plant forms (42.64%), and a variety of preparation methods were observed. *Melia azedarach* L. exhibited the highest use value (0.82), while *Datura stramonium* L. recorded the lowest (0.05). Parasitic and intestinal infections were the most prevalent livestock diseases, whereas bacterial ailments were less common. *Melia azedarach* L. also had the highest relative frequency of citation (RFC) value (0.80), in contrast to *Aesculus indica*, which had the lowest (0.22). Statistical analyses, including correlation and regression, were performed at a 95% confidence level. The pharmacological activities of *Melia azedarach* L., *Punica granatum* L., *Olea ferruginea* Royle, *Grewia optiva* J.R. Drumm. ex Burret, *Euphorbia illirica* Hoppe ex W.D.J. Koch, *Hordeum vulgare* L., and *Thymus linearis* Benth., which demonstrate the highest use values, have been extensively studied. Collaborative efforts involving indigenous communities, researchers, and policymakers are essential for preserving traditional knowledge, promoting evidence-based practices, and ultimately improving animal health and well-being on a global scale.

Keywords: *Livestock, Pahari Tribe, Ethnoveterinary*

Abstract ID 8070

Sowing and Transplanting Techniques: Direct Sowing, Raised Beds, Polyhouse Transplants, and Manual Mechanization

KARTIK SAINI¹, Naveen Chandra²

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

The efficacy of crop establishment relies heavily on the selection of appropriate sowing and transplanting techniques, which directly influence seed germination, plant vigor, and overall agricultural yield. This paper explores various crop establishment methods, evaluating their applications, benefits, and operational constraints. Direct sowing remains a cost-effective and time-saving approach for robust crops; however, it necessitates precise soil moisture control and rigorous weed management. Conversely, raised bed cultivation significantly improves soil drainage, root aeration, and nutrient uptake, making it highly beneficial in areas prone to waterlogging or heavy rainfall. For high-value and climate-sensitive horticultural crops, the use of polyhouse transplants offers a highly controlled environment. This method protects delicate seedlings from extreme weather, pests, and diseases, thereby ensuring higher survival rates, uniform growth, and early maturity. Furthermore, the integration of manual mechanization—such as hand-pushed precision seed drills and semi-automated transplanters—bridges the critical gap between labor-intensive traditional practices and fully automated large-scale farming. This technological shift not only mitigates the challenges of rural labor shortages but also ensures precise seed placement, uniform row spacing, and optimized plant density. Ultimately, the strategic combination of these diverse sowing and transplanting techniques is essential for enhancing resource use efficiency, promoting sustainable farming practices, and maximizing farm profitability.

Keywords: *Direct Sowing, Raised Beds, Polyhouse Transplants, Manual Mechanization, Crop Establishment, Nursery Management, Agricultural Productivity.*

Abstract ID 8071

“An Agronomic Review of Finger Millet (Ragi) (*Eleusine coracana* (L.) Gaertn): Adaptability, Productivity and Nutritional Importance”

*Aditya Raturi**, *Dr. Hemraj Meena*, *Dr. Anoop Badoni*

¹School of Agricultural Science and Technology, RIMT University, Mandi Gobindgarh, Punjab;

²PLANTICA-Indian Academy of Rural Development, Dehradun Uttarakhand

Abstract

Millets play a crucial role in ensuring nutritional security due to their high nutritional value, highlighting the need to promote their cultivation and consumption. They have served as a staple food for human societies for centuries, especially in Asia and Africa. Millets are a dependable source of dietary energy, providing approximately 320–370 kcal per 100 g of grain. Finger millet is well adapted to high-altitude conditions and is cultivated in Himalayan regions up to about 3,000 meters above sea level. Ragi is a nutrient-dense grain, rich in bioactive compounds, dietary fiber, and essential micronutrients, with a particularly high calcium content compared to most other cereals. Ragi is rich in nutrients that serves as an important source of essential micronutrients, dietary fiber and bioactive compounds, with a particularly high calcium content compared to most other grains. Ragi seeds are used in the preparation of different types of traditional foods, including porridge, fermented products, unleavened bread and are also used in alcohol production. This review focuses on the morphology, ecological adaptability, nutritional composition, health benefits, and food security potential of finger millet.

Keywords: *Finger millet, Gluten Free, Nutritional Security, Climate Resilient*

Abstract ID 8072

Elm Oyster Mushroom (*Hypsizygus ulmarius*): High Value Edible, Medicinal and Nutraceutical Mushroom Species for Trans-Gangetic Plains of India

Aditya *, Neeraj , J.N. Bhatia

1Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship and Management (NIFTEM-K; An Institute of National Importance of India), Kundli-131028, Sonapat, Haryana, India;

2Department of Plant Pathology, Chaudhary Charan Singh Haryana Agricultural University (CCS HAU), Hisar-125004, Haryana, India

Abstract

Elm oyster mushroom (*Hypsizygus ulmarius*) has emerged as a promising new-age functional and medicinal mushroom species for the Trans-Gangetic Plain of India, driven by the increasing demand for mushrooms and sustainable climate-resilient foods. This mushroom is rich in high-quality proteins, dietary fibers, essential minerals, vitamins, potent antioxidants and a diverse array of health-promoting bioactive compounds, positioning it as a nutritionally and therapeutically valuable functional food resource. The widespread availability of diverse agro-wastes generated by intensive agricultural practices in this region provides an ecologically favourable and resource-efficient environment for its large-scale and sustainable adoption. The present study successfully standardized the cultivation technology for this mushroom by systematically optimizing nutrient media, substrate formulation, spawn quality, spawn rate, environmental parameters and crop management practices. The mycelium grew well on oatmeal agar and its broth at pH 8.0 and temperature $25\pm 1^\circ\text{C}$. Wheat straw supplemented with the cotton seed hull at the rate of 10.0% dose, spawned with pearl millet grain spawn at the rate of 5.0% spawn dose, gave the highest mushroom yield (953.66 g/0.4 kg dry substrate) with biological efficiency (238.41%). The sporocarps harvested from the first flush were freeze-dried for physicochemical and functional characterization, demonstrating strong nutri-functional potential that is valuable for pharmaceutical, nutraceutical and food industry applications. The standardized protocol, supported by patented innovation, research and review publications, enables reliable, low-cost and scalable production at commercial levels while promoting recycling and circular bioeconomy principles. The technological standardization and successful regional adaptation of this mushroom species may establish it as a viable future food crop for the Trans-Gangetic region of India, capable of enhancing nutritional security, farm diversification and rural livelihoods.

Keywords: *Agro-waste Valorization; Circular Bioeconomy; Cultivation Technology; Functional Food; Hypsizygus ulmarius*

Abstract ID 8073

Sustainable Management of Natural Resources in Agriculture

Mahima

Uttaranchal College of Science and Technology

Abstract

Natural resources are fundamental to human survival and economic development, providing essential materials such as food, water, energy, and shelter. These resources are broadly categorized into renewable and non-renewable types, both of which require careful management to ensure long-term availability. However, rapid population growth and increasing anthropogenic activities have led to the excessive exploitation of natural resources, resulting in environmental degradation and ecological imbalance. Deforestation, urbanization, and industrial expansion have further intensified pressure on ecosystems, contributing to resource depletion and loss of biodiversity. The conservation of natural resources is therefore critical for maintaining ecological stability and achieving sustainable development. It plays a vital role in preserving biodiversity, protecting ecosystems, and mitigating global environmental challenges such as climate change, desertification, and water scarcity. Conservation efforts help ensure a balanced relationship between human needs and environmental health, supporting both present and future generations. Effective conservation strategies include afforestation and reforestation to restore forest cover, as well as sustainable land and water management practices. Techniques such as rainwater harvesting and watershed management are essential for addressing water scarcity and improving resource efficiency. Additionally, promoting awareness and adopting environmentally responsible practices can significantly contribute to the sustainable use of natural resources. Natural resources are finite and invaluable, making their conservation indispensable. A collective and well-planned approach toward resource management is necessary to safeguard ecological balance, ensure sustainability, and secure the well-being of future generations. This article highlights the importance of natural resources and discusses how they can be sustainably managed and utilized in agricultural systems.

Keywords: *Natural Resources, Conservation, Sustainability, Resource Depletion, Climate Change*

Abstract ID 8074

Agri- Tourism- Connecting Urban People to Rural Roots

Abhijeet Tiwari

Uttaranchal College of Science and Technology;

Abstract

Agri-tourism is emerging as a transformative business model that bridges the gap between urban consumption and rural production. This paper explores how agri-tourism serves as a vital tool for both agri-entrepreneurship and rural development. In the modern era, urban populations often face high levels of stress, city hustle, and a sense of disconnection from nature. Agri-tourism addresses this by offering "experiential travel," where visitors can enjoy fresh air, traditional lifestyles, and a peaceful environment, while simultaneously learning about crop production and rural heritage. The study highlights three primary channels through which agri-tourism drives rural growth. Firstly, it facilitates economic diversification. By shifting the reliance from unpredictable crop yields and weather-sensitive harvests to a more stable tourism-based income, farmers can significantly reduce their financial burden. Offering farm stays, guided tours, and "pick-your-own" activities provides a steady, year-round revenue stream. Secondly, the paper emphasizes the preservation of culture and heritage. Agri-tourism creates a commercial value for traditional crafts, local cuisines, and folk music. This curiosity from urban visitors encourages rural communities to keep their unique identity alive while turning it into a source of livelihood. Finally, the model fosters infrastructure development and employment. The demand for tourism necessitates better roads, sanitation, and connectivity, which benefits the entire village. It also creates localized job opportunities for the rural youth in hospitality and tour guiding, thereby reducing forced migration to cities. In conclusion, agri-tourism is not merely a tourism trend but a sustainable ecosystem. It turns the natural beauty and traditional lifestyle of a village into a commercial asset. By transforming simple farms into tourism destinations, it ensures that both the farmer and the rural community thrive economically and socially. It provides a "win-win" scenario where urban people reconnect with their roots, and the rural landscape receives the economic boost it deserves.

Key Words - Agri-Entrepreneurship, Cultural Heritage, Economic Diversification, Rural Development, Sustainability

Abstract ID 8075

Natural Farming: A Pathway to Sustainable Agriculture and Eco-friendly Food Production

Priyanshu Saklani

Uttaranchal College of Science and Technology

Abstract

Natural farming is an eco-friendly and sustainable agricultural approach that avoids the use of chemical fertilizers and pesticides, relying instead on natural inputs such as cow dung, cow urine, compost, and other locally available resources. This system emphasizes the maintenance of soil fertility, enhancement of crop productivity, and protection of the environment. It plays a crucial role in reducing the adverse effects of chemical-based agriculture while promoting ecological balance. One of the key advantages of natural farming is its low cost of cultivation, as it minimizes dependence on external inputs. It improves soil health by increasing organic matter content and encouraging the activity of beneficial microorganisms. Additionally, natural farming ensures the production of safe and chemical-free food, which is essential for human health. It is also an environmentally sustainable practice that reduces pollution of soil, water, and air. Furthermore, natural farming contributes to water conservation by improving soil structure and water retention capacity. It supports biodiversity by promoting beneficial insects, earthworms, and other soil organisms. By encouraging the recycling of natural resources, it ensures long-term sustainability in agricultural systems. Overall, natural farming is an effective approach for improving soil health, reducing production costs, and ensuring safe food production. It holds great potential for achieving sustainable agricultural development and environmental conservation, thereby contributing to a healthier ecosystem and a secure future for farmers.

Keywords: *Natural farming, Sustainable agriculture, Soil fertility, Chemical-free food, Eco-friendly, Biodiversity.*

Abstract ID 8076

Isolation, Screening and Functional Characterization of Plant Growth-Promoting Rhizobacteria (PGPR) for Sustainable Crop Productivity with Prospects for Nano Integration

Aditya Sheerswal , Vani Sharma

1Faculty of Science, Motherhood University, Roorkee, Uttarakhand

Abstract

The intensive and indiscriminate use of chemical fertilizers in modern agriculture has led to serious concerns related to soil degradation, reduced microbial diversity, and environmental imbalance. In recent years, plant growth-promoting rhizobacteria (PGPR) have emerged as promising eco-friendly alternatives due to their ability to enhance plant growth through mechanisms such as nutrient solubilization, phytohormone production, and improved root colonization. The present study was undertaken to isolate, screen, and functionally characterize PGPR from rhizospheric soil with the aim of identifying efficient strains for sustainable agricultural applications. Rhizospheric soil samples were collected, and a total of fifteen bacterial isolates were obtained using standard serial dilution and spread plate techniques. Preliminary characterization indicated that 11 isolates were Gram-positive, while 4 were Gram-negative, suggesting considerable microbial diversity in the rhizosphere. The isolates were further screened for key plant growth-promoting traits, including phosphate solubilization (PSB), zinc solubilization (ZSB), and potassium mobilization (KMB). Among the isolates, 8 showed prominent phosphate solubilization with clear halo zone formation on selective media, while 6 isolates exhibited zinc solubilization and 5 demonstrated potassium mobilization ability. Morphological and biochemical characterization further confirmed the functional diversity and potential of these isolates. The results suggest that selected PGPR isolates possess significant potential as bioinoculants for improving nutrient availability and enhancing crop productivity while reducing reliance on chemical fertilizers. In addition, the study provides a useful foundation for future work involving the integration of these beneficial microbes with nanotechnology to develop more efficient and targeted biofertilizer formulations. Such integrated approaches may play an important role in promoting sustainable and resilient agricultural systems.

Keywords: *PGPR, Rhizosphere, Sustainable Agriculture, Biofertilizers, Nutrient Solubilization, Nano Integration*

Abstract ID 8077

EVALUATION OF THE BIOACTIVE POTENTIAL OF SECONDARY METABOLITES DERIVED FROM AN ENTOMOPATHOGENIC FUNGUS

*Swati Jamwal**, *Neelam Kaushik* and *Kailash Chandra Naga*

1 Department of Biotechnology, Himachal Pradesh University, Shimla; 2 ICAR- Central Potato Research Institute, Shimla; 1* Department of Biotechnology, Himachal Pradesh University, Shimla

Abstract

Entomopathogenic fungi are recognized as a promising source of bioactive secondary metabolites with potential applications in sustainable pest management and antimicrobial development. The present study aims to evaluate the bioactive potential of metabolites derived from *Akanthomyces*. Metabolites were extracted using suitable organic solvents and assessed for their insecticidal activity against aphids through laboratory bioassays. The results demonstrated significant insect mortality, indicating potent insecticidal efficacy of the fungal metabolites. In addition, antibacterial activity was evaluated using agar well diffusion method which indicating promising inhibitory effects against selected bacterial strains. Preliminary chemical profiling of the extracted metabolites was carried out using LC-MS/MS analysis, indicating the presence of diverse compounds. Overall, the findings highlight the potential of *Akanthomyces* metabolites as eco- friendly alternatives for aphid's management and as promising candidates for antimicrobial applications.

Keywords: *Entomopathogenic fungi, bioactive metabolites, aphids, insecticidal, antibacterial*

Abstract ID 8078

Climate-Smart Agriculture & Environmental Sustainability

Deepak Awasthi

M.Sc. (Soil Science) Shri Guru Ram Rai University, Dehradun

Abstract

Climate-Smart Agriculture (CSA) is a holistic approach to transform agri-food systems, ensuring sustainable food production for a growing population amidst climate change. Popularized by the Food and Agriculture Organization, CSA has three key objectives: increasing agricultural productivity and farm incomes, strengthening adaptation and resilience to climate variability, and reducing greenhouse gas emissions. To achieve these goals, CSA employs context-specific practices like conservation agriculture, climate-resilient crop varieties, and precision nutrient and water management. It also promotes nature-based solutions like agroforestry and landscape restoration, which sequester carbon and diversify livelihoods. Efficient irrigation, renewable energy, and improved manure management reduce emissions and resource use. CSA contributes to environmental sustainability by conserving soil organic matter, enhancing biodiversity, and improving water-use efficiency. However, its implementation must be tailored to local agro-ecologies and socio-economic realities, prioritizing equity, gender inclusion, and smallholder access to technology and markets. Robust measurement, reporting, and verification frameworks, alongside climate finance and institutional coordination, are crucial to scaling CSA's impact. Overall, CSA offers a pragmatic pathway to align agricultural productivity with environmental stewardship, supporting resilient food systems and long-term ecological health.

Abstract ID 8079

PERSISTENCE AND RESIDUAL EFFECT OF CYANTRANILIPROLE IN MAIZE AND ITS IMPACT ON SOIL ENZYMATIC ACTIVITY

*Ashok Kumar Parida , Priya , Sanhita Chowdhury , Katta Subramanya Sai Teja , Sanjay Kumar Sahoo **

¹. Department of Entomology, Post Graduate College of Agriculture, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India, 848125

Abstract

This study investigated the persistence of cyantraniliprole 600FS in soil and its subsequent impacts on soil enzymatic activities following seed treatment at different application rates. Soil samples were analyzed for residue persistence and enzymatic activity following treatments at recommended dose (RD, 1.44 g a.i./kg), 1.25 times RD (1.80 g a.i./kg), and double the RD (2.88 g a.i./kg). Residue analysis demonstrated dose-dependent persistence patterns, with detectable residues persisting for 7 days at RD and 1.25 RD, while extending to 14 days at 2 RD. Evaluation of soil biological function revealed significant inhibitory effects on enzymatic activities with varying recovery periods. Dehydrogenase activity was suppressed for 21 days at RD, while phosphatase activity demonstrated extended inhibition for 30 days at the same application rate. Both enzymes exhibited prolonged inhibition periods of 45 days at higher application rates (1.25 RD and 2 RD). GMean index analysis confirmed significant negative impacts on soil biochemical processes in treated soils compared to controls. These findings indicate that cyantraniliprole seed treatments, particularly at higher-than-recommended rates, potentially disrupt essential nutrient cycling processes, which may have cascading effects on soil fertility and crop productivity.

Keywords: *Cyantraniliprole, seed treatment, soil persistence, enzymatic activity, dehydrogenase, phosphatase, soil health, residual effects*

Abstract ID 8080

Assessing the interactive effects of aphid infestation and heat stress on wheat physiology and yield

Priya, Marri Keerthana, Pushpa Singh, M. S. Sai Reddy

Dr. Rajendra Prasad Central Agricultural University, Pusa, Samatipur, Bihar, 263145

Abstract

In the field, plants usually have to face the combined effects of biotic and abiotic stresses. A field experiment was conducted during Rabi 2023–24 used $4 \times 4 \times 2$ factorial design (four wheat genotypes \times four different sowing dates \times 2 types of stress) to evaluate heat and combined (aphid and heat) stress effects. Results revealed, early sowing consistently outperformed very late sowing across multiple parameters. For instance, early sowing resulted in higher grain yield per plant (26.16 to 16.44 g). Among the four genotypes, HD2967 and DBW333 generally exhibited superior performance. HD2967 had the highest yield per plant with an average of all sowing dates (23.26 g), while DBW333 showed the highest test weight (39.28 g) and highest yield (16.23 g) during very late sowing. The combination of heat and aphid stress typically resulted in more severe impacts compared to heat stress alone. Under individual stress, crop showed higher yield per plant (24.13 g) than under combined stress (21.45 g). Biochemical studies revealed that phenol and proline content increased during very late sown conditions when compared to other sowing dates, likely as stress responses. Conversely, early sowing resulted in higher total soluble protein and reducing sugars. This study also revealed that, combined stress induced higher levels of stress-response compounds i.e., 12.7% higher phenol content, 12.2% higher proline content, 17% higher total soluble sugars than individual stress conditions. Molecular characterization using 32 SSR markers identified 275 allelic variants, with distinct clustering patterns. RG4 and HD2967 shared 65% genetic similarity (potentially linked to aphid resistance), while DBW333 emerged as genetically distinct (46% similarity) yet heat-tolerant. These findings provide insights, how heat stress intensifies aphid damage in wheat morpho-physiological, biochemical and genetic responses, providing critical insights into plant-insect interactions under climate change scenarios.

Keywords: *Heat stress, aphid infestation, yield, plant insect interactions*

Abstract ID 8081

Organic, natural and integrated farming systems

Minakshi rani

Research Scholar, Department of Horticulture, School of Agriculture Sciences, Shri Guru Ram Rai University, Dehradun-248001, Uttarakhand, INDIA; Minakshimandhan6@gmail.com

Abstract

Agricultural sustainability has gained global importance due to challenges such as climate change, soil degradation, and inefficient resource use. Alternative approaches like organic farming, natural (IFS) are increasingly being recognized for their potential to address these issues. Organic farming avoids synthetic chemicals and relies on practices such as crop rotation, organic manures, and biological pest control to enhance soil health and ecological balance. Natural farming focuses on low external input use, emphasizing on-farm resources like cow-based inputs, mulching, and microbial activity to develop self-sustaining agro-ecosystems. In contrast, IFS integrates multiple farm enterprise such as crop, livestock, fisheries, and agroforestry, to improve resource efficiency, generate stable income, and provide continuous employment. These systems collectively support soil fertility, biodiversity conservation, and reduced environmental impact while improving resilience to stresses and ensuring food and nutritional security. Organic farming offers premium market input costs, and IFS minimizes risk through diversification. However, challenges such as initial yield reduction, high labour requirement, limited awareness, and certification barriers restrict widespread adoption. Integrating the strength of these approaches, along with strong research support, farmer training, and favorable policies, can provide a comprehensive pathway toward sustainable agriculture. Ultimately, these systems promote environmental protection, economic stability, and long-term farmer wellbeing.

Keywords: *Sustainability, organic farming, soil degradation, synthetic chemicals, mulching, biodiversity conservation, integrated farming, diversification.*

Abstract ID 8082

Integrated farming natural and organic

Smriti

Research Scholar, Department of Horticulture, School of Agriculture Sciences, Shri Guru Ram Rai University Dehradun -248001, Uttarakhand INDIA; Smritithakur758@ gmail.com

Abstract

Agricultural sustainability to enhance soil fertility, conserve water resources, safeguard ecosystems, maintain stable farm incomes, and improve food and nutritional security. Organic, natural farming systems are important strategies for promoting sustainable agricultural amid growing environmental and economic challenges. Organic farming eliminates the use of synthetic chemicals and depends on methods like crop rotation, organic manures, and biological pest management to improve soil health and maintain ecological balance. Natural farming focuses on minimal external inputs, making use of on-farm resources sources use efficiency. Integrated farming systems(IFS) combine multiple farm enterprises such as crops, livestock, fisheries and agroforestry to enhance resource efficiency, Diversify income sources and provide continuous employment collectively, these approaches enhance soil fertility, conserve biodiversity and reduce environmental impact, while also increasing resilience to climate variability and supporting food and limited awareness exist, integrating these systems with strong research support farmer training and favorable policies can offer a comprehensive pathway toward sustainable and resilient agricultural development.

Keywords: *Sustainability, organic farming, diversify, soil fertility, integrated farming, chemicals, diversify, manure, crop rotation.*

Abstract ID 8083

Prevalence of Major Onion Diseases in Kangra Region of Himachal Pradesh

*Sakshi , Nisha Kumari , Sachin Upmanyu**

Central University of Himachal Pradesh, Shahpur Campus-176206, Kangra (HP); Department of Plant Sciences, School of Life Sciences

Abstract

Onion (*Allium cepa* L.) is one of the most widely cultivated and economically important vegetables that belongs to the Alliaceae family. Onions are grown in a variety of climatic conditions ranging from temperate to semi-arid conditions, and are crucial to India's vegetable-based agriculture system. However, due to temperature variations and weather conditions like humidity, rainfall, and agronomic techniques and intense disease pressure, onion productivity is highly affected. Himachal Pradesh's local farmers rely on onion as a profitable crop, but because of this region's humid environment and diverse geography, onion crops become particularly vulnerable to fungal diseases that lead to a considerable amount of yield loss. The major onion diseases are Purple Blotch, Stemphylium Blight, Fusarium Basal Rot, Downy Mildew, and White Rot. Purple Blotch which is caused by *Alternaria porri* is the most common foliar disease encountered in the Kangra region of Himachal Pradesh. Under field circumstances, foliar sprays of fungicides proved effective in managing purple blotch disease of onions. The primary goal of this study is to gather and examine the data that is currently available on significant onion diseases that have been reported from the Himachal Pradesh region of Kangra. The purpose of this research is to provide the information on the major onion diseases that impact onion production observed from the Kangra region, which may be used as a reference for future disease monitoring and management studies.

Abstract ID 8084

Morphological and Genetic Diversity in Brugmansia in Kangra region

*Geetanjali Thakur¹, Pardeep Kumar**

Central University of Himachal Pradesh,; Shahpur Campus-176206, Kangra (HP); Department of Plant Sciences, School of Life Sciences; Abstract:

Abstract

Brugmansia is a woody perennial shrub belonging to the family Solanaceae. The plant is indigenous to Brazil, South America. The plant was earlier positioned in the same taxa as Datura but was later identified as a separate genus. It was introduced in India for ornamental purposes and has since flourished in various parts of the country. It is an important ornamental and medicinal genus cultivated in Kangra district where diverse agro-climatic conditions and altitudinal variations are seen. Brugmansia grows in tropical and temperate areas and is usually found growing near margins of forests and streams in the region. Brugmansia is a plant of high medicinal value due to the presence of tropane alkaloids like scopolamine, and atropine. It is widely used in traditional medicine in many American countries. The plant shows morphological and genetic diversity which shows its adaptability, variation and potential for conservation and breeding. The morphological diversity can be seen in flower structure, plant height, growth habit and shape of leaves. These phenotypic variations are influenced by environmental factors as well as genetic makeup. The flower color of the plant ranges from white, yellow, orange to red color indicating genetic diversity influenced by geographical isolation and local adaptation. Also the plant species are known for extensive natural and artificial hybridization, which significantly contributes to their genetic variability. This study highlights the significance of Kangra region as the reservoir of Brugmansia diversity and provides valuable insights for taxonomy, conservation strategies and development of improved ornamental varieties.

Abstract ID 8085

From Himalayan Biodiversity to Economic Value: *Tinospora cordifolia* as a Sustainable Antiobesity Innovation.

Radheshyam^{1*}, Ajay Semalty²

¹ Praduman Singh SPS Pharmacy College, Basti, U.P. 272001

² Department of Pharmaceutical Sciences, HNB Garhwal University (A Central University), Srinagar (Garhwal), Uttarakhand, India

Abstract

Obesity has emerged as a major global health crisis, with more than one billion individuals affected worldwide, and its prevalence continues to rise across both developed and developing nations. In India, the burden of obesity has increased significantly over recent decades, contributing to a growing incidence of metabolic disorders and placing substantial strain on healthcare systems. This escalating scenario necessitates the development of safe, effective, and economically viable therapeutic interventions. Himalayan biodiversity offers a promising reservoir of medicinal plants with significant pharmacological potential. The present study explores the antiobesity potential of Himalayan *Tinospora cordifolia* through in vitro evaluation of pancreatic lipase inhibition and antioxidant activities. Among the tested extracts, the ethyl acetate fraction exhibited the highest lipase inhibitory activity (91.64%), followed by the aqueous (83.42%), butanol (66.32%), and methanolic extracts (73.72%), indicating strong potential to reduce dietary fat absorption. Antioxidant assays revealed significant free radical scavenging activity, with butanol and aqueous extracts demonstrating superior DPPH inhibition (up to 94.50% and 94.30%, respectively), surpassing the standard BHT. Similarly, in hydrogen peroxide scavenging assays, aqueous and butanol extracts showed notable activity (up to 56.24% and 58.21%, respectively), indicating their efficacy in mitigating oxidative stress. The observed bioactivities suggest a multi-targeted mechanism involving inhibition of lipid digestion and attenuation of oxidative stress, both of which are critical to obesity pathogenesis. *Tinospora cordifolia* holds significant economic potential through its application in the development of cost-effective herbal formulations, promoting value addition of Himalayan bioresources and contributing to a sustainable bioeconomy. Himalayan *Tinospora cordifolia* represents a promising, sustainable antiobesity runner. Further in vivo studies and clinical validation are warranted to facilitate its translation into effective phytopharmaceutical interventions.

Abstract ID 8086

INHERITANCE OF RIPENING MUTANT “NON-RIPENING (nor)” GENE IN TOMATO

Srijana Saha¹, Pranab Hazra^{}, Ranit Roy², Arup Chattopadhyay² and Kiran Mary Kandir³*

¹Department of Vegetable Science, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand 263 145, India;

²Department of Vegetable Science, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur-741 252, Nadia, West Bengal, India

³ Krishi Vigyan Kendra Pakur, Birsa Agricultural University, Ranchi, Pakur-816 016 Jharkhand, India;

Abstract

Tomato, one of the most widely cultivated vegetable crops worldwide, valued for its nutritional importance but due to its quick ripening character and poor shelf life it suffers substantial postharvest losses. The non-ripening (nor) mutant gene have been identified and utilized in breeding programmes for developing fruits with enhanced shelf life and appreciable lycopene content. This study aimed to document fruit characters in the F₁ generation of BCT nor/nor (non-ripening mutant) x AVTO-1424 Ty₂, Ty₃ (normal ripening tomato line) and its F₂ generation to understand the inheritance pattern of the nor gene. Attempts have also been made to isolate desirable segregants with improved shelf life and lycopene content. The inheritance pattern was studied in the F₁ and F₂ generation of the cross by the χ^2 test. In the F₁ generation, the fruits ripened normally and produced normal red colour which indicated that the gene “nor” was recessive in nature. The F₂ population segregated in the ratio of 3:1 (normal ripening: non- ripening), demonstrating its monogenic-recessive inheritance. Lycopene content in the F₁ hybrids (1.48 mg/ 100 g fruit weight) was lower than the normal ripening parent which indicated depressive effect of “nor” gene on carotenoid biosynthesis even in heterozygous condition. However, the shelf life of normal ripening F₁ hybrids (29.87 days) was higher than the normal ripening parent suggesting the possibility of selecting breeding lines with enhanced shelf life and lycopene content. In the F₂ population, normal ripening segregants could further be grouped into three classes based on shelf life. Class 3 exhibited the highest shelf life (up to 21 days) with a high lycopene content (3.56 mg/100g of fresh weight) indicating the possibility of isolating desirable lines through advancement of generations. This study suggested to develop promising line-bred varieties with enhanced shelf-life and high lycopene content.

Keywords: *Tomato, non-ripening, nor, ripening mutants, shelf life, inheritance, monogenic, recessive, lycopene, F₁ hybrid, F₂, heterozygous, segregate.*

Abstract ID 8087

Soil Health: The Foundation of Sustainable Agriculture

Sakshi Chauhan, M.Sc. (Agri), Soil Science,
Shri Guru Ram Rai University, Pathribagh, Dehradun

Abstract

Soil health is the backbone of our food system, influencing plant growth, biodiversity, and ecosystem services. Healthy soils support nutrient-rich crops, filter water, and sequester carbon, addressing climate change. Simple practices like composting, reduced tillage, and cover cropping boost soil fertility, structure, and biota. For instance, adding organic amendments like compost or manure can increase soil organic matter, improving its water-holding capacity and nutrient supply. By prioritizing soil conservation and management, we can ensure food security, mitigate climate change, and promote ecosystem resilience. This abstract highlights the importance of soil health in achieving sustainable agriculture, emphasizing practical strategies for farmers and policymakers.

Keywords: *Soil health, Sustainable agriculture, Composting, Climate change, Food security, Ecosystem services*

Abstract ID 8088

Harnessing Hydroponics for Sustainable Food Production

Haripriya,
M.Sc. (Agri), Soil Science,
Shri Guru Ram Rai University, Pathribagh, Dehradun

Abstract

Hydroponics, a cutting-edge soilless cultivation method, is transforming agriculture by optimizing water usage, reducing land requirements, and boosting crop yields. By leveraging nutrient-rich solutions and advanced technologies like IoT, AI, and bio-electrochemical systems, hydroponics enables precise nutrient management and waste reduction. This scalable approach addresses pressing global challenges – food security, climate change, and resource scarcity – making hydroponics a vital component of future sustainable agriculture. Hydroponic systems can increase crop yields by up to 30% while using 70-90% less water than traditional farming methods. Additionally, hydroponics allows for year-round production, reducing reliance on seasonal changes and geographical limitations. As the global population continues to grow, hydroponics offers a promising solution for meeting increasing food demands while minimizing environmental impact. By integrating hydroponics with renewable energy sources and advanced data analytics, we can create a more resilient and sustainable food system

Keywords: *Hydroponics, Sustainable agriculture, IoT, Artificial intelligence, Bio-electrochemical systems, Food security, Climate change, Nutrient management, Resource efficiency*

Abstract ID 8089

Regenerative Soil Futures: Integrating Climate Signals with Biological Fertility Design

Sumit Gahlot

PG Scholar (SOIL SCIENCE); Department of Soil Science, Shri Guru Ram Rai University (SAS)
Dehradun-248001, Uttarakhand India

Abstract

Climate change is increasingly recognized as a critical driver of soil degradation, influencing key soil processes through rising temperatures, altered precipitation patterns, and intensified extreme weather events. These changes disrupt soil structure, reduce soil organic carbon (SOC), and alter microbial dynamics, ultimately constraining soil fertility and agricultural productivity. In this context, conventional input-driven soil fertility approaches are insufficient to sustain long-term soil functionality. This paper proposes a regenerative framework that integrates climate signals with biological fertility design to enhance soil resilience and sustainability. The study examines the interactions between climate variability and soil biological processes, with a particular focus on SOC dynamics, microbial community structure, and nutrient cycling. Soil organic carbon plays a central role in maintaining soil aggregation, water-holding capacity, and nutrient availability, while also acting as a major carbon sink (Lal, 2004; 2020). Climate-induced stresses such as drought and temperature fluctuations significantly influence microbial activity and enzymatic processes, thereby affecting nutrient transformations and soil fertility (Schimel et al., 2007; Allison & Martiny, 2008). To address these challenges, the paper highlights regenerative soil management strategies that emphasize biological processes. These include the application of biochar for carbon stabilization and enhanced cation exchange capacity (Lehmann et al., 2011), conservation agriculture practices that minimize soil disturbance and improve soil structure (Hobbs et al., 2008), and diversified cropping systems such as cover cropping and crop rotations to enhance soil biodiversity and nutrient cycling (Drinkwater et al., 1998). Integrated soil fertility management (ISFM) is also discussed as a holistic approach to improving nutrient use efficiency and sustaining soil productivity (Vanlauwe et al., 2010). Furthermore, the integration of climate-informed decision-making tools, including soil health indicators and digital monitoring systems, offers opportunities for adaptive and site-specific soil management. These approaches enable the alignment of soil biological processes with changing climatic conditions, enhancing both resilience and productivity. The paper concludes that regenerative soil systems, grounded in biological fertility design and responsive to climate signals, provide a viable pathway for restoring soil health, improving nutrient efficiency, and mitigating climate change through carbon sequestration. Such approaches are essential for achieving sustainable agricultural systems and ensuring long-term food security under a changing climate.

Keywords: *Regenerative agriculture, Soil organic carbon, Climate variability, Soil microbiome, Biochar, Integrated soil fertility management, Sustainable agriculture*

Abstract ID 8090

Sustainable dyeing of cotton fabric with walnut (*Juglans regia*) Green Husk dye

Bharti Sharma and Manisha Gahlot

Department of Apparel and Textile Science, College of Community Science; G.B. Pant University of Agriculture & Technology,; Pantnagar, Udham Singh Nagar, Uttarakhand

Abstract

India has impressive biological diversity and plant kingdom serves as a large source of valuable natural products. A wide variety of natural dyes obtained from plant sources signifies one of the amazing gifts of nature. Plant-based dye source used for dyeing fabrics, the green walnut husk commonly referred to as WGH derived from *Juglans regia* are being used as a promising source for natural dyes. The outer layer of the walnut fruit is rich in several bioactive compounds. Walnut green husks are able to impart unique shades of brown to various textile materials. As these are agricultural waste product, walnut green husks are readily available and can be used efficiently for obtaining dyes. In this study, a natural dye obtained from the walnut green (*Juglans regia*) husk used to extract dye using aqueous extraction technique. The dyeing conditions were 1:30 M:L ratio, 50°C, 60°C, 70°C dyeing temperature and 30, 40, 50 minutes of dyeing time. The cotton fabric samples were dyed with extracted walnut green husk dye solution and the effects of temperature and time were exhibited. The cotton fabric samples dyed with the WGH exhibited higher colour strength (K/S) values were observed at lower dyeing time and dyeing temperature. The cotton fabric samples dyed with the WGH exhibited good washing fastness properties. So, it can be concluded from the study that a natural dye could help ecologically sustainable dyeing process for cotton textiles and highlights the potential of walnut green husk, an agricultural waste product as a sustainable natural dye source.

Keywords: *Natural dyeing, Walnut (*Juglans regia*), Extraction, Sustainability, Cotton fabric*

Abstract ID 8091

Estimation of Correlation and Path Coefficients in Brinjal (*Solanum melongena* L.)

Nikhil Priyadarshi, K.N. Shah, D.K. Rana, Abhay Singh and Sweta Kumari*
Department of Horticulture, HNBGU Srinagar-246174, Uttarakhand India

Abstract

A field trial was conducted to estimate the correlation and path coefficient analysis in brinjal (*Solanum melongena*) at Horticultural Research Centre, H.N.B. Garhwal University, Srinagar, Uttarakhand during the summer season, 2025. The experiment was laid out in a Randomized Block Design with three replications. The experimental material consisted of thirty-four genotypes which was evaluated for sixteen quantitative traits of different growth, flowering, yield and quality parameters. The analysis revealed that genotypic correlation coefficients were generally higher than phenotypic correlations, indicating strong genetic association with minimal environmental influence. Yield per plot exhibited significant positive association with number of pickings (0.940**), average fruit length (0.398**) and plant height at 30 days (0.252*), while negative association was observed with days to 50% flowering (-0.173NS) and ascorbic acid content (-0.129NS). Path coefficient analysis indicated that number of pickings exerted the highest positive direct effect on yield per plot at both phenotypic (0.906) and genotypic (0.982) levels, followed by average fruit weight (0.442) and days to first flowering (0.229). In contrast, average fruit volume and days to 50% flowering showed negative direct effects on yield. Some traits showed low direct effects but contributed indirectly through important yield components. The residual effect at phenotypic (0.274) and genotypic (0.052) levels indicated a comparatively higher environmental influence at phenotypic level. Therefore, selection based on number of pickings, average fruit weight and days to first flowering would be effective for improving yield in brinjal.

Keywords: *Brinjal, Correlation, Genotypic, Phenotypic and Yield.*

Abstract ID 8092

Plant-Derived Antimicrobials and Nanotechnology: A Sustainable approach to Combat the Global increase of Drug-Resistant Pathogens.

Simran , Shikha Devi

Department of Microbiology, Himachal Pradesh University Summerhill, Shimla

Abstract

The worldwide rise of multidrug-resistant pathogens such as multidrug-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococci* (VRE), multidrug-resistant tuberculosis (MDR-TB), and carbapenem-resistant *Enterobacteriaceae* (CRE) is a significant problem to modern medicine. Traditional synthetic antimicrobials were initially efficacious but frequently induce adverse effects and expedite the emergence of resistance. On the other hand, medicinal plants have a wide range of bioactive secondary metabolites, such as alkaloids, flavonoids, terpenoids, tannins, and saponins, that have broad-spectrum antimicrobial activity and minimal toxicity. Recent progress in green nanotechnology has further enhanced the therapeutic potential of plant-derived compounds by allowing for the eco-friendly development of nanoparticles that have better pharmacokinetics and exhibits enhanced synergistic effects with conventional antibiotics. This review brings together the latest research on phytochemical diversity, how their antimicrobial mechanisms, and how nanoparticles can be used to deliver them. It also discusses the ecological and economic effects of plants on a large scale. To responsibly use plant-derived antimicrobials as a long-term solution to antimicrobial resistance, this study suggests integrated recommendations for sustainable cultivation, standardized protocols for nanoparticle synthesis, and collaboration between different fields.

Keywords: *multidrug-resistant pathogens, green nanotechnology, secondary metabolites, pharmacokinetics, MRSA.*

Abstract ID 8093

Assessment of Genetic Variability and Trait Interrelationships Among Yield in Chilli (*Capsicum annuum L.*)

Sweta Kumari, K.N. Shah, D.K. Rana, Abhay Singh*, Shailesh Goyam
Department of Horticulture, HNBGU Srinagar-246174, Uttarakhand India

Abstract

The present investigation was conducted to assess the genetic variability and trait interrelationships that influenced the yield in chilli (*Capsicum annuum L.*) at Horticultural Research Centre, H.N.B. Garhwal University, Srinagar, Uttarakhand during the summer season, 2025. During the investigation, eighteen diverse genotypes were collected from different parts of India which was laid out in a Randomized Block Design with three replications for twelve quantitative characters. The result revealed that, all the collected germplasms were found to be diverse. In all the cases the PCV was higher than the GCV indicating high environmental influence. High heritability coupled with high genetic advance as per cent of mean was observed in fruit length (99.76%, 93.81%), number of fruits per plant (99.18%, 104.02%) and yield per hectare (69.70%, 58.77%), indicating the predominance of additive gene action and effectiveness of selection. Genotypic correlations were generally higher in magnitude, where yield showed strong positive association with fruit length (0.381**), primary branches (0.508**), secondary branches (0.360**) and number of fruits per plant (0.319*). However, the phenotypic correlation analysis revealed that yield per plant had significant positive association with plant height (0.272*), fruit length (0.317*), primary branches (0.357**) and secondary branches (0.350**). Path coefficient analysis indicated that most traits had low direct effects, while indirect effects played a major role in yield determination. However, number of fruits per plant and branching traits contributed positively towards yield, whereas flowering traits exhibited negative direct and indirect effects. Thus, selection based on fruit number and branching traits would be effective for improving yield in chilli.

Keywords: *Chilli, Correlation, Genetic, Path and Variability.*

Abstract ID 8094

Eco-Friendly Development of Water-Soluble Metallic Nanoparticles from Medicinal Plant Extracts: Antimicrobial, Cytotoxic, Enzyme Inhibition, Phytochemical, and Antioxidant Properties

Simran Chauhan and Shikha Devi

Department of microbiology, Himachal Pradesh University Summerhill, Shimla -171005.

Abstract

Antimicrobial resistance (AMR) is a significant global health issue that requires long-lasting therapeutic interventions. Nanoparticles have special physical and chemical properties, but traditional chemical synthesis often uses dangerous chemicals and processes that harm the environment. Green synthesis that uses medicinal plants as natural reducing and capping agents is an eco-friendly and biocompatible way to make nanoparticles that contain bioactive phytochemicals. This review describes how to produce nanoparticles from plants, from proving the plant material and preparing the extract to transforming metal salts into stable, water-soluble nanoparticles. Optimizing synthesis parameters and characterizing them with UV–Vis spectroscopy, FTIR, TEM, DLS, and XRD assures that they can be repeatedly performed and their structure is accurate. Biological assessments exhibit extensive antimicrobial properties, targeted cytotoxicity, enzyme inhibition and a strong ability to fight free radicals. Phytochemical profiling shows that flavonoids, phenolics, and terpenoids are important for bioactivity. Comparative studies validate that green-synthesized nanoparticles exceed chemically produced equivalents in biocompatibility, sustainability, and diminished toxicity. Structure activity relationships connect changes in the spectrum to enzyme inhibition and the choice of metal to processes like generating reactive oxygen species and breaking into membranes. The results highlight their promise as antibiotic adjuvants and enzyme-targeted antimicrobial agents, while acknowledging obstacles such as scalable production, standardized synthesis protocols, and in vivo pharmacokinetic studies. Plant-mediated nanotechnology represents a promising frontier in the fight against AMR, connecting sustainable synthesis with biomedical innovation

Keywords: *Antimicrobial resistance (AMR), phytochemicals, Metallic Nanoparticles, cytotoxicity, therapeutic interventions, green synthesis, Plant-mediated nanoparticles, flavonoids, phenolics, terpenoids, reactive oxygen species (ROS), antibiotic adjuvant, and biocompatibility.*

Abstract ID 8095

Smart Farming's Transformative Role in Modern Agriculture

Antima

B.sc Agriculture Shree Guru Ram Rai University Dehradun; Mail id – antimaydv070@gmail.com

Abstract

Smart farming is revolutionizing agriculture with cutting-edge technologies that boost productivity, efficiency, and sustainability. By harnessing tools like sensors, satellite imaging, automation, and data-driven systems, farmers can monitor and manage operations in real-time, making informed decisions on irrigation, fertilization, pest control, and crop health. This approach addresses global challenges like population growth, climate change, and resource scarcity, enhancing crop yields, quality, and labor efficiency while minimizing environmental impact. Smart farming optimizes input use, reducing waste and conserving resources like water, fertilizers, and pesticides. IoT, AI, and machine learning analyze vast agricultural data, predicting weather patterns, detecting diseases early, and improving farm management. Mobile platforms empower farmers with access to information, financial services, and market linkages, bridging the gap between rural areas and global markets. Despite its benefits, smart farming adoption faces hurdles like high initial costs, technical knowledge gaps, and limited rural infrastructure. Supportive policies, training programs, and investments in digital infrastructure are crucial for widespread adoption, particularly in developing regions. Ultimately, smart farming plays a vital role in modern agriculture, driving productivity, sustainability, and global food security. By leveraging technology, farmers can meet growing demands while minimizing environmental footprint, ensuring a more resilient and sustainable food system for the future.

Abstract ID 8096

Hatching Success and Early Larval Development Following Captive Spawning of the Siamese Fighting Fish, *Betta splendens*, in a Controlled Aquarium Environment

Prerna Dhyani¹, Mohammad Faisal¹, Shagun Lodhi¹

¹School of Agriculture, Forestry and Fisheries, Jigyasa University, Dehradun, Uttarakhand, 248011

Abstract

A study was undertaken in the month of May 2024 to document the captive breeding of *Betta splendens* under controlled aquarium conditions. The observations were recorded from pre-spawning conditioning to post-hatch fry development. Following a two-week conditioning period, a single breeding pair was introduced in the breeding tank. The male successfully constructed a bubble nest, and spawning was observed and recorded. Immediately after egg deposition and fertilisation, the female was removed and kept in the other tank. Approximately 100-150 eggs were deposited during the spawning event. Eggs were tended and taken care exclusively by the male under monitored water quality parameters, 27°C temperature, pH 6.8, 0 ppm ammonia, and 0 ppm nitrite. Hatching occurred two days post-spawning, with a hatching success rate of approximately 75%. Observations on the spawning behaviour, bubble nest characteristics, parental care, egg development, and early larval morphology were recorded. The results confirmed that *B. splendens* can be successfully bred in small-scale captive aquarium conditions with appropriate environmental and behavioural management protocols being followed.

Abstract ID 8097

Influence of Novel Bio-stimulants on Growth Dynamics, Root Yield and Quality Attributes of Carrot cv. Pusa Nayan Jyoti

Ankit Yadav, K.N. Shah, D.K. Rana, V. Singh & Pragya Pancholi
Department of Horticulture, HNBGU, Srinagar, Uttarakhand-246174

Abstract

Increasing concerns over excessive use of chemical fertilizers have emphasized the need for sustainable alternatives such as bio-stimulants to enhance crop productivity and quality. Carrot (*Daucus carota* L.) is a highly nutritive root vegetable, valued for its rich β -carotene content, antioxidant properties and significant role in human nutrition. By considering the above mention facts, the present investigation was conducted to evaluate the effect of foliar application of different novel bio-stimulants on growth, root yield and quality of carrot cv. Pusa Nayan Jyoti. The experiment was conducted during rabi season, 2025-26 at Horticultural Research Centre, Hemvati Nandan Bahuguna Garhwal University, Srinagar, Uttarakhand by using three biostimulants namely humic acid, seaweed extract and chitosan. The treatments were applied individually and in combination at different concentrations. During the experiment eleven treatments including control was laid out in a randomized block design with three replications. The results revealed that, all treatments significantly improved growth, yield and quality over control. The maximum (27.18 cm) plant height at 90 DAS was recorded under T₁ (Humic acid), while the highest (13.3) number of leaves was observed in T₅ (SWE). On the other hand, the maximum (20.17 cm) root length was recorded under T₄ (SWE), whereas the highest (103.93 g) root weight was obtained in T₆ (SWE). However, the quality parameter TSS was found highest (7.73 °Brix) under T₃ (Humic acid). Overall, combined bio-stimulant treatments exhibited superior performance, indicating synergistic effects in carrot under subtropical conditions of Garhwal Himalaya.

Keywords: *Carrot, Chitosan, Extract, Humic and Seaweed.*

Abstract ID 8098

Enhancing Seed Viability Assessment: A Multi-Approach Strategy

Kritika Jaiswal

M.Sc. (Agri), Seed Science and technology; Shri Guru Ram Rai University, Pathribagh, Dehradun

Abstract

Accurate seed viability testing is crucial for crop establishment, storage, and trade, but traditional methods can be time-consuming and uncertain. This study develops a comprehensive framework that combines physiological, biochemical, and imaging-based techniques to improve seed viability evaluation. The approach integrates rapid screening tools with confirmatory tests and clear decision criteria, using controlled storage scenarios and laboratory assays like germination testing, tetrazolium staining, and non-destructive measurements. By analyzing data with agreement metrics and multivariate models, the study aims to create a practical, tiered protocol that reduces reliance on single tests and supports faster quality control decisions. The outcome is an adaptable framework for seed science and technology, applicable across crops and storage contexts, with implications for seed certification, inventory management, and on-farm planting decisions.

Keywords: *Physiological tests, Germination and vigor testing, Biochemical tests, Tetrazolium-based viability staining, Imaging-based tests, Seed physical traits and spectral features*

Abstract ID 8099

“Effect of Sowing Methods and Levels of Phosphorus on Growth and Yield of Wheat (*Triticum aestivum* L.)”

Shagun Lodhi¹, Maneesh bhatt³, Nikita Kohli², Mohammad Faisal¹, Prerna Dhyani¹

¹School of Agriculture, Forestry and Fisheries, Jigyasa University, Dehradun, Uttarakhand, India;

²School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India.;

³School of Natural Science, Dolphin (PG) Institute, Dehradun.

Abstract

Wheat growth and yield are significantly increased by combining appropriate sowing methods with balanced phosphorus administration. A field experiment was conducted at the Agronomy Research Farm, Agriculture Department, Jigyasa University (Formerly Himgiri Zee University), Selaqui, Chakrata Road, Dehradun, Uttarakhand during the Rabi season 2021- 2022 to study the effects of sowing methods and levels of phosphorus on growth and yield of wheat. The experiment comprised of twelve treatment combinations of sowing methods (SM) and levels of phosphorus (P). Experiment was laid down in Randomized Block Design (Factorial) with twelve treatments and three replications each. There were three sowing methods SM1 (Broadcasting), SM2 (Line sowing) and SM3 (Criss-cross 20X20 cm) and four levels of phosphorus at which phosphorus was applied at P1 (No phosphorus), P2 (30 kg /ha P), P3 (60 kg /ha P) and P4 (90 kg /ha P). The significantly higher values of each growth and yield component obtained from SM3 (Criss-cross 20X20 cm) and application of phosphorus P4 (90 kg /ha P) recorded the higher crop growth and produces higher yield. The interaction between sowing methods and levels of phosphorus was found significant and produces higher growth and yield of wheat. It is therefore, suggested that sowing method i.e. Criss- cross 20X20 cm with the application of phosphorus 90 kg /ha-1 may be recommended the best treatment combination for the wheat crop.

Keywords: *Treatment, Randomized Block Design, Experiment, replication, Wheat.*

Abstract ID 8100

Growth and physiology of parasitic Sandalwood in association with host species in partly reclaimed sodic soils

Sagar Chaudhary^{1*}, Sneha Dobhal²

¹Department of Silviculture and Agroforestry, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan-173230, Himachal Pradesh, India;

²Department of Silviculture and Agroforestry, V.C.S.G. University of Horticulture and Forestry, Ranichauri-249199, Tehri Garhwal, India

Abstract

The present investigation titled “Growth and physiology of parasitic Sandalwood in association with host species in partly reclaimed sodic soils” was conducted from August 2023 to June 2024 at ICAR-CSSRI, Karnal to evaluate the influence of nine host species *Azadirachta indica*, *Psidium guajava*, *Casuarina equisetifolia*, *Melia dubia*, *Dalbergia sissoo*, *Phyllanthus emblica*, *Swietenia macrophylla*, *Punica granatum* and *Leucaena leucocephala* on two-year-old Sandalwood. The results revealed significant variation, with *Melia dubia* recording the highest host height (9.23 m) and diameter (35.49 cm), followed by *Casuarina equisetifolia* (7.91 m) and *Dalbergia sissoo* (6.89 m; 7.09 cm). Sandalwood attained maximum height with *D. sissoo* (4.53 m), highest branching with *C. equisetifolia* (15.5) and greatest biomass with *C. equisetifolia* (6.97 kg m⁻³ branch biomass; 14.10 kg m⁻³ total biomass). Combined hosts *M. dubia* + *D. sissoo* produced maximum height (4.55 m), while *P. guajava* + *C. equisetifolia* resulted in the largest diameter (3.89 cm). Leaf traits were highest with *Punica granatum* (leaf area 21.13 cm², fresh weight 0.51 mg, dry weight 0.22 mg), whereas moisture content was maximum with *Phyllanthus emblica* (66.65%). Physiological parameters of Sandalwood were highest with *D. sissoo* (photosynthesis 18.81 μmol m⁻² s⁻¹, transpiration 8.21 μmol m⁻² s⁻¹, stomatal conductance 212.96 μmol m⁻² s⁻¹), while internal CO₂ concentration was highest with *Melia dubia* (304.91 μmol m⁻² s⁻¹) and chlorophyll content with *Azadirachta indica* (31.10 μg cm⁻²). Nutrient content varied significantly, with highest nitrogen (3.52%) under *D. sissoo*, potassium (0.11%) under *Swietenia macrophylla*, iron (55.83 mg kg⁻¹) under *P. guajava*, zinc (8.28 mg kg⁻¹) under *A. indica*, manganese (10.71 mg kg⁻¹) under *L. leucocephala* and calcium (1.34%) under *M. dubia*. Soil properties were also improved under *D. sissoo* with higher pH (6.74), organic carbon (0.73%) and nitrogen (209 kg ha⁻¹). Overall, *Dalbergia sissoo*, *Casuarina equisetifolia*, *Azadirachta indica* and *Melia dubia* were identified as the most suitable hosts for enhancing growth and biomass production of Sandalwood under sodic soil conditions.

Keywords: *Sandalwood, host species interaction, sodic soils, physiological traits, nutrient dynamics,*

Abstract ID 8101

The carbon sequestration potential of *Alnus nepalensis* forest stands at different altitudes of Chopta Tungnath Region in the Garhwal Himalaya.

Smriti Joshi and Munesh Kumar*

Department of Forestry and Natural Resources, HNB Garhwal University, Srinagar Garhwal, Uttarakhand, India,; (Email: smritij475@gmail.com (SJ), muneshmzu@yahoo.com (MK))

Abstract

The Himalayas are rich in diverse vegetation, including *Alnus nepalensis*, a fast-growing, nitrogen-fixing species that prevents soil erosion, enriches soil fertility, and supports biomass production and carbon storage. Because of these characteristics, it plays an important role in restoring degraded lands and enhancing ecosystem services. This study assessed the carbon sequestration potential of *A. nepalensis* and examined how altitude-related environmental factors influence its growth and carbon storage efficiency. The research was conducted during 2023–2024 in Rudraprayag district, particularly in Chopta and Tungnath Valley (1000–2500 m). The standard sampling and analytical methods were used for vegetation and soil assessment. Associated species included *Rhododendron arboreum*, *Acer caesium*, *Quercus leucotrichophora*, *Quercus semicarpifolia*, *Quercus floribunda*, *Lyonia ovalifolia*, *Ficus palmata*, and *Pyrus pashia*. Results showed that *A. nepalensis* had the highest IVI across altitudes and formed pure stands at higher elevations. Tree volume strongly correlated with biomass and carbon components ($r = 0.956$, $p < 0.01$), indicating its importance in predicting carbon stock. Aboveground and belowground biomass was perfectly correlated, reflecting a strong biomass–carbon relationship. Tree density also showed significant correlation with carbon variables. Soil properties varied significantly with altitude. Moisture and water holding capacity were positively correlated and negatively related to pH, suggesting more acidic, moisture-rich soils at higher elevations. Soil organic carbon and organic matter were strongly influenced by moisture, while texture shifted with decreasing sand and increasing clay at higher altitudes. Overall, altitude and moisture emerged as key factors regulating biomass production and soil carbon dynamics in *A. nepalensis* forests.

Keywords: / *Biomass, Carbon, CO2 equivalent, Oxygen production, Soil organic carbon.*

Abstract ID 8102

Evaluation of Nano Urea Fertilizer for Enhancing growth, quality, yield and post-harvest Attributes in Sugarcane Plant

Anjali Sharma and Dr. Deepali Joshi

M.Sc Student, Department of Agriculture Agronomy, Dehradun Uttarakhand, India;

Principal, Department of Agriculture, HIT Dehradun Uttarakhand, India

Abstract

The increasing demand for sustainable sugarcane production necessitates the development of innovative nutrient management strategies that enhance crop productivity while minimizing environmental impacts. In this context, nanotechnology-based fertilizers have emerged as a promising alternative to conventional fertilizers due to their higher nutrient use efficiency and controlled nutrient release properties. Among these, nano urea has gained considerable attention as an advanced nitrogenous fertilizer for efficient nitrogen delivery in crop production systems. Nano urea, developed using nanotechnology, possesses an ultra-small particle size of less than 50 nm and a significantly larger surface area compared to conventional urea granules, which enhances its bioavailability and absorption efficiency in plants. Its foliar application ensures rapid uptake through leaf stomata and efficient translocation to various plant parts, thereby reducing nutrient losses through leaching, volatilization, and runoff. A 500 ml bottle of nano urea is considered equivalent to one bag of conventional urea, offering an environmentally sustainable and cost-effective alternative for nitrogen fertilization (Kumar et al., 2021). Previous studies have demonstrated that nano-fertilizers improve soil nutrient status, enhance microbial activity, and create a favourable rhizospheric environment for crop growth (Rajput et al., 2018). Research on field crops such as wheat, maize, chickpea, and mustard has shown significant yield enhancement with foliar application of nano urea in combination with reduced nitrogen doses (Lakshman et al., 2022). These findings indicate its potential role in improving growth, quality, and yield attributes. In sugarcane, which is a heavy nitrogen-feeding crop, the evaluation of nano urea assumes greater significance for enhancing vegetative growth, cane yield, juice quality parameters, and post-harvest attributes. Controlled nutrient release and improved nutrient absorption can contribute to better cane weight, sugar recovery, and prolonged post-harvest quality maintenance. Moreover, the use of nano urea aligns with sustainable agriculture by reducing environmental contamination and improving nutrient use efficiency (Liu and Lal, 2014; Kah et al., 2018). Therefore, the present review focuses on the evaluation of nano urea fertilizer for enhancing growth, quality, yield, and post-harvest attributes in sugarcane, with special emphasis on its role in sustainable nutrient management and improved crop performance.

Abstract ID 8103

Climate-Smart Agriculture & Environmental Sustainability

AmanBandhani

M.Sc.(Ag)Soil Science; Shri Guru Ram Rai University, Dehradun

Abstract

Smart farming can revolutionize agriculture with advanced technologies like sensors, automation, and data analytics, boosting productivity, efficiency, and sustainability. However, rural areas face significant hurdles in adopting these practices. High upfront costs for tech, equipment, and infrastructure make it tough for small farmers. Digital literacy is also a major issue, with many farmers unfamiliar with modern tech, making it hard to operate and maintain smart farming systems. Poor infrastructure, like shaky internet and electricity, limits implementation. Socio-economic factors like limited credit access, fragmented land, and traditional practices also hinder adoption. Farmers may resist change due to familiarity with conventional methods. Localized solutions are lacking, and policy gaps, including insufficient govt support and awareness programs, slow down the transition. Weak extension services and lack of technical support further restrict adoption. Collaborative efforts from governments, private sectors, and institutions can provide affordable solutions, training, and infrastructure to overcome these challenges. Financial incentives, subsidies, and capacity-building programs can help bridge the gap. Ultimately, addressing these hurdles is crucial for inclusive and sustainable agricultural development in rural areas. With the right support, smart farming can benefit small farmers, improve yields, and promote environmental sustainability, ensuring food security and rural prosperity.

Abstract ID 8104

Ethno-veterinary medicinal plants and their conservation for animal diseases protection at Uttarakhand State.

Mahendra Pal Singh Parmar, Reena Shah and Kiran Negi

Department of Botany R. College, Uttarkashi- 249 193 (Uttarakhand);

The people of far-flung rural areas of Uttarkashi district of Uttarakhand state still depend to a large extent upon plants and household remedies for curing veterinary ailments. The folk knowledge of ethnoveterinary medicine and its significance has been identified by the traditional communities through a process of experience over hundreds of years.; Ethno veterinary knowledge is deeply rooted in many traditional cultures and is an integral part of subsistence animal husbandry in many societies across the globe, including Nepal (1), India (3), Pakistan (4), Ethiopia (5), Romania (6), and elsewhere .; Animal husbandry is the backbone of the rural sector of the Uttarkhand and particular Uttarkashi region and development of this sector may improve the living standard of rural communities. This is evident from the occurrence of different breeds of sheep, goats, cattle, horses, mules, buffaloes and poultry etc. In these remote areas, where modern veterinary health curative systems is very poor, the traditional societies have evolved several indigenous veterinary health care practices to maintain a variety of livestock populations (Palni et al., 1998; Samal et al., 2004). Ethno veterinary medicines are used extensively and quite effectively for primary health care treatment to make domestic animals productive and healthy and their conservation may promote environment conserve soil also.;

Abstract ID 8105

Harnessing Genetic Diversity for Fodder Biomass Improvement in Maize and Teosinte Germplasm;

Mayank Tiwari¹ and N.K Singh²;

¹ Ph.D Scholar Genetics and Plant Breeding G.B Pant University of Agriculture and Technology Pantnagar Uttarakhand India 263145;

² Professor Department of Genetics and Plant Breeding G.B Pant University of Agriculture and Technology Pantnagar Uttarakhand India 263145

Abstract

Maize (*Zea mays* L.) is a widely cultivated fodder crop known for its high biomass yield and nutritional quality, playing a crucial role in supporting livestock production systems. The effective utilization of genetic diversity is essential for enhancing fodder productivity and developing superior genotypes. In this context, the present study was undertaken to explore the extent of genetic diversity and its potential for improving biomass-related traits in maize and teosinte germplasm. A total of 28 genotypes, comprising 23 maize lines and five teosinte accessions, were evaluated during Kharif 2024 at the Norman E. Borlaug Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, under a randomized block design with three replications. Analysis of variance showed significant variation among genotypes for all studied traits indicated the presence of substantial genetic diversity. Traits associated with biomass accumulation, particularly green leaf weight, green stem weight, dry stem weight, and fodder yield, exhibited considerable variability, highlighting their importance in fodder improvement. Key agronomic traits such as flowering time, plant height, leaf attributes, and stem girth demonstrated strong genetic control, suggesting their reliability for selection. Furthermore, certain biomass related traits showed a high response to selection, indicating their effectiveness in breeding programs aimed at improving fodder yield. The inclusion of teosinte germplasm provides an opportunity to broaden the genetic base and introduce novel variability into maize improvement programs. Overall, the study emphasizes the importance of harnessing genetic diversity for developing high-yielding and resilient fodder maize hybrids, thereby contributing to sustainable livestock production and agricultural systems.

Keywords: *Genetic diversity, Maize, Teosinte, Fodder biomass, livestock production*

Abstract ID 8106

"Enhancing Vegetative Propagation of *Oroxylum indicum* through Trichoderma-Mediated Root Cutting Treatment for Sustainable Conservation"

SUSHMITA UNİYAL *, A. N. SINGH², AMIT PANDEY³

¹ Forest Pathology Discipline, Forest Protection Division, ICFRE- Forest Research Institute, Dehradun;

² Indian Council of Forestry Research and Education (ICFRE), Dehradun

³ ICFRE-Institute of Forest Productivity, Ranchi

Abstract

Oroxylum indicum, commonly known as the Indian trumpet flower or Shyonaka in Ayurveda, is a valuable medicinal tree widely used in traditional formulations due to its anti-inflammatory, antioxidant, hepatoprotective, and immunomodulatory properties. It plays a significant role in the treatment of arthritis, respiratory disorders, digestive ailments, and liver diseases. Despite its importance, the species is increasingly threatened by overharvesting, habitat degradation, and poor natural regeneration, leading to a decline in its population. Natural propagation through seeds is often unreliable due to reduced viability and low germination rates. These limitations are primarily associated with seed-borne fungal pathogens that cause seed rot and damping-off, thereby affecting seedling establishment and survival. Addressing these constraints is essential for ensuring sustainable conservation and large-scale propagation. To overcome these limitations, the present study focuses on the use of root cuttings as propagules for raising planting stock through vegetative propagation. The cuttings were treated with *Trichoderma* spp., a well-known biocontrol and bioinoculant agent. *Trichoderma* suppresses pathogenic fungi through mycoparasitism, nutrient competition, and the production of antifungal metabolites, while also enhancing plant growth by improving nutrient uptake, inducing systemic resistance, and promoting root and shoot development. The experimental results highlighted that treatment with *Trichoderma* spp. particularly *T. harzianum* significantly improves sprout health and overall plantlet growth developed from treated root cuttings compared to untreated control. This approach facilitates the production of healthy and robust planting stock suitable for nursery raising and field establishment, offering an eco-friendly and sustainable strategy for conserving this economically important medicinal species.

Keywords: *Oroxylum indicum*, medicinal tree, *Trichoderma*, root cutting.

Abstract ID 8107

Regional Study of Lady Beetle Diversity in Rishikesh: Natural Allies in Pest Management

Pramod Chandra Khanduri and Pushpendra Kumar Sharma

Insect Biodiversity and Behaviour Laboratory, Department of Zoology; D.A.V. (P.G.) College Dehradun (Affiliated to HNBGU Srinagar Garhwal Uttarakhand)

Abstract

A systematic survey of lady beetles (Coleoptera: Coccinellidae) was conducted in Rishikesh, Uttarakhand, from January 2023 to December 2025 to document species composition and their predatory role in agro-ecosystems. Field sampling from agricultural habitats and associated vegetation recorded 15 species, with *Coccinella septempunctata*, *Menochilus sexmaculatus*, *Cheilomenes sexmaculata*, *Hippodamia variegata*, *Propylea dissecta*, *Coccinella transversalis*, *Micraspis discolor*, *Chilocorus nigritus*, and *Rodolia sexnotata* as the most dominant taxa. These species were observed preying on major agricultural pests including *Aphis gossypii*, *Lipaphis erysimi*, *Bemisia tabaci*, *Phenacoccus solenopsis*, scale insects, and leafhoppers. Peak species abundance was observed during March–June, coinciding with higher prey availability. Among the recorded taxa, *Menochilus sexmaculatus* and *Coccinella septempunctata* showed maximum occurrence and broad prey preference, indicating their importance in natural pest regulation. The study highlights the ecological significance of coccinellids as efficient biological control agents and supports their conservation through reduced pesticide use and adoption of sustainable pest management practices. The findings provide baseline information on the coccinellid fauna of the Rishikesh region and their role in eco-friendly pest management.

Keywords: *Coccinellidae, biodiversity, biological control, pest predators, Rishikesh.*

Abstract ID 8108

Doon Basmati Rice: A Hidden Heritage of Uttarakhand

Shivangi Negi and Rekha Dhanai

Department of Agriculture, Tula's Institute, Dehradun

Abstract

Doon Basmati rice is a traditional aromatic rice variety cultivated in the fertile Doon Valley of Dehradun in the state of Uttarakhand, India. Renowned for its unique aroma, long slender grains, soft texture, and delicate flavor, this variety has historically been considered one of the finest basmati types in the country. The exceptional quality of Doon Basmati is largely attributed to the specific agro-climatic conditions of the Doon Valley, including fertile alluvial soils, favorable temperature, abundant water resources, and traditional cultivation practices followed by local farmers. Over generations, the crop has become deeply embedded in the cultural and agricultural heritage of the region, contributing significantly to local identity and traditional farming systems. However, in recent decades the cultivation of Doon Basmati rice has declined considerably due to rapid urbanization, land-use changes, and the adoption of high-yielding hybrid varieties that offer greater productivity but lack the distinctive qualities of traditional basmati. Climate variability and increasing production costs have further discouraged farmers from maintaining this indigenous variety. As a result, this valuable genetic resource and cultural heritage crop faces the risk of gradual disappearance. The preservation and revival of Doon Basmati rice are therefore essential for maintaining agricultural biodiversity and protecting the traditional knowledge associated with its cultivation. Efforts such as promoting geographical identity, supporting farmers through incentives, and increasing market awareness can play a crucial role in conserving this unique rice variety. Recognizing Doon Basmati rice as a hidden heritage crop can help strengthen sustainable agriculture and ensure its survival for future generations.

Keywords: *Doon Basmati, Traditional, Rice, Agricultural heritage, Biodiversity, Conservation, Uttarakhand, Sustainable*

Abstract ID 8109

Precision farming for sustainable agriculture

Shruti Kumari

Uttaranchal College of science and technology

Abstract

Precision farming is an innovative approach in modern agriculture that uses advanced technologies to improve crop production while conserving natural resources. It involves the use of tools such as sensors, Global Positioning System (GPS), drones, and data analysis to monitor and manage field conditions accurately. This method helps farmers make informed decisions about irrigation, fertilization, and pest control. By applying inputs only where and when they are needed, precision farming reduces waste, lowers costs, and minimizes environmental impact, making it an important practice for sustainable agriculture. In the current scenario, precision farming is gradually gaining popularity, especially in developing countries like India. Farmers are increasingly adopting technologies such as soil moisture sensors, satellite imaging, and drones to collect real-time data about soil health, weather conditions, and crop growth. For example, soil moisture sensors help farmers determine the exact amount of water required for irrigation, preventing both overwatering and water wastage. Similarly, drones are used to monitor large agricultural fields quickly and identify pest attacks or diseases at an early stage. GPS-based systems allow accurate application of fertilizers and pesticides, reducing excess use and improving efficiency. These technologies not only increase crop yield but also protect soil fertility and reduce pollution caused by chemical overuse. Despite its benefits, the adoption of precision farming faces challenges such as high initial costs, lack of technical knowledge, and limited access to infrastructure in rural areas. However, with government support, training programs, and technological advancements, these barriers are gradually being overcome. Increasing awareness among farmers about the long-term benefits of precision farming is also encouraging its adoption. In conclusion, precision farming has a strong potential to transform agriculture by making it more efficient, productive, and environmentally friendly. In the future, with the development of affordable technologies and better farmer education, precision farming is expected to become more accessible and widely used. It will play a crucial role in ensuring food security, conserving natural resources, and promoting sustainable agricultural practices for future generations.

Keywords: *Precision farming, sustainable agriculture, crop health, natural resources*

Abstract ID 8110

Organic, Natural, and Integrated Farming Systems: Prospects and Difficulties for Agriculture in the Future

Dr. Soniya Singh, Dr. Mohd. Irfan,

Assistant Professor. Department of Botany. Motherhood University, Roorkee;

Assistant Professor. Department of Botany, Chaman Lal Degree College , Landhoura

Abstract

Climate change, soil degradation, and declining resource-use efficiency have made agricultural sustainability a global priority. Among various strategies, Integrated Farming Systems (IFS), organic farming, and natural farming have emerged as reliable alternatives to conventional agriculture. To enhance soil health and ecosystem services, organic farming emphasizes the elimination of synthetic agrochemicals and utilizes organic manures, crop rotation, bio-fertilizers, and biological pest control. By prioritizing biodiversity, soil health, and the reduction of carbon emissions, organic, natural, and integrated farming methods all offer greater sustainability compared to conventional agriculture. Natural farming adopts purely ecosystem-based approaches that require no external inputs; organic farming utilizes certified natural inputs; and integrated farming combines conventional and organic methods to achieve higher yields with minimal environmental impact. Natural farming, grounded in ecological principles, promotes the utilization of on-farm resources—such as mulching, microbial inoculants, and cow-based formulations—to enhance soil fertility and reduce production costs, while simultaneously minimizing reliance on external inputs. In contrast, integrated farming systems interlink crop cultivation, animal husbandry, aquaculture, horticulture, agroforestry, and other allied activities in a manner that ensures the optimal utilization of resources, boosts income, and guarantees year-round employment for farming families. Overall, these farming systems contribute to maintaining soil fertility, enhancing biodiversity, and reducing greenhouse gas emissions. In conclusion, organic, natural, and integrated farming systems offer an ecologically sound, economically viable, and socially acceptable pathway for the agriculture of the future. To facilitate the large-scale adoption of these systems, it is crucial to strengthen research-extension linkages, foster capacity building among farmers, and ensure the implementation of supportive policies.

Keywords: *Integrated Farming Systems (IFS), Natural farming, Horticulture, microbial inoculants.*

Abstract ID 8111

Unveiling a New Host Record of *Curvularia pseudobrachyspora* from *Dalbergia sissoo*

Srishti Manikpuri, Dr Amit Pandey, Dr Shailesh Pandey

Forest Pathology Discipline, Forest Protection Division, Forest Research Institute, Dehradun

Abstract

Abstract- *Dalbergia sissoo* Roxb. (Shisham) is a commercially and ecologically important timber-yielding species in the Indian subcontinent, widely used in agroforestry, furniture, and afforestation programs. In recent times, severe decline and mortality of Shisham have been reported across northern India, often linked to biotic stressors including fungal pathogens. This study reports the occurrence of *Curvularia pseudobrachyspora* as a foliar pathogen on *Dalbergia sissoo* Roxb. (Shisham) for the first time from the central forest nursery at the Forest Research Institute (FRI), Dehradun, India. Necrotic lesions were prominent on mature leaves, prompting a mycological investigation. Based on detailed morphological characteristics and phylogenetic analysis of the translation elongation factor 1-alpha (TEF1- α) gene, the pathogen was identified as *Curvularia pseudobrachyspora*. Pathogenicity of the isolate was confirmed through controlled inoculation and re-isolation, thereby fulfilling Koch's postulates. This study represents the first confirmed report of *C. pseudobrachyspora* as a foliar pathogen of Shisham in India. Given the growing reports of Shisham mortality, this finding highlights the importance of monitoring emerging pathogens in forest nurseries and developing effective disease management strategies.

Keywords: *Curvularia pseudobrachyspora*, *Dalbergia sissoo*, foliar pathogen, TEF1- α , forest nursery, India.

Abstract ID 8112

Yield and quality enhancement of French bean (*Phaseolus vulgaris*) genotypes by using bio-priming agents: Empowering Uttarakhand women through economic inclusion

Anita Trivedi, Girish Chandra

Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun 248 001, Uttarakhand, India

Abstract

Diverse French bean landraces from Uttarakhand have enormous potential to raise farmers' incomes, especially for women in self-help groups (SHGs) who want to be economically included through sustainable agriculture. Eco-friendly bio-priming methods can increase quality and yield, allowing women-owned businesses to produce value-added goods like rajma. In order to investigate the impact of bio-priming on growth, yield, and seed quality, this study examined eight local landraces from Uttarakhand regions. *Pseudomonas fluorescens* + *Trichoderma viride* (T1), *Aconitum heterophyllum* (T2), and control (T0) were the treatments. The results showed that bio-priming significantly increased growth, yield, and quality. Harshil Rajma (V2) shown minimal days to 50% field emergence and blooming, whereas T1 performed better than T2 and T0. In terms of pods per plant, seed output per plant, and per plot, Chakrata Rajma (V7) performed exceptionally well. In terms of seed quality, T1 produced the highest germination rate (95.16%), seedling length (21.81 cm), dry weight (0.80 g), vigour Index-I (2075.44), and vigour index-II (76.12), whereas T0 produced the lowest. With 91.55% germination, 22.01 cm seedling length, 0.83 g dry weight, vigour Index-I (2015.01), and vigour index-II (75.98), Chakrata Rajma was the top landrace. All things considered, bio-priming Chakrata Rajma with T1 provides high-output, sustainable farming in Dehradun, empowering Uttarakhand women through resilient livelihoods and SHG-led economic inclusion.

Keywords: *Bio-priming, seed yield, women empowerment, French bean, Uttarakhand landraces*

Abstract ID 8113

Impact of weather parameters on crop growth and development of capsicum in mid-hills of Himachal Pradesh

*Prakriti Dadial **, *MS Jangra*¹, *SK Bhardwaj*¹, *Purnima Mehta*¹, *Kartikey Sahil*¹ and *Nitin Sharma*²

¹Department of Environmental Science,

²Department of Basic Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP)173230

Abstract

The present study was conducted during kharif seasons of 2024 and 2025 at Experimental Research Farm of the Department of Environmental Science to analysed the impact of weather parameters on crop growth and development of capsicum in mid-hills of Himachal Pradesh. The experiment was laid out in a randomized block design with three replications under different transplanting dates, irrigation levels, and cultivars. Daily meteorological parameters including maximum and minimum temperature, relative humidity, sunshine hours and rainfall were recorded. Correlation analysis was performed using R software to quantify the associations among growth parameters, thermal indices and yield. Results revealed strong positive correlations of yield with plant height, leaf area index, dry matter accumulation, heat use efficiency, accumulated growing degree days and fruit number during the study period. While elevated maximum and minimum temperatures showed negative associations with yield particularly during reproductive stages. The findings highlighted the critical influence of stage-specific thermal conditions and morphological efficiency on capsicum productivity under mid-hill conditions.

Keywords; Correlation, growth, physiological parameters, quality parameters, yield

Abstract ID 8114

Agro-Entrepreneurship and Value-Added Innovations for Sustainable Rural Change in India

Abhinav Singhal¹, Abhishek Maurya¹, Ritu Pal¹ & Sugam Gupta²

¹Dept. of Computer Science & Engg. Tula's Institute, Dehradun, Uttarakhand, India;

²Dept. of Applied Science & Humanities, Tula's Institute, Dehradun, Uttarakhand, India

Abstract

The emergence of agro-entrepreneurship offers an important strategy for making Indian agriculture more sustainable, integrated and innovative; particularly in rural regions where livelihoods are increasingly dependent upon the success of small-scale farmers. This paper explores how the provision of value-added innovations (e.g., farm-level processing, brand-based marketing of niche products, organised marketing channels and digital advisory services) enable both farmers and young people living in rural areas to take a greater proportion of the added value generated by their agricultural activities, relative to the raw produce they have grown or harvested. Specifically, this research investigates the ways in which locally based agro-processing hubs, producer cooperatives and start-ups can contribute to reducing waste at the point of harvest, providing a stable and predictable level of income to farmers and creating new employment opportunities for women and young people outside of the traditional agricultural sector. In addition, this research identifies key elements of the ecosystems that enable these types of agro-enterprise to operate effectively; notably, access to relevant technology, business and extension support, market intelligence and financial capital. These ecosystems include public-private-community partnerships that provide support to producers who are developing high-value market links, while also conserving environmental resources within their respective locales. However, there are also significant challenges associated with promoting the growth of these types of enterprises; most notably, poor-quality rural infrastructure, food safety and quality issues related to the supply chain, as well as limitations on the range of entrepreneurial skills available to potential entrepreneurs. Overall, this research suggests that the promotion of agro-entrepreneurship in relation to value-added products and services has the potential to create transformational changes in rural areas from places primarily engaged in subsistence agriculture to thriving centres of agri-business and innovation; ultimately leading to enhanced levels of income and employment among rural populations consistent with India's long-term goal of achieving a "Sustainable Future India."

Keywords: *Agro-entrepreneurship; Value-added agriculture; Agro-processing; Rural livelihoods; Agricultural value chains; Employment of rural youth and women; Sustainable rural development.*

Abstract ID 8015

Bovine Colostrum Composition and its Importance in Human Food

Prem Singh Verma¹, Pankaj Singh Negi, Ashesh Upadhayay, Shivendra Mishra

¹Dept. of Agriculture, Tula's Institute, Dehradun (Uttarakhand)

Abstract

Colostrums, the initial mammary gland secretion after birth, supply all of the nutrients a newborn needs on their first day of life and have effects that last far beyond these first few hours. Due to the high amounts of bioactive proteins, vitamins, minerals, growth factors, free and conjugated oligosaccharides, and bioactive proteins in colostrum from cows, it has been used for human consumption. The steps taken to prepare cow colostrum for human consumption are crucial in keeping and sustaining the bioactive compounds' activity. Bovine colostrums are multipurpose nourishment for human health, so analysing the primary methods used to prepare it with both benefits and drawbacks is an important topic to cover. We talk about the main factors that affect how colostrums are produced.

Keywords: *Colostrums, Immunoglobulin, thermal processing, drying methods, human consumption*

Abstract ID 8116

Studies on fodder resources and ethnoveterinary practices prevalent in Kinnaur region of Himachal Pradesh

Funchok Norbu Negi

Department of Silviculture and Agroforestry, Dr. Y.S. Parmar University of Horticulture and Forestry

Abstract

The present investigation entitles “Studies on fodder resources and ethnoveterinary practices prevalent in Kinnaur region of Himachal Pradesh” was carried out in Kalpa and Pooh block of Kinnaur, Himachal Pradesh during 2021-2022 with the objectives viz. to analyze the nutritive content of important fodder resources in Kinnaur region of Himachal Pradesh and to document the existing ethnoveterinary practices adopted by local farmers in Kinnaur region of Himachal Pradesh. The composite samples of extensively used grasses, legumes and fodder tree leaves were collected in month of September (2021) and May (2022) to analyze the different nutritional parameters. A multistage random sampling was done to document the ethnoveterinary practices followed in Kalpa and Pooh block of Kinnaur, in which a total of 72 respondents were chosen for obtaining information on ethnoveterinary practices. The present study revealed that the nutritional attributes of different fodder species varied markedly among different category of samples. Dry matter content (DM%) 55.12 per cent was recorded highest in the leaves of *Quercus semecarpifolia* while minimum 29.71 per cent in *Medicago falcata*. Crude protein per cent (CP%) was found highest 23.83 per cent in case of *Medicago falcata* and lowest 6.63 per cent in *Lactuca serriola*. The highest 6.36 per cent ether extract (EE%) was found in *Malva palviflora* and lowest 1.63 per cent in *Convolvulus arvensis*. The crude fibre content (CF%) was recorded maximum 37.47 per cent in *Quercus semecarpifolia* and minimum 19.51 per cent in *Medicago sativa*. The neutral detergent fibre (NDF%) was found highest 55.26 per cent in *Quercus semecarpifolia* and lowest 32.37 per cent in *Rumex nepalensis*. The acid detergent fibre (ADF%) was recorded maximum 43.74 per cent in *Quercus semecarpifolia* and minimum 27.78 per cent in *Rumex nepalensis*. The total ash content was found highest 13.54 per cent in *Malva palviflora* and lowest 4.13 per cent in *Quercus semecarpifolia*. The acid insoluble ash per cent (AIA%) was found highest 4.86 per cent in *Malva palviflora* and lowest 1.67 per cent in *Lactuca serriola*. The nitrogen free extract per cent (NFE%) was recorded maximum 56.10 per cent in the *Salix daphnoides* and minimum 41.26 per cent in *Quercus semecarpifolia*. The use value in case of ethnoveterinary practices it was found highest in case of *Rumex nepalensis* (UV=0.80) followed by *Salix daphnoides* (UV=0.76) and *Heracleum lanatum* (UV=0.72). The lowest use value was observed in *Eremurus himalaicus* (UV=0.34). The fidelity level (%) was found highest in *Eremurus himalaicus* (100%) which was used to increase the milk production in animals. was found lowest in case of *Rumex nepalensis* (15.51%) which was used for the treatment of gastrointestinal diseases, boils and insect bite in animals. The highest informant consensus factor (ICF) was found in case of high-altitude sickness (1) and foot and mouth disease (1) and lowest in parasite related problems (0.85).

Keywords: *Ethnoveterinary, fodder, use value, fidelity level, informant consensus factor*

Abstract ID 8117

Title: Integrated Environmental Assessment of Climate Stress, Resource Degradation, Waste Dynamics, and Biodiversity Decline for Sustainable Agricultural Systems

Dr. Neha Uniyal

Assistant Professor; Department of Journalism and Mass Communication; Tula's Institute, Dhoolkot, Dehradun, Uttarakhand, 248001

Abstract

Environmental sustainability in agriculture is being compromised by rising climate stress, depletion of natural resources, waste accumulation, and rapid biodiversity depletion. Addressing these interconnected pressures is critical to sustaining long-term ecological balance and agricultural production. This research seeks to offer an integrated environmental assessment backed by three core objectives, i.e. to consider the role of climate variability in agricultural stability and ecosystem functioning; to scrutinize natural resource degradation, considering, first, the health of soils, water and vegetation; and, second, to investigate loss of biodiversity with an emphasis on the vulnerability of plant species. The methodology consists of a structured synthesis of both scientific literatures, the environmental databases and ecological datasets and global monitoring platforms. Climate impacts are evaluated by using trend evaluation of temperature anomalies, rainfall variability, drought frequency, and extreme weather events. Natural resource degradation using compiled data sets on soil organic carbon loss, groundwater depletion, erosion indicators and land use transition. Biodiversity assessment is based on species distribution data, conservation status, and habitat fragmentation data obtained from botanical and biodiversity databases. Waste dynamics, i.e. agricultural residues, chemical contaminants, and non-biodegradable pollutants are studied through environmental quality reports and recorded ecological studies. Findings suggest that increasing temperature extremes, erratic precipitation and increasing climatic disruptions are reducing the balance of soil moisture, affecting crop responses and decreasing ecosystem resiliency. Resource degradation patterns show declining soil fertility, reduced vegetative cover and impaired water systems in many agroecological regions. Biodiversity assessment reveals accelerated plant species vulnerability linked to habitat loss, agricultural intensification and pressure from chemicals. Waste synthesis poses the increasing environmental costs of persistent agrochemical residues and unmanaged agricultural waste flows. Overall, this integrated assessment shows that building greater ecological balance by revamping resource-efficient practices, improving environmental management and protecting biodiversity is essential in preserving agricultural systems in changing environmental conditions.

Keywords: *Sustainable Agriculture, Ecosystem Resilience, Climate Variability, Biodiversity Loss*

Abstract ID 8118

Soil Health, Water Management & Natural Resource Conservation

Anshit Verma

M.Sc. (Soil science) Shri Guru Ram Rai University Dehradun;

Abstract

The term soil quality and soil health are often used interchangeably in the scientific literature and popular articles, with agricultural and environmental scientists in general preferring the term soil quality and farmers or producers preferring the term soil health. Some others prefer the term soil health because it depicts soil as a living, dynamic organism that functions holistically rather than as an inanimate or non-living mixture of sand, silt and clay. Others prefer the term soil quality as descriptor of its innate quantifiable physical, chemical and biological characteristics. Soil quality is the capacity of soils within landscapes to sustain biological productivity, maintain environmental quality and promote plant and animal health. On the other hand, soil health is the ‘fitness’ (or condition) of soil to support specific uses (e.g. crop growth) in relation to its potential as determined by the inherent soil quality and is more sensitive to anthropogenic disturbance and is severely limited in extreme environments. Both of these terms relate soil to other concepts of health such as environmental health, human health, plant health, and animal health. Soil health and soil quality are functional concepts that describe how fit the soil is to support the multitude of roles that can be defined for it. Therefore, soil quality can be regarded as soil health.

Abstract ID 8120

Environmental sustainability in agriculture

Dr. Richa Punetha

Deptt. of Botany, PNG Govt PG College Ramnagar Nainital (Uttarakhand)

Environmental sustainability in agriculture focuses on producing food while protecting natural resources, reducing pollution and preserve biodiversity through techniques like conservation, tillage, Crop rotation and integrated pest management. It promotes long term ecological balance, soil health and H₂O efficiency, aiming to reduce chemical Reliance and increase resilience to climate change. Key elements and practices for sustainable agriculture include- soil management, H₂O conservation, biodiversity enhancement, integrated pest management energy and resource efficiency. A comprehensive look at the Food and Agricultural Organization's (FAO)- view on environmental sustainability in agriculture highlights the critical need for innovation and the transition towards methods that reduce pollution and conserve natural resources. Agricultural production is a key driver of resource use and agricultural practices directly affect natural resources and ecosystem services. Soil degradation- the diminishing capacity of the soil to provide ecosystem goods and services is also worsening due to unsustainable agricultural practices, overgrazing, deforestation and improper land use. Agricultural expansion is a leading cause of deforestation Agricultural production of cattle, soybeans and palm oil accounted for 40% of the Tropical deforestation between 2000 and 2010. Sustainable agriculture is defined along the three dimensions of sustainable development namely environmental health, profitability and social and economic equity. Sustainable agriculture is farming in such a way to protect the environment and expand natural resources and to make the best use of non- renewable resources. There are many practices commonly used by people working in sustainable food systems. H₂O resource management plays a central role in sustainable agriculture This aims to optimize H₂O use while preserving this important resource. In addition rain H₂O harvesting and storage can reduce dependence on external H₂O sources, promoting more autonomous and sustainable management

Keywords: *tillage, H₂O efficiency, soil management, ecosystem, deforestation, biodiversity*

Abstract ID 8121

Response of Okra [*Abelmoschus esculentus* (L.) Moench] to Different Levels of Boron and Zinc under Field Conditions

Madhuri Bhatt, Lalit Bhatt and Mahima Sanodiya

Department of Vegetable Science, G.B. Pant University of Agriculture and Technology, Pantnagar-263145, Udham Singh Nagar (Uttarakhand)

Abstract

Okra (*Abelmoschus esculentus* (L.) Moench) is an important vegetable crop it is an annual vegetable belonging to the family Malvaceae. widely cultivated in tropical and subtropical regions, with significant nutritional and economic value. The productivity of okra is often constrained by micronutrient deficiencies, particularly boron (B) and zinc (Zn), which are essential for various physiological and biochemical processes in plants. Keeping this in view, a field experiment was conducted during May to September 2024 at the Vegetable Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, to evaluate the effect of different levels of boron and zinc on the growth and yield of okra under open field conditions. The experiment was laid out in a randomized block design with three replications, comprising sixteen treatment combinations of boron and zinc applied at varying doses. The results revealed that the application of boron and zinc significantly influenced vegetative growth parameters as well as yield attributes of okra. Improved plant height and yield were observed with the combined application of these micronutrients compared to control. The positive effects may be attributed to the role of boron in cell division and translocation of sugars, and zinc in enzymatic activity and nutrient uptake. The Zinc (Zn) and Boron (B) in Indian soils was most prevalent which are important in seed formation and seed quality. Boron is required for proper development and differentiation of plant tissues. If boron deficiency occurs, the assimilated product accumulates in the leaves and the young growing point lacks sugar. Maximum production of starch and sugar is restricted if crops are inadequately supply with boron. Zinc mainly functions as the metal component of a series of enzymes. Zinc application also helps in increasing the uptake of nitrogen and potassium. It can be concluded that the balanced application of boron and zinc plays a crucial role in enhancing growth and yield of okra, and their optimum use can be recommended for improving productivity under similar agro-climatic conditions.

Abstract ID 8122

MOLECULAR CHARACTERIZATION OF YELLOW MOSAIC DISEASE- ASSOCIATED VIRUSES AND THEIR IMPACT ON YIELD IN PIGEONPEA (*Cajanus Cajan L.*) IN SEHORE DISTRICT OF MADHYA PRADESH

Sonu Saurav^{1*}, *Moly Saxena*², *Mohammad Akram*³, *D. R. Saxena*², *Deepender Kumar*³

¹ School of Agriculture Science, Sandip University, Madhubani, Bihar- 847235, India

² Department of Plant Pathology, R. A. K. College of Agriculture, Sehore- 466001, India

³ Division of Crop Protection, ICAR-Indian Institute of Pulses Research, Kanpur 208024, India

Abstract

Yellow Mosaic Disease (YMD) is the major constraint of legume crops that realise high productivity worldwide. Twelve causal viruses of YMD were reported in legumes; out of them, the four major viruses causing YMD are Mungbean Yellow Mosaic Virus (MYMV), Mungbean Yellow Mosaic Indian Virus (MYMIV), DoYMV (Dolichos Yellow Mosaic Virus) and Horsegram Yellow Mosaic Virus (HgYMV). Besides, mungbean and urdbean, pigeonpea also got infected by the YMV groups of viruses. The major symptoms observed on the pigeonpea plants were the yellow mosaic patches on trifoliolate leaves, complete yellowing, necrotic lesions, stunted growth, defoliation of immature pods and leaves and losses in yield. The percentage disease incidence of YMD in pigeonpea based on a rowing survey in the Sehore district of Madhya Pradesh ranges from 1 to 5%. The yield loss assessment due to YMD infection in pigeonpea ranged from 12 to 21%, depending on disease severity. The molecular characterization of YMD-causing viruses using species-specific primers-based PCR detection in the five samples from Sehore (MP) shows the predominant presence of MYMIV as a causal agent of YMD in pigeonpea. The DNA-A and DNA-B from the respective samples, after being sequenced and analyzed through the NCBI database using BLAST, show that the phylogenetic relationship of the MYMIV viruses falls in the MYMIV cluster infecting mungbean. This close genetic relationship confirms the identification of MYMIV as the predominant strain affecting pigeonpea in the studied regions. These findings align with global sequence data, providing further validation for molecular characterization and emphasizing the importance of MYMIV in YMD outbreaks. This study contributes valuable genetic insights for future research and virus management strategies in pigeonpea.

Keywords: *MYMIV, MYMV, Begomovirus, Yellow Mosaic Disease, Legumes, YMV*

Abstract ID 8123

Vase life of gerbera flower

Hema Rawat¹ and Anita Trivedi²

¹ Department of Agriculture (Horticulture), Uttaranchal University, Dehradun, Uttarakhand, India

² Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand, India;

Abstract

Gerbera (*Gerbera jamesonii* Hook) popularly known as Transvaal daisy, belongs to the Asteraceae family. It is a perennial plant native to South Africa and some parts of Asia. It is one of most important cut flowers in the world. The naturally short vase life of the cut gerbera flowers is one of the most important problems. The using of different treatments is recommended to keeping quality and extending the vase life of cut gerbera flowers. Life of cut gerbera flowers increased by using chemical preservatives to the holding solution to prolong the vase- life of cut gerbera flowers and also use suitable concentrations of organic acids such as salicylic acid, citric acid and ascorbic acid. Research studies have shown that the highest fresh weight of flower heads (7.3 g), fresh weight of stems (4.2 g), zero stem bending percentage and the maximum vase life (16 day) were obtained in the treatment containing sucrose 2 % + vinegar 0.6 % + CaCl₂ 1 % in distilled water (W.A.N.T et al., 2013) followed by cv. ‘Salvador’ (14.33 days) in 15 ppm AgNO₃ plus four per cent sucrose and screening of gerbera cultivars for vase life, the longest vase life exhibited by the cultivars Dune (15.67 days) followed by Winter Queen (14.47 days) and Dana Ellen (14.4days) (Kumar et al. 2013).

Keywords: *Vase life, Preservatives, Organic acids, Salicylic acid, Citric acid and Ascorbic acid.*

Abstract ID 8124

A Study on Export Potential and Challenges of Indian Agricultural Products in Global Markets

Pratik N. Moghe

Assistant Professor(CHB),; Department of Agriculture Business Management,;
School of Agriculture Business Management(SABM),Nagpur; Dr.P.D.K.V,Akola

Abstract

Agriculture plays a vital role in the Indian economy, contributing significantly to employment, GDP, and foreign exchange earnings. In recent years, India has emerged as a key exporter of agricultural products such as rice, spices, tea, coffee, fruits, and vegetables. The growing demand for organic, processed, and value-added agricultural products in international markets presents substantial opportunities for expanding India's agri-export sector. This study, titled "A Study on Export Potential and Challenges of Indian Agricultural Products in Global Markets," aims to analyze the current export performance of Indian agricultural commodities and identify potential growth areas in the global market. The research focuses on evaluating key export destinations, product competitiveness, and emerging trends influencing global agricultural trade. The study also highlights major challenges faced by Indian exporters, including inadequate infrastructure, lack of cold chain facilities, stringent international quality standards, price fluctuations, and complex regulatory frameworks. Additionally, issues such as supply chain inefficiencies, limited access to market information, and financial constraints among small and marginal farmers are examined. The research is based on both primary and secondary data. Primary data is collected through surveys and interviews with exporters, farmers, and agribusiness stakeholders, while secondary data is sourced from government reports, export statistics, and published research articles. The findings of the study aim to provide insights into improving export competitiveness by strengthening supply chains, adopting advanced technologies, enhancing quality standards, and promoting policy support. The study concludes with strategic recommendations to boost India's position in the global agricultural market and ensure sustainable growth in agri-exports.

Abstract ID 8125

Green synthesized Nanocomposite using invasive plant extract for improving growth and physiological performance of Brassica oleracea

Shivam Kumar¹, Shubra Kala², Pooja Saklani^{1*}

¹Department of Biotechnology HNB Garhwal University Srinagar

²Department of Physics HNB Garhwal University Srinagar

Abstract

A green synthesis approach was employed for the preparation of a plant-mediated nanocomposite using aqueous leaf extract of *Ageratum conyzoides*, an invasive plant rich in bioactive phytochemicals that function as reducing and stabilizing agents during synthesis. Synthesized Nanocomposite characterized by the various technique such as Uv-vis, XRD, SEM, XPS etc. The synthesized nanoformulation was applied at different concentrations to *Brassica oleracea* to evaluate its effect on plant growth and physiological development. Morphological parameters including plant height, leaf number, root development, and biomass were assessed following treatment. In addition, biochemical attributes such as chlorophyll content and total soluble protein were analyzed to determine physiological responses. The results indicated concentration-dependent variation in growth and metabolic activity, with moderate treatments showing improved chlorophyll accumulation and enhanced protein content compared with untreated plants. These findings suggest that plant-mediated nanoformulations synthesized using invasive plant resources may offer potential as sustainable growth-promoting agents for crop improvement and agricultural applications.

Abstract ID 8126

Impact Assessment of Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) Scheme on Rural Farming Communities: A Micro-Level Study in Kirti Nagar Block, Tehri Garhwal, Uttarakhand

Aksh Tyagi

Masters Scholar, Department of Rural Technology (School of Agriculture & Allied Sciences), Hemvati Nandan Bahuguna Garhwal University, Uttarakhand (A Central University)

Abstract

The government of India launched the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) on February 24, 2019. This program provides ₹6,000 annually to eligible farming families, with three equal payments of ₹2,000 each through Direct Benefit Transfer. It was initially designed for small and marginal farmers, but it has since expanded to include all land-owning families. This evaluation of the program's effectiveness has taken place in the primarily agricultural Kirtinagar block in Tehri Garhwal district, Uttarakhand. The evaluation focuses on three objectives: 1) Study the socio-economic status of all participants, 2) Measure participants' awareness with each part of the program and 3) Evaluate expenditure pattern of the fund & to assess the Satisfaction level about the scheme. Data was collected by using a purposive convenience sampling method. The Kirtinagar block in Tehri Garhwal District was chosen for its rural-agricultural characteristics and easy access to logistical support. Eight villages were included in the sample, with 80 farmers (10 from each village). Primary data were collected through a structured questionnaire and face-to-face interviews with each farmer. According to the results, Demographically, 77.5 % were male, 87.5 % were small and marginal farmers (≤ 20 Nali land), and 71.25 % from General category. Most respondents, 78.75% were aware about the scheme, primarily from government sources. Meanwhile, 88.75% believed the scheme's implementation was fair and transparent, and there is a positive correlation between socio-economic status and awareness of the PM-KISAN scheme. Most beneficiaries, 83.75% spent most of their funds on agricultural inputs, especially for seeds (83.75%) and fertilizers (60%). In contrast, 68.75% spend their funds in household consumption. About 63.75% reported that their reliance on loans decreased, 88.75% said productivity increased, and 63.75% expressed satisfaction with the PM-KISAN scheme. Satisfaction correlated strongly with landholding size, education, caste, and perceived transparency. This micro-level evidence offers actionable insights for strengthening direct-benefit schemes and advancing sustainable rural development.

Keywords: *PM-KISAN Scheme, Beneficiaries, Awareness, Satisfaction, Expenditure Pattern, Rural Development*

Abstract ID 8127

Development of Salt Tolerant and Early Maturing Mustard Varieties Through Speed Breeding for Semi-Arid Regions of India

Vikas Jha

Assistant Professor

S.M.T School of Agricultural Sciences, Sandip University, Madhubani, Bihar

Abstract

Indian mustard [*Brassica juncea* (L.) Czern & Coss] is a critical oilseed crop for India's edible oil security, yet its productivity in salt-affected semi-arid regions remains constrained by salinity stress and terminal drought. Conventional breeding approaches typically require 8–10 years to release an improved variety, a timeline incompatible with the accelerating pace of soil salinization threatening 6.73 million hectares (mha) of Indian agricultural land, projected to expand to 16.25 mha by 2050. This paper presents a comprehensive research framework for developing salt-tolerant and early-maturing mustard varieties through speed breeding technology integrated with genomics-assisted selection. Drawing upon recent experimental evidence from high-throughput phenotyping of 250 recombinant inbred lines (RILs) screened at ECiw 12 dS m⁻¹ salinity and 210 diverse genotypes evaluated using multiple selection indices, we identify key functional traits governing salt tolerance, including Na⁺ exclusion efficiency, photosynthetic rate maintenance under stress, and intrinsic water use efficiency. The review synthesizes data demonstrating that speed breeding protocols can achieve 4–6 generations per year under controlled environments with 22-hour photoperiod regimes, reducing the variety development timeline to 2–3 years. Five elite salt-tolerant RILs (R114, R150, R164, R170, and R206) and four promising genotypes (CS 2009-159, CS 2009-420, CS 2009-124, and Swarn Jyoti) have been identified through composite selection indices as potential donors for accelerated breeding programmes. Furthermore, CRISPR/Cas9 genome editing of the BjuAOP2 gene family has demonstrated the feasibility of enhancing nutritional quality in mustard while maintaining yield parameters. The integration of speed breeding with marker-assisted backcrossing (MABC) and high-throughput phenotyping offers a viable pathway for rapidly deploying salt-tolerant, early-maturing mustard cultivars tailored to India's semi-arid agroecosystems. This framework addresses the urgent need to bridge the gap between India's domestic edible oil demand and production, currently met through imports exceeding 16 million metric tonnes (MMT) annually.

Keywords: *Brassica juncea*; Speed breeding; Salt tolerance; Early maturity; Semi-arid regions; QTL mapping; CRISPR/Cas9

Abstract ID 8128

Minimal RNA-Guided Genome Editors: TnpB and the Future of Compact CRISPR Technologies

Saksham Choudhary¹, Shweta²

¹Department of Genetics and plant Breeding, School of Agriculture, Lovely professional University, Phagwara, Punjab;

²Department of Horticulture, School of Agriculture, Lovely professional University, Phagwara, Punjab

Abstract

The identification of TnpB as a programmable endonuclease that targets DNA using an RNA template has altered the genome editing platform significantly providing an alternative to larger CRISPR-Cas effectors that is minimally invasive. TnpB is the evolutionary ancestor of the Cas12 nuclease family and, with its size of around 400 amino acids, is one of the smallest known endonuclease-guided by RNA. It is catalyzed by a transposon-related motif (TAM) and directed by an RNA (omega RNA), a scaffold of the parent transposon which not only contains guide determinants but also has structural motifs to recruit proteins. It offers a review of the biology of TnpB, its evolutionary origin (part of the IS200/IS605 transposon superfamily), and its mechanistic analogies with the Cas12 effectors. We critically evaluate more recent engineering tools that include directed evolution, redesigning RNA scaffolds, fusing protein domains, and AI-guided mutagenesis, which have greatly improved the efficiency of TnpB editing and targeting biological systems in both mammals and plants. The therapeutic and agricultural applications of TnpB-based editors are considered focusing on single-AAV delivery to clinical use and plant transformation using RNP. We also compare the performance of TnpB with that of SpCas9, Cas12a, and Cas12f on major functional parameters such as the size of the molecular, TAM/PAM flexibilities, on-target and off-target landscapes. Existing constraints curtailed TAM needs, catalytic turnover which occurs in suboptimal, and translational regulatory constraints are evaluated and emerging solutions approaches. The priority of research paths are determined, some of which are to integrate with prime editing architecture, to develop ultra-compact base editors, and to translate to agriculture and clinical.

Keywords: *TnpB*; IS200/IS605 transposons; RNA-guided nuclease; genome editing; ωRNA; compact CRISPR; Cas12 evolution; therapeutic delivery

Abstract ID 8129

Comparative Evaluation of Nanoparticles Seed Priming on Seed Quality and Early Seedling Growth of Lentil (*Lens culinaris Medik*) Varieties VL-126 and VL-148

Shailendra Tiwari^{1}, J.S. Chauhan¹, Vinay Chamoli², Sonali Rajput¹, Meenakshi Joshi¹*

¹: Department of Seed Science and Technology, HNBGU, Srinagar Garhwal;

²: Department of Agriculture, JB Institute of Technology (JBIT), Dehradun

Abstract

The current study was carried out before rabi season (2026) to determine the impact of seed priming using nanoparticles on germination and seed vigor in the lentil (*Lens culinaris Medik*) VL-126 and VL-148 varieties in the laboratory. The experiment was conducted at the Department of Seed Science and Technology, H.N.B Garhwal University, Srinagar Garhwal, Uttarakhand on the basis of Completely Randomized Design (CRD) with four replications. They were treated with zinc oxide (ZnO), silicon dioxide (SiO₂), iron oxide (Fe₂O₃), titanium dioxide (TiO₂) and copper oxide (CuO) nanoparticles of 50, 100, 150 and 200 ppm concentration and a control sample of hydroprimed and untreated. The overnight primed seeds were tested on parameters of germination and vigor, like first count, final germination percentage, seedling length, seedling fresh and dry weight, and vigor index (VI) Ist and IInd. Findings showed that nanoparticle priming greatly improved germination and seedling vigor over control. Among treatments, ZnO (200 ppm), Fe₂O₃ (50 ppm), SiO₂ (100 ppm), TiO₂ (200 ppm), and CuO (150 ppm) were found most effective. Hydropriming was found to enhance germination and initial growth, making it cost-effective. Varietal differences were noted and both VL-126 and NSC-148 reacted positively to optimized treatments. These results indicated the potential of seed priming using nanoparticles as a useful measure to enhance seed quality and early seedling establishment in lentil. Further testing under field conditions should aim to validate the laboratory findings in actual farming conditions.

Keywords: *Seed Priming, Nanoparticles, Germination, Seed Vigor, VL-126, VL-148*

Abstract ID 8130

SOIL HEALTH, WATER MANAGEMENT AND NATURAL RESOURCE CONSERVATION

Abdul Wajid Malik

M.Sc. Agriculture (Soil Science), Shri Guru Ram Rai University, Dehradun

Abstract

Sustainable intensification of agriculture is crucial to meet the increasing food demand while maintaining environmental integrity. Soil health, efficient water management, and conservation of natural resources are key components for achieving climate-resilient agricultural systems. Soil health, defined by its physical, chemical, and biological properties, directly influences nutrient cycling, microbial activity, and crop productivity. However, indiscriminate use of chemical inputs, soil erosion, and declining organic matter have led to wide spread soil degradation. Efficient water management is equally critical, particularly under the growing threat of climate variability and water scarcity. Adoption of precision irrigation techniques such as drip and sprinkler systems, along with soil moisture conservation practices like mulching and conservation tillage, significantly enhances water use efficiency (WUE). Additionally, rainwater harvesting and watershed management approaches contribute to sustainable water resource utilization. Natural resource conservation strategies, including integrated nutrient management (INM), agroforestry, crop diversification, and organic amendments, play a vital role in restoring soil fertility and maintaining ecosystem services. Conservation agriculture practices such as minimum tillage and residue retention further improve soil structure, reduce carbon loss, and enhance resilience to climatic stresses. In conclusion, a holistic approach combining soil health restoration, efficient water management, and sustainable resource use is imperative for ensuring long-term agricultural productivity, environmental sustainability, and resilience against climate change.;

Abstract ID 8131

Development of a Multifunctional Anti-Transpirant Biostimulant for Enhancing Plant Growth and Physiological Efficiency;

Kavita Yadav^{1*}, Sweta Yadav¹ and Prashant Khare¹;

¹Xenesis, Absolute, 5th floor, Plot 68, Sector-44, Gurugram 122003, Haryana, India

Abstract

The development of sustainable plant bio-stimulants with multifunctional properties is gaining increasing importance in modern agriculture. This study presents a novel anti-transpirant bioformulation categorized as a plant bio-stimulant, designed to enhance plant growth, physiological efficiency, and overall crop performance. The formulation integrates natural polymers, plant-derived bioactive compounds, and beneficial microbial metabolites that act synergistically to improve plant health. Upon foliar application, the formulation forms a thin, semi-permeable film on the leaf surface, regulating gas exchange while reducing excessive transpiration. This mechanism improves water-use efficiency and supports better nutrient assimilation. Simultaneously, the bioactive components stimulate key physiological processes, including chlorophyll biosynthesis, enzymatic activity, and nutrient uptake, resulting in enhanced plant vigor and growth uniformity. A key feature of this formulation is its dual-mode functionality, combining a physical film-forming mechanism with biologically active constituents. This integrated approach provides both external protection and internal metabolic enhancement, distinguishing it from conventional bio-stimulants. Efficacy evaluation through pot experiments demonstrated significant improvements in plant vigor, chlorophyll content, and growth parameters compared to untreated controls. These findings highlight its potential as an eco-friendly and innovative solution for sustainable crop management.

Keywords: *Biostimulant; anti-transpirant; natural polymers; plant physiology; metabolic regulation*

Abstract ID 8132

Evaluation of Nano Urea and Nano DAP for Enhancing Quality and Yield of Okra (*Abelmoschus esculentus L.*)

Arti Gairola and Manoj Raghava

Department of Vegetable Science G. B Pant University of Agriculture and Technology, Pantnagar – 263145, Udham Singh Nagar (Uttarakhand)

Abstract

Okra (*Abelmoschus esculentus L.*) is a widely cultivated vegetable crop valued for its tender pods rich nutritional composition and economic importance. Improving nutrient-use efficiency has become a major objective in modern agriculture to enhance productivity while minimizing environmental degradation. In this context nano-fertilizers such as Nano Urea and Nano Diammonium Phosphate (Nano DAP) are emerging as efficient nutrient delivery systems due to their nano-scale size higher reactivity enhanced absorption efficiency and reduced nutrient losses. A field experiment was conducted during the summer season of 2025 at the Vegetable Research Centre of G. B. Pant University of Agriculture and Technology Pantnagar Uttarakhand. The experiment was laid out in a Randomized Block Design with ten treatment combinations and three replications. The treatments comprised different levels and combinations of Nano Urea and Nano DAP to evaluate their effect on growth and quality parameters of okra under open field conditions. Observations were recorded on quality parameters along with yield parameters. The results revealed that nano-fertilizer application significantly influenced growth as well as quality attributes of okra. The combined application of Nano Urea and Nano DAP exhibited superior performance compared to their individual application and conventional fertilization practices. In conclusion the integrated use of Nano Urea and Nano DAP has considerable potential to enhance quality and improve yield of okra. Their application can serve as an effective strategy for efficient nutrient management reduced dependence on conventional fertilizers and promotion of sustainable vegetable production systems.

Abstract ID 8133

STUDIES ON SEED LONGEVITY OF SOYBEAN [*Glycine max* (L.) Merrill] WITH PACKAGING MATERIALS AND PRIMING AGENTS

Vandana Bhakuni

Assistant Professor, DSB Campus; Kumaun University, Nainital

Abstract

The objective of this study was to examine the effect of different priming agents on seed quality parameters of Soybean. For this purpose, seeds of twelve variety were packed in five different packaging materials and stored for six months of storage. The seeds were then treated with three priming agents viz., CaCl₂.2H₂O (0.5%), GA₃ (20 ppm) and nSiO₂ (8000 ppm) with molar mass 60.08 g/mol. These treated seeds were then tested for seed quality as per the procedure of ISTA, 2007 along with check which was untreated seeds in each case. The obtained results revealed that the effects of priming depended on soybean varieties and treatment as well the packaging material, whereas the efficiency of this pre-sowing treatment was not affected by the starting value of seed germination. Some varieties responded favourably to immersion, while in others priming had an inhibitory effect, causing a significant decrease in germination. Highest germination was recorded in seeds primed with CaCl₂.2H₂O (62.51), followed by GA₃ (61.83) and nSiO₂ (57.18%) while unprimed seeds had the lowest germination per cent (44.12%). Highest germination per cent was recorded for seeds stored in jute bag when primed with GA₃ (70.75) which was at par with the seeds stored in tin container primed with CaCl₂.2H₂O (69.44%).

Keywords: *Priming agents, molar mass, ppm, germination percent.*

Abstract ID 8134

Species Composition and Diversity of Tree Species in Bhimtal Forest Division in Uttarakhand, Himalaya

Neeta Arya

Department of Forestry, Kumaun University, Nainital

Abstract

The objective of this work was to study species composition and diversity of tree species between two forests. One is the oak dominated forest and other is pine dominated forest. The tree species composition and community structure were analyzed by field visit in Bhimtal forest division. Random sampling is done by using a standard size of quadrats i.e. 10x10 m². Result showed that total of 6 species belonging to 6 genera and 5 families are present in oak dominated forest, whereas 4 species 4 genera and 4 families are present in pine dominated forest. The density ranged between 270-540 m²/ha subsequently, basal area ranged between 1052.8-3062.4 m²/ha. The Shannon-Weiner index ranged between 1.56-2.02, Simpson index 0.2-0.40, Margalf-index 1.23-1.24 and evenness 2.60-2.93 indicating high tree diversity of Bhimtal forest. It is evident for the study that natural forest has an edge over plantation forest in terms of species density, dominance and richness.

Keywords: *diversity, richness, forest, random sampling.*

Abstract ID 8135

Role of biofertilizer *Rhizobium* in organic chickpea production

Aditi Chauhan

Doctor of Philosophy in Agronomy; Maya Devi University, Selaqui; 2024-2027

Abstract

Chickpea (*Cicer arietinum* L.) is a major pulse crop valued for its high protein content and its ability to improve soil fertility through biological nitrogen fixation. In organic production systems, the use of microbial biofertilizers, particularly *Rhizobium* (mainly *Mesorhizobium* spp.), has gained importance as a sustainable alternative to synthetic nitrogen fertilisers. This review critically examines published research on the role of *Rhizobium* inoculation in enhancing chickpea growth, nodulation, yield, and soil health under diverse agro-climatic conditions. Most studies consistently report that seed inoculation with effective *Rhizobium* strains increases nodule number, nodule dry weight, nitrogen fixation efficiency, and plant biomass, ultimately resulting in improved yield attributes and seed yield. Several investigations also highlight enhanced nutrient uptake, especially nitrogen and phosphorus, leading to better crop performance and seed quality. Synergistic effects have been observed when *Rhizobium* is applied along with organic manures or phosphorus amendments, indicating the importance of integrated nutrient strategies in organic farming. In addition to yield improvement, *Rhizobium* inoculation contributes to soil biological activity, increases available nitrogen after harvest, and supports long-term soil sustainability. However, the effectiveness of inoculation is strongly influenced by soil conditions, environmental stress, native microbial competition, and strain compatibility with chickpea genotypes. Therefore, selecting efficient region-specific strains and adopting suitable organic nutrient management practices are essential to maximise the benefits of *Rhizobium* biofertilizers. Overall, *Rhizobium*-based inoculation offers a low-cost, eco-friendly approach for improving productivity and sustaining soil fertility in organic chickpea cultivation.

Keywords: *Chickpea, Rhizobium, biofertilizer, organic farming, nodulation, nitrogen fixation, soil fertility, sustainable agriculture.*

Abstract ID 8136

Effect of Organic Farming Inputs on Growth and Yield of Beans (*Phaseolus vulgaris* L.)

Anjay Singh Bisht, Pooja Barthwal, Rakesh Kumar and Naveen Chandra

School of Agricultural Studies, Quantum University, Roorkee, Uttarakhand, 247667

Abstract

This study, conducted during 2025 at the Hasanpur Farm, Quantum University, Roorkee, investigated the impact of various organic nutrient sources on the growth and productivity of French bean (*Phaseolus vulgaris* L., cv. Beans Royal). The experiment utilized a Randomized Block Design with eight treatments and three replications to evaluate the efficacy of integrated organic inputs. Results demonstrated that the application of organic amendments significantly improved all phenological and yield attributes compared to the untreated control. Specifically, treatment T7, comprising a soil drenching mixture of Vermicompost (300 g), FYM (2.5 kg), and Poultry Manure (125 g) per plot, emerged as the most effective protocol. It recorded the highest germination (92.59%), plant height (39.82 cm), and nodulation (24.61 nodules/plant), alongside superior yield components including 22.37 pods per plant and a maximum pod yield of 138.42 q/ha. The significant enhancement in leaf area and nodule count under T7 suggests that a combined organic approach fosters superior nutrient absorption and soil microbial activity. The study concludes that the integrated use of diverse organic manures is a highly productive and sustainable strategy for enhancing French bean performance under natural farming conditions.

Keywords: *Phaseolus vulgaris*, *Organic Farming*, *Vermicompost*, *Sustainable Yield*, *Soil Fertility*, *Nodulation*.

Abstract ID 8137

Essential Oil Mediated Insecticidal Activity and Detoxification Enzyme Inhibition in *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae)

Saba Tanveer, Rajat Mohan Bhatt, Ruchira Tiwari

Department of Entomology, College of Agriculture, Govind Ballabh Pant University of; Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, 263145.

Abstract

The pulse beetle is among the most damaging pests of stored grains, severely reducing grain quality and marketability. Plant-derived essential oils (EOs) have gained attention as viable alternatives to synthetic insecticides because of their potent insecticidal effects and relatively low toxicity to humans. The main aim of this study was to analyze the chemical composition five EOs *Mentha spicata*, *Mentha piperita*, *Cymbopogon citratus*, *Cymbopogon nardus* and *Cymbopogon martini* and to evaluate their insecticidal efficacy and ability to inhibit detoxification enzymes in pulse beetles. Key constituents identified in these oils by GC-MS included Carvone, Menthol, Citral, Geraniol and (R)-(+)-Citronellal. *Mentha piperita* exhibited promising contact toxicity against *C. chinensis* after 72 hours ($LC_{50} = 0.5708 \mu\text{L/mL}$; $p = 0.033$) and proved to be the most effective treatment, causing 96.72% ovipositional deterrence at a concentration of $10 \mu\text{L/mL}$ ($F_{4,20} = 24.080$; $p < 0.0001$). Among all EOs *M. spicata* ($LC_{50} = 0.0390 \mu\text{L/mL}$) showed the highest fumigant toxicity, followed by *M. piperita*, *C. citratus*, Aluminium phosphide (positive control), *C. nardus*, and *C. martini*. In repellency assays, *C. martini* at highest concentration ($60 \mu\text{L/mL}$) exhibited significantly greater repellence (84-96%) across all time intervals ($F_{4,20} = 8.222-13.353$; $p < 0.0001$). Moreover, *M. spicata* and *M. piperita* oils at mid-range concentration of $2.5 \mu\text{L/mL}$ significantly suppressed Acetylcholinesterase (AChE) and Glutathione S-transferase (GST) activities in *C. chinensis* after 24 hours of exposure.

Keywords: *Essential oils; Enzymatic activity; Insecticidal toxicity; Ovipositional deterrence; Repellency Index*

Abstract ID 8138

Advancements in Post-Harvest Technology and Agro-Processing for Sustainable Food Security

Sarthak Raturi

Bsc (hons.) Agriculture

Department – School of Agricultural Sciences, SGRRU Pathribagh

Abstract

Post-harvest technology, food science, and agro-processing play a critical role in enhancing food security, reducing losses, and improving the economic value of agricultural produce. A significant portion of harvested crops is lost due to poor handling, inadequate storage facilities, inefficient transportation, and limited access to processing technologies. These losses adversely affect farmers' income and the availability of quality food. Recent innovations in post-harvest management, including cold chain systems, improved packaging, drying methods, and controlled storage conditions, have contributed to extending shelf life and maintaining product quality. Food science provides insights into the physicochemical and microbiological properties of food, ensuring safety, quality control, and the development of value-added products. Agro- processing transforms raw agricultural commodities into diversified products, creating employment opportunities and supporting rural livelihoods. The integration of advanced technologies with sustainable and eco-friendly practices is essential to minimize post-harvest losses and enhance resource efficiency. This paper discusses recent developments, challenges, and future prospects in post-harvest technology and agro-processing. It also emphasizes the need for cost-effective, scalable solutions to strengthen the agricultural value chain and ensure the availability of safe and nutritious food throughout the year.

Keywords: Post-harvest technology, Food processing, Agro-processing, Value addition, Food security, Cold chain management, Sustainable agriculture

Abstract ID 8139

Enhancement of Seed Germination and Quality improvement in Kiwi

Aparna Pant

Kumaun University (D.S.B Campus) Nainital , Department of Agriculture and Agroforestry

Abstract

Kiwi (*Actinidia* spp.) is a valuable fruit. It is a horticultural crop, but it doesn't grow well from seeds because of physiological dormancy, which makes germination low and uneven. To make sure that plants grow uniformly and produce more, it is important to improve seed germination and seedling quality. Cold stratification at 2-5°C for 3-6 weeks is a common way to break dormancy by getting the embryo's metabolic processes going. Using gibberellic acid (GA3) at levels of 500 to 2000 parts per million (ppm) speeds up germination even more by making enzymes work harder and slowing down embryo growth. In vitro germination using Murashige. Adding growth regulators to Murashige and Skoog (MS) medium creates controlled conditions that greatly increase the percentage of seeds that germinate and the health of the seedlings. It has also been shown that priming seeds with substances like potassium nitrate and polyethylene glycol can speed up germination and make it more even. Among the approaches, combined treatments—especially stratification followed by GA3 application or priming—have shown better results in terms of both germination rate and seedling quality. These combined methods are a useful and effective way to grow a lot of kiwi plants and make high-quality planting material. Using these methods can help kiwi farmers get their crops off to a better start, make more money, and get better yields.

Keywords: *Kiwi, Actinidia, seed dormancy, stratification, GA3, seed priming, germination in vitro.*

Abstract ID 8140

Effect of Phosphorus on plant Growth, quality of Lentil Crop (*Lens culinaris Medik*)

Aarti Gauni¹, Anoop Badoni², Vandana Petwal² and Neha Joshi¹

¹Kumaon University D.S.B Campus Nainital Uttarakhand

²PLANTICA -Indian Academy Rural Development, Dehradun Uttarakhand

Abstract

A experiment was carried out during Rabi Seasons of 2025-2026, at the instructional farm. (*Lens culinaris*) lentil is an important pulse crop known for its high protein content and soil fertility improvement through biological nitrogen fixation. The phosphorus is one of the essential nutrients required for root development, nodulation, and overall growth of lentil. The experiment was laid out in a randomized block design (RBD) with three replications and nine treatments, including control, recommended dose of fertilizers (RDF), varying levels of phosphorus (20,40,60,80,100, 120) kg P/ha. Observation was recorded on Growth parameters, plant height(cm), number of branches /plants, root length and nodulation (number of nodules per plant), leaf area index (LAI) at different growth stages (30, 60, 90 DAS). The results indicate that higher phosphorus levels enhanced root development and nodulation, leading to better nutrient uptake and plant growth. The result revealed that phosphorus application significantly improved growth of lentil over control. Among the treatments R1T5(40kg/h) recorded the highest growth parameters such as plant height and number of branches per plant. It also showed better nodulation and overall plant performance.

Keywords: *lentil, phosphorus levels, growth parameters, nodulation, root development , nutrient uptake.*

Abstract ID 8141

Influence of Irrigation Methods and NPK Levels on Nutrient Uptake, Efficiency, and Yield Performance of Broccoli (*Brassica oleracea var. italica*)

Dr. Priyanka

Assistant Professor; Department of Agriculture; JB Institute of Technology, Dehradun;

Abstract

A field experiment was conducted to evaluate the influence of irrigation methods and NPK levels on nutrient uptake, nutrient use efficiency, and yield performance of broccoli (*Brassica oleracea var. italica*). The study compared drip and conventional irrigation systems in combination with varying levels of recommended NPK fertilization. Results revealed that irrigation method and nutrient levels significantly affected plant growth, nutrient absorption, and productivity. Drip irrigation, particularly when combined with optimal NPK levels, enhanced nutrient uptake and improved use efficiency by ensuring better moisture and nutrient availability in the root zone. This led to superior vegetative growth, curd development, and higher marketable yield compared to conventional irrigation. Among the treatments, the application of 100% recommended dose of NPK under drip irrigation recorded the highest nutrient use efficiency and yield. The findings indicate that integrating drip irrigation with balanced fertilization is an effective strategy for improving productivity and resource use efficiency in broccoli cultivation.

Abstract ID 8142

Comparative phytochemical profiling of *Catharanthus roseus* (L.) G. Don through GC-MS analysis

Kavita², Balkar Singh²

¹Research scholar, Department of Botany, Kurukshetra University, Kurukshetra, Haryana, India;
²Associate professor, Department of Botany, Arya P.G. College, Panipat, Haryana, India

Abstract

Catharanthus roseus being an ornamental plant, having anticancer and anti-diabetic properties. To unveil their phytochemical potential, methanolic and n-hexane extract of its dry leaf powder were taken. Preliminary spot analysis and GC-MS analysis confirms the presence of their secondary metabolites. The GC-MS chromatogram shows the presence of different class of secondary metabolites such as fatty acids, phenolic compounds and alkaloids. 9,12,15-Octadecatrienoic acid, (Z,Z,Z)- is major phytoconstituent in n-hexane extract and 9-Octadecenoic acid, methyl ester, (E)- in methanolic extract. Vitamin E, Squalene, Vindolene, phytol etc. some common phytoconstituents in both solvent extract. These phytoconstituents possess antioxidant, antimicrobial and anticancer activities which shows its ethnomedicinal importance. The presence of these bioactive secondary metabolites highlights the therapeutic potential of this species and suggests its suitability for further phytochemical characterization and drug discovery studies.

Keywords: *Catharanthus roseus*, bioactive compounds, GC-MS analysis, therapeutic potential

Abstract ID 8143

Study of organic and chemical farming and Their impact on soil health and crop productivity

¹Hardik sain, ²Anoop Badoni, ³Vandana petwal

Shekhawati institute, SKNAU Agriculture University, jobner

Plantica -Indian Academy Rural Development, Dehradun Uttarakhand

Agriculture plays a vital role in sustaining human life, and farming practices significantly influence soil health and crop productivity. This study focuses on a comparative analysis of organic and chemical farming systems. Organic farming relies on nature inputs such as compost, manure and biofertilizers, whereas chemical farming uses synthetic fertilizers and pesticides to enhance crop yield. The study evaluates key soil parameters such as pH and electrical conductivity (EC), along with overall soil fertility. Organic farming was observed to improve soil structure, increase microbial activity, and maintain long-term soil health. In contrast, chemical farming provided higher immediate yields but showed potential negative effects on soil quality over time, including nutrient imbalance and reduced soil biodiversity. The findings suggest that while chemical farming may offer short-term benefits in productivity, organic farming is more sustainable and environmentally friendly in the long run. Therefore, practices can help achieve a balance between productivity and sustainability.

Keywords. *Organic farming, Chemical farming, Soil health, Sustainability, Agriculture*

Abstract ID 8144

Impact of Ecophysiological Factors on Regeneration of *Quercus floribunda* Lindl. ex A. Camus. Dominated Forest in Uttarakhand

Ikramjeet Maan and Ashish Tewari,

Department of Forestry, D.S.B. Campus, Kumaun University, Nainital.

Abstract

The Indian Himalayan region is highly vulnerable to the impact of climate change. The Himalayan region is expected to be 2–3 times warmer than the world average by 2050. This major global climatic change is leading to intensive impact on the regeneration status of certain species with short seed viability and viviparous species. *Quercus floribunda* (Moru oak) is an evergreen species that occurs across a narrow altitudinal range of 1900 to 2600 m above sea level in the Western Himalayan region. Six high elevation sites (HES; 2300-2600 asl) and six low elevation sites (LES; 1900-2250 asl) across Kumaun and Garhwal Himalaya were selected for the study to understand the impact of ecophysiological factors on regeneration of species. The species appears to be regenerating profusely at HES with 80% conversion of seedlings to saplings. Low seedling density (94 ± 5.11 ind/ha) was a conspicuous feature at LES in comparison to HES (270 ± 61.56 ind/ha), which could be due to severe summer and winter water stress and other climatic factors. The soil at LES was much drier than HES. The seedlings which grow under most severe micro climate were more water stressed with predawn water potentials varying between -1.7 MPa and -3.1 MPa (summers/winters) at LES, lethal enough to disrupt several physiological activities causing mortality. The seedling mortality at LES sites was close to 95% over a period of one and half year when compared to 10% mortality at HES. The mean number of seeds in 1m² quadrat was 142 ± 2.41 at HES, and 104.67 ± 4.63 at LES. *Q. floribunda*, not only provide crucial resources but also supports the survival systems of people living in the hills. The regeneration of the species is declining over time and at risk in LES hence, systematic management plan for the conservation of *Q. floribunda* is essential at LES.

Keywords: *Poor regeneration, water potential, water stress, seedling dynamics, seed fall*

* The study was funded by ANRF, DST No: SCP/2022/000051.

Abstract ID 8145

Identification of drought-tolerant *Populus ciliata* genotypes for climate resilient forestry in the north-western Himalayas

Anchal and Anita Kumari

Department of Tree Improvement and Genetic Resources, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, HP, India 173230

Abstract

Water stress is a major constraint to growth and productivity of tree species in Himalayan ecosystems due to high climatic variability. The present study investigated growth, biochemical and physiological responses of *Populus ciliata* sites, selected across north-western Himalayan regions under water stress conditions. Cuttings collected from different sites were grown under controlled conditions and subjected to four soil moisture regimes (100, 80, 60 and 40 % field capacity). Findings revealed that water stress significantly reduced plant height, collar diameter, number of leaves, chlorophyll content and relative leaf water content, with severe stress leading to pronounced growth suppression, particularly in sensitive sites. In contrast, total soluble sugars, reducing and non-reducing sugars and proline increased with increasing stress intensity, while total protein content declined. Principal Component Analysis (PCA) extracted three principal components explaining 90.69 per cent of total variability. The first principal component clearly separated growth, relative leaf water content and chlorophyll traits from osmolyte-related biochemical traits, indicating a shift in carbon and metabolic allocation from growth processes toward osmotic protection under water stress. The second and third principal components highlighted variation related to protein metabolism and chlorophyll pigment stability. Significant site-specific responses were observed, with populations from Jeolikot and Batote possessing higher chlorophyll content and relative leaf water content under water stress, indicating greater drought tolerance. These findings emphasize the importance of integrating physiological and biochemical traits for identifying resilient genotypes. The study provides a basis for developing targeted, trait-based screening strategies to select climate-resilient and drought-tolerant poplar genotypes suitable for future afforestation and breeding programs in Himalayan regions.

Keywords: *biochemical traits, growth traits, physiological traits, Populus ciliata, Principal component analysis (PCA), water stress*

Abstract ID 8146

Tree Vegetation Analysis and Physical Indicators of Seed Maturity in *Acer oblongum* Wall ex. DC in Nainital and the Surrounding Areas”

Anjali Oli and Ashish Tewari,

Department of Forestry, D.S.B. Campus, Kumaun University, Nainital.

Abstract

Acer oblongum Wall. ex. DC. locally known as Putli, Pangoi, Parpat, and Kirmola, belonging to the family Sapindaceae, is an ecologically important evergreen tree species found in the temperate forests of the Kumaun Himalaya. The winged fruit of this species is usually a double samara characteristic. It is an ecologically important tree species, but its regeneration dynamics and seed maturation processes remain poorly understood. This study examined the vegetation parameters, regeneration patterns, seed maturation, and edaphic factors of *A. oblongum* across three distinct altitudinal sites (1600-2100 m) within the Nainital catchment. The results demonstrated that the regeneration of *A. oblongum* is highly site-specific and strongly influenced by edaphic factors. Site I exhibited relatively high densities of seedlings (70 ind./ha) and saplings (100 ind./ha) among all three sites. In contrast, Sites II and III showed poor or negligible regeneration. Although Site II recorded the highest density of mature trees (200 ind./ha), seedling establishment was limited, likely due to microclimatic stress and less favourable soil conditions. Furthermore, seed maturation was indicated by a change in colour from green to faded brown and a significant reduction in seed moisture content from over 55% to below 20% by January, which coincides with the time of maximum germination. Seed germination was high, but conversion of seeds to seedlings was poor. Additionally, phenological observations showed delayed flowering and fruiting patterns compared to past data. Overall, natural regeneration of *A. oblongum* is highly site-specific and environmentally constrained, despite its robust seed viability. Future conservation and restoration efforts must prioritize microhabitat management to mitigate the impacts of habitat degradation and climatic shifts on this ecologically valuable Himalayan species.

Keywords: *Samara, Regeneration, Seed maturation, Edaphic factors.*

Abstract ID 8147

Reviving Lingda (*Diplazium esculentum*): An Underutilized Nutrient-Rich Vegetable for Sustainable Livelihoods in Uttarakhand

Vandana Petwal

Plantica -Indian Academy Rural Development, Dehradun, Uttarakhand

Abstract

The rich biodiversity of Uttarakhand offers a wide range of edible plant species, many of which remain underutilized despite their nutritional and economic potential. One such species is Lingda (*Diplazium esculentum*), a wild fern traditionally consumed by local communities but gradually declining in use due to changing food preferences and limited market awareness. This study highlights the potential of Lingda as a valuable component of sustainable rural livelihoods and nutritional security. Lingda is naturally adapted to the hilly ecosystems of Uttarakhand and requires minimal external inputs for growth, making it suitable for low-cost and eco-friendly cultivation. It is rich in essential nutrients, including vitamins, minerals, and dietary fiber, which contribute to improving food diversity and health outcomes in rural households. Despite these benefits, its utilization remains confined to local consumption, with limited efforts toward value addition, processing, and commercialization. Promoting the cultivation and utilization of Lingda can open new avenues for income generation, particularly for small and marginal farmers. Strengthening awareness, developing market linkages, and encouraging value-added products can enhance its acceptability beyond local boundaries. Integrating such underutilized crops into mainstream agriculture can support biodiversity conservation while improving livelihood resilience in mountain regions. Therefore, focused efforts are needed to revive traditional knowledge and promote the sustainable use of Lingda as a climate-adapted and nutritionally significant vegetable in Uttarakhand.

Keywords: *Underutilized vegetables; Lingda; Uttarakhand agriculture; Nutritional security; Sustainable livelihoods; Biodiversity conservation; Value addition; Mountain farming; Traditional knowledge; Climate-resilient crops.*

Abstract ID 8148

Emerging Role of Women and Youth in Strengthening Sustainable Rural Agriculture Systems

Vandana Petwal ,Anoop Badoni

Plantica -Indian Academy Rural Development, Dehradun, Uttarakhand

Abstract

Women and youth are increasingly recognized as key contributors to the advancement of rural agricultural systems. Their active participation is bringing notable changes in farming practices, resource management, and livelihood diversification. Women, through their involvement in agricultural operations, household-level enterprises, and community-based organizations, are enhancing economic stability and promoting sustainable use of natural resources. At the same time, rural youth are playing a significant role in introducing innovative approaches by adopting modern technologies, digital platforms, and entrepreneurial activities in agriculture. The combined efforts of women and youth are fostering inclusive growth, improving farm productivity, and encouraging climate-resilient agricultural practices. Their engagement also supports the development of local institutions and strengthens community-level decision-making processes. By integrating traditional knowledge with modern advancements, they contribute to building more adaptive and sustainable rural economies. However, to fully realize their potential, there is a need for focused interventions such as skill development, access to resources, institutional backing, and policy support. Encouraging leadership among women and youth can significantly accelerate rural transformation and ensure long-term agricultural sustainability and livelihood security.

Keywords: *Women participation; Rural youth; Sustainable agriculture; Agricultural innovation; Rural development; Climate resilience; Entrepreneurship; Community participation; Natural resource management; Livelihood security*

Abstract ID 8149

Smart Agricultural Research through Smart Libraries

Ankit Rawat

Tula's Institute, Dehradun

Abstract

Agriculture holds a preeminent position in the Indian economy; it provides employment opportunities to nearly half of India's population, particularly in rural areas. The objective of this research paper is to explore various facets of the agricultural sector, agricultural research, and agricultural libraries in India. Agricultural libraries are not just repositories of information; they are dynamic agents of progress. However, they are burdened by challenges such as resource scarcity and rural poverty. Given the interconnection between agriculture and global goals such as zero hunger, responsible consumption and production, and climate action, libraries play a vital role in raising awareness and driving meaningful change. By highlighting their transformative potential, this research emphasizes the importance of leveraging agricultural libraries to accelerate research and development. Agricultural libraries connect users with various agriculture-related information institutions, such as ICAR, CeRA, AGRIS, FAO, and NAL. Krishikosh, the institutional repository for agriculture, helps users discover agriculture-related resources. Furthermore, the system incorporates AI-driven knowledge management, cloud-based platforms, IoT-enabled services, voice-assisted information retrieval, and blockchain technology for secure information management. These innovations foster sustainable and inclusive automation strategies for policymakers, agricultural library managers, researchers, and technology developers.

Abstract ID 8150

Molecular Insights For Sustainable Plant Disease Management

*¹ *Kalpna Gairola and* ²*Archana Kuniyal*

¹Department of Plant Pathology, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun, India

²Department of Botany, Balganga Degree College, Sendul-Kemar, Tehri Garhwal, Uttarakhand

Abstract

Plant diseases are threat to agricultural sector, cause significant loss to crop resulting in food insecurity. Plant pathogens i.e. fungi, bacteria, viruses and nematodes cause losses to agricultural crops. Various management practices are employed to control these pathogens but found insignificant. Currently farmers are dependent on chemical pesticides to manage plant diseases. Use of chemical pesticides in agricultural sector causes adverse effect on environment and human health in the form of residues. Plant diseases are caused by interaction between host, pathogen and environment called disease triangle. Primarily, disease management practices are focused on interaction between host, pathogen and environment but these practices have no such significant effect on controlling diseases. Therefore, there is a need of sustainable and innovative approaches of managing diseases. Biotechnological tools such as genetic engineering, PCR, Marker assisted selection, CRISPR-Cas, genome editing, RNA interference and molecular diagnostics have been proven as an effective, sustainable and eco-friendly method of managing diseases. Plant pathogen produces virulent and effector molecules to infect and cause the diseases on plant and plant respond to these responses through innate immunity. Plant have two types of immunity pattern triggered immunity (PTI) and effector triggered immunity (ETI). These responses are triggered by signaling pathways such as salicylic acid, jasmonic acid and ethylene. These pathways assist to develop effective disease management strategies. Plant disease management through molecular diagnostic assist to understand the host pathogen interaction and revealing complex mechanism of infection and defence. This review focuses on how molecular tools such as gene-for-gene hypothesis, signaling pathways and pathogen virulence factors ensure sustainable disease management practices. These pathways help to identify the resistance gene involved in plant immunity. Integrating traditional and molecular approach of plant disease management ensure the crop resistance and reduce the dependency on chemical pesticides. This review is focusing on harnessing the molecular tools to develop eco-friendly and sustainable plant disease management practices.

Keywords: *Food security, Disease resistance, Plant immunity*

Abstract ID 8151

Impact of Biotic and Abiotic Stressors on Fish Health and Productivity

*Rajender Pal and Harinder Singh Banyal **

Vertebrate Biology and Animal Physiology Laboratory, Department of Biosciences, Himachal Pradesh University, Shimla- 171005, India

Abstract

Aquatic ecosystems are increasingly exposed to a wide range of biotic and abiotic stressors that significantly influence fish health and overall productivity. Biotic stressors, including pathogens (bacteria, viruses, parasites, and fungi), invasive species, and harmful algal blooms, directly compromise fish immune systems, leading to disease outbreaks, reduced growth, and increased mortality. Simultaneously, abiotic stressors such as temperature fluctuations, dissolved oxygen depletion, salinity changes, pH imbalance, and pollution (heavy metals, pesticides, and industrial effluents) alter the physiological and metabolic functions of fish. Climate change further intensifies these stressors by modifying water quality parameters and habitat conditions, thereby exacerbating stress responses in aquatic organisms. The interaction between biotic and abiotic factors often results in synergistic effects, amplifying their negative impacts on fish populations. Chronic exposure to suboptimal environmental conditions weakens fish immunity, making them more susceptible to infections, while acute stress events can lead to mass fish kills and economic losses in aquaculture systems. Additionally, stress-induced hormonal changes disrupt feeding behavior, reproduction, and growth performance, ultimately affecting fish productivity and sustainability. Understanding the mechanisms through which these stressors affect fish health is crucial for developing effective management and mitigation strategies. Approaches such as improved water quality management, disease surveillance, selective breeding for stress resistance, and adoption of eco-friendly aquaculture practices can help minimize adverse impacts. This review highlights the importance of integrated stress management to ensure the health, resilience, and productivity of fish populations in both natural and cultured environments.

Keywords: *Biotic stressors, Abiotic stressors, Fish health, Aquaculture productivity, Disease management.*

Abstract ID 8152

Biomass and Carbon stock in Kranteshwar (Champawat) Sacred Forest of Kumaun Himalaya

Ashish Tewari & Shruti Shah

Department of Forestry; Kumaun University, Nainital

Abstract

Dedicated areas of vegetation in the name of regional deities or ancestral spirits are known as sacred groves/ forests (SFs). The removal of any living item from the sacred grove is forbidden, however dead logs and leaves are occasionally taken. This establishment is the best illustration of an indigenous traditional resource-use method that supports the preservation of biodiversity. These groves are mostly associated with temples and are also culturally important. They manifest the spiritual and ecological ethos of rural indigenous communities. India is the country with the greatest number of sacred groves in the world, between 100,000 and 150,000, because of the country's diverse castes, religions, and ethnic groups. Sacred groves are often being studied from floristic and faunal diversity point of view. Sacred groves play crucial roles in maintaining vegetation diversity and storing carbon. For effective C mitigation, it is pivotal to accurately quantify the C stocks of SFs. With this background, the present study focused on documenting the tree diversity in Kranteshwar, (Champawat) SF of Kumaun Himalaya and also estimate the tree biomass and carbon storage. Kranteshwar Mahadev is a holy shrine of Lord Shiva situated on a top of a lofty hill on the east of Champawat town at an elevation between 1820-2000 masl. In Kranteshwar SF the total tree density was 855indi/ha in which *Quercus lanata* contributed maximum with density of 193indi/ha. In this SF the tree species richness was 10. Total tree biomass was 710.1t/ha in which above ground contribution was 78.6% and below ground was 21.2%. The tree carbon stock was 333.7 t C ha⁻¹ with maximum contribution by *Q. lanata* 168.6 t C ha⁻¹. Forests are the most important carbon pools among terrestrial ecosystems, and ensuring fewer disturbances/ degradation of sacred forests might constitute a form of forest management for carbon sequestration and climate change mitigation.

Keywords: *Sacred Forest, Biomass, Carbon Stock, Tree Density*

Study funded by Kumaun University Internal Funding for Research-III (KUIFR-III)

Abstract ID 8153

Genetic Variability Assessment and Development of F1 Hybrids in Brinjal (*Solanum melongena* L.) for Garhwal Himalayan Conditions

*Abhay Singh , Khulakpam Naseeruddin Shah *, Deepak Kumar Rana and Vivek Singh*

1Department of Horticulture, School of Agriculture & Allied Science, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India, 246174.

Abstract

The present study was carried out at the Horticultural Research Centre, Department of Horticulture, H.N.B. Garhwal University (A Central University), Srinagar, Garhwal, Uttarakhand, to evaluate the genetic variability among brinjal (*Solanum melongena* L.) genotypes for developing 4 superior F1 hybrids for the hill agro-climatic conditions of the Garhwal Himalaya. Thirty-four diverse brinjal genotypes collected from different locations in India were evaluated in a Randomised Block Design (RBD) with three replications during the summer season of 2025. Based on superior performance across morphological, yield, quality, and screening parameters, eight parents were selected, four as female and four as male lines and they were crossed in a bi-parental mating design to develop four F1 hybrid combinations. Observations were recorded on key morphological traits, growth parameters, yield attributes, quality characteristics and shoot and fruit borer screening parameters. Significant genetic variability was observed among the 34 genotypes for all the traits studied. Analysis of variance revealed highly significant differences, indicating considerable genetic diversity in the experimental material. The study identified promising genotypes and hybrid combinations as valuable genetic material for future brinjal breeding programmes in the Garhwal Himalayan region, and seeds from the four F1 hybrids were harvested and stored for the future development of F2 progenies.

Keywords: *Bi-parental, Brinjal, Evaluation, Mating and Variability.*

Abstract ID 8154

Smart Fertilization for Nutritional Security: Precision Fertigation Strategies in Hybrid Brinjal

S. Muthulakshmi¹, M.R.Backiyavathy²

¹PG Scholar Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University; Coimbatore - 641 003;

²Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University; Coimbatore - 641 003

Abstract

Climate-resilient nutrient management strategies are crucial for enhancing crop productivity, profitability, and nutritional security under increasing resource constraints and climate variability. Precision fertilization through fertigation offers a sustainable approach to improve nutrient use efficiency while minimizing soil degradation and environmental losses. A field experiment was conducted at a farmer's field in Idikarai village, Coimbatore district, Tamil Nadu, to evaluate smart fertilization strategies using Tamil Nadu Agricultural University Water Soluble Fertilizer (TNAU-WSF, 19:19:19) in hybrid brinjal (*Solanum melongena* L.) cv. 'Lalita'. The experiment was laid out in a strip plot design with five main plot treatments comprising graded levels of STCR-based NPK (0, 25, 50, 75, and 100%) and five subplot treatments involving different rates and methods of TNAU-WSF application through fertigation and foliar spray. Results revealed that precision fertigation significantly enhanced growth, physiological efficiency, biochemical quality, nutrient uptake, soil fertility status, and fruit yield. The interaction treatment 100% STCR-NPK + TNAU-WSF @ 60 kg ha⁻¹ recorded the highest yield (49.83 t ha⁻¹); however, it was statistically on par with 75% STCR-NPK + TNAU-WSF @ 60 kg ha⁻¹. Notably, the latter treatment achieved the highest benefit–cost ratio (4.09), demonstrating superior nutrient use efficiency with a 25% reduction in conventional fertilizer inputs. Progressive depletion of available soil N, P, and K from vegetative to harvest stages indicated effective nutrient uptake under fertigation. FTIR analysis confirmed the chemical stability and enhanced solubility of TNAU-WSF, supporting improved bioavailability during fertigation. The study highlights that smart fertilization through precision fertigation can enhance crop resilience, optimize fertilizer inputs, improve fruit quality, and ensure economic sustainability. The application of 75% STCR-NPK combined with TNAU-WSF @ 60 kg ha⁻¹ emerges as a climate-smart, economically viable, and environmentally sound nutrient management strategy for sustainable brinjal production.

Abstract ID 8155

Prediction of GreenHouse Gas emission in maize crop as influenced by different nutrients levels

I Mohammed Wajid¹, K Sathiya Bama^{1}, S Meena¹, P Kathirvelan² & P C Prabu³*

¹Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore 641 003

²Department of Millets, Centre for Plant Breeding & Genetics, Tamil Nadu Agricultural University, Coimbatore 614 003

³Centre for Water and Geospatial Studies, Tamil Nadu Agricultural University, Coimbatore 614 003

Abstract

GreenHouse Gas (GHG) emissions are often linked with industry, yet agriculture is a less recognized contributor, particularly through fertilizer-induced emissions of N₂O, CH₄, and CO₂. Mitigating these emissions requires judicious nutrient management, including reduced fertilizer inputs and integrated organic–inorganic approaches. This study aimed to identify nutrient management strategies that enhance maize yield, improve soil health, reduce GHG emissions, and predict future emission trends. A field experiment was conducted in 2024 at Tamil Nadu Agricultural University, Coimbatore, using ten treatments combining chemical fertilizers, farmyard manure (FYM), and biofertilizers in a randomized block design. Gas samples collected at key growth stages were analyzed by gas chromatography, while soil physico-chemical, biological, and carbon-related parameters were evaluated. Remarkably, organic treatment T₅ (FYM @ 10 t ha⁻¹ + biofertilizer @ 2 kg ha⁻¹) recorded the lowest GHG emissions (N₂O: 138 µg N₂O–N m⁻² h⁻¹; CH₄: 51 µg m⁻² h⁻¹; CO₂: 26 mg m⁻² h⁻¹) and significantly enhanced soil enzyme activity, microbial dynamics, and carbon stability. The integrated treatment T₆ (100% RDF + FYM @ 5 t ha⁻¹) achieved the highest soil quality index (0.82), nutrient uptake, and grain yield, while T₇ (75% RDF + FYM @ 5 t ha⁻¹) produced comparable yields (>7.5 t ha⁻¹) with lower emissions. DNDC model validation confirmed T₅ as the lowest N₂O-emitting treatment. Overall, T₅ proved most effective for reducing emissions and improving soil carbon, while T₆ and T₇ delivered higher yields with sustainable emission management. Notably, 75% RDF + FYM (T₇) emerged as a practical climate-smart strategy, achieving a balance between productivity, environmental sustainability, and long-term agroecosystem resilience.

Keywords: *Nitrous oxide emission, maize, DNDC,*

Abstract ID 8156

Integrated Nutrient Management in Chickpea (*Cicer arietinum* L.): A Review on Productivity, Soil Health and Profitability

*Ramavath Umadevi **, Yuvraj Yadav , Kartik Panchal and Rahul Sandhu

School of Agricultural Sciences, Geeta University, Naultha, Panipat (132 145), Haryana (India)

Abstract

Chickpea (*Cicer arietinum* L.) is the most important pulse crop of India, contributing approximately 45% of national pulse production. Declining soil fertility, rising fertilizer costs, and the need for environmentally sustainable production have propelled Integrated Nutrient Management (INM) as a viable strategy for chickpea cultivation. INM combines chemical fertilizers, organic manures, and biofertilizers to optimize nutrient availability, sustain soil health, and maximize productivity. This review synthesizes recent research findings from 2024 to 2026 across diverse agro-climatic zones of India, examining the effects of INM practices on chickpea growth parameters, yield attributes, grain yield, soil physical and chemical properties, and economic profitability. Evidence consistently indicates that combining 75-100% of the recommended dose of fertilizers (RDF) with organic amendments (farmyard manure, poultry manure, vermicompost) and biofertilizers (*Rhizobium*, PSB, PGPR, *Azotobacter*) significantly enhances plant height, branching, pod number, grain yield (up to 2320 kg/ha), and soil nutrient status compared to sole chemical fertilization or control treatments. Furthermore, micronutrient supplementation with zinc (Zn) and iron (Fe) alongside *Rhizobium* inoculation has been shown to improve both yield attributes and post-harvest soil fertility. The economic analysis across studies confirms superior net returns and benefit-cost ratios under INM regimes. This review concludes that INM is an ecologically and economically sound approach for sustainable chickpea production in India.

Keywords: *Chickpea, Integrated Nutrient Management, Organic manures, Biofertilizers, Soil health, Grain yield, Profitability*

Abstract ID 8157

Nanozyme-Driven Active Nanofibrous Packaging for Controlled Antimicrobial Protection and Shelf-Life Extension of Fresh-Cut Apples

Nikita^{a}, Shekhar Agnihotri^{a,b}*

^aDepartment of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship and Management, Kundli, Sonapat, Haryana, 131028, India;

^bCentre for Advanced Translational Research in Food NanoBiotechnology, National Institute of Food Technology Entrepreneurship and Management, Kundli, Sonapat, Haryana, 131028, India

Abstract

The rapid deterioration of fresh-cut fruits due to enzymatic browning and microbial contamination necessitates the development of advanced active packaging systems to minimize postharvest losses. In this study, nickel disulfide (NiS₂) nanozyme-integrated electrospun nanofibrous mats based on polyvinyl alcohol (PVA) and hydroxyethyl cellulose (HEC) were developed for enhanced preservation of fresh-cut apples. The synthesized NiS₂ nanozyme was systematically characterized to confirm its structural and functional properties. X-ray diffraction (XRD) analysis revealed the crystalline nature of NiS₂, while Fourier transform infrared spectroscopy (FTIR) confirmed the presence of characteristic functional groups and successful interaction with the polymeric matrix. Scanning electron microscopy (SEM) demonstrated uniform spherical morphology, and energy-dispersive X-ray spectroscopy (EDX) verified the elemental composition and homogeneous distribution of Ni and S. The nanozyme exhibited intrinsic catalytic activity, enabling reactive oxygen species (ROS)-mediated antioxidant and antimicrobial functionality. Incorporation of NiS₂ into PVA/HEC nanofibres significantly improved physicochemical properties. Moisture content increased from 2.47% to 2.89%, while water solubility decreased from 16.70% to 12.96%, and swelling ratio reduced from 195% to 162%, indicating enhanced structural stability and water resistance. Application studies on fresh-cut apples demonstrated improved retention of bioactive compounds, with total phenolic content showing only ~10.8% reduction, and total flavonoid loss limited to 21.9%, compared to significantly higher losses in control samples. The nanozyme-loaded system effectively suppressed enzymatic browning and reduced microbial growth, thereby extending shelf life up to 7 days under refrigerated conditions. Overall, the developed NiS₂ nanozyme-embedded nanofibrous mats function as a smart, active packaging system with enhanced stability, catalytic activity, and preservation efficiency. This work highlights the potential of nanozyme-enabled biodegradable materials for sustainable food packaging and postharvest loss reduction.

Keywords: *Electrospinning; fresh-cut apples; nanozymes; nanofibers; shelf-life extension.*

Abstract ID 8158

Modern Trends and Research in Floriculture

¹Ashish negi, ²Anoop Badoni, ³Vandana Petwal

PLANTICA- Indian Academy Rural Development, Dehradun Uttarakhand

Abstract

Floriculture is not limited to the simple cultivation of flowers; it has developed into a modern, technology-driven branch of horticulture. Today, it plays an important role in commercial agriculture, urban landscaping, and environmental improvement. With the use of protected cultivation methods such as polyhouses and greenhouses, flowers can be grown throughout the year with better quality and higher productivity. Techniques like drip irrigation and fertigation help in efficient use of water and nutrients. Floriculture also provides employment opportunities and supports export markets, making it an economically valuable sector. In recent years, scientific research has significantly advanced floriculture. One major area of research is genetic engineering, where scientists are working to develop new flower colors, improved fragrance, and longer vase life using advanced tools like gene editing. Another important development is tissue culture and micropropagation, which allows rapid production of disease-free and uniform plants, especially in crops like orchids and gerbera. Researchers are also focusing on developing disease- and pest-resistant varieties to reduce the use of harmful chemicals and promote eco-friendly cultivation. In addition, smart technologies such as sensors and artificial intelligence are being introduced in greenhouse systems to monitor environmental conditions like temperature, humidity, and soil moisture, ensuring optimal plant growth. Sustainability is another key focus area, with increasing research on organic floriculture, biofertilizers, and biodegradable materials. Overall, floriculture is evolving into an innovative and sustainable sector, combining traditional knowledge with modern science to meet global demand and environmental challenges.

Abstract ID 8159

Soil Testing and its Importance in Sustainable Agriculture

¹Kunal Shakya, ²Anoop Badoni, ³Vandana Petwal

PLANTICA- Indian Academy Rural Development, Dehradun Uttarakhand

Abstract

Soil testing is a fundamental practice in agriculture that helps determine the nutrient status, composition, and overall health of soil. It plays a vital role in improving crop productivity and ensuring sustainable land management. This study focuses on the analysis of key soil parameters such as pH, electrical conductivity (EC), organic carbon, and available macronutrients including nitrogen, phosphorus, and potassium. Soil samples were collected from agricultural fields using standard sampling techniques and analyzed in laboratory conditions. The results of soil testing provide valuable information about soil fertility and help in identifying nutrient deficiencies or imbalances. Soil pH indicates the acidity or alkalinity of the soil, which directly affects nutrient availability to plants. Electrical conductivity helps assess the salinity level, while organic carbon reflects soil organic matter content, which is essential for soil structure and microbial activity. The estimation of available nitrogen, phosphorus, and potassium supports farmers in making informed decisions regarding fertilizer application. Based on the analysis, suitable recommendations can be made to optimize fertilizer use, reduce unnecessary input costs, and minimize environmental pollution. Soil testing also promotes efficient nutrient management, enhances crop yield, and maintains soil health over the long term. It is an essential tool for modern agriculture and supports the concept of precision farming. In conclusion, soil testing is a scientific approach that ensures balanced nutrient management and sustainable agricultural practices. Regular soil analysis should be encouraged among farmers to achieve better productivity and environmental conservation.

Keywords: Organic carbon, Agricultural, Sustainable Agricultural, Soil testing

Abstract ID 8160

Evaluation of medicinal Plant Extracts Against *Callosobruchus chinensis* (Coleoptera: Bruchidae) in Storage Conditions Using Integrated Bioassay and Gut Enzymatic Analysis

Rajat Mohan Bhatt , Saba Tanveer , Ruchira Tiwari

Department of Entomology, College of Agriculture, Govind Ballabh Pant University of; Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, 263145.

Abstract

The Pulse beetle, *Callosobruchus chinensis* (Coleoptera: Bruchidae), is a major stored grain pest causing severe post-harvest losses in chickpea (*Cicer arietinum*). In the present study, the insecticidal potential of methanol extracts of six botanicals including *Ageratina adenophora* (kala bansa), *Murraya koenigii* (curry leaves), *Justicia adhatoda* (white bansa), *Zanthoxylum armatum* (timur), *Azadirachta indica* (neem), and *Calotropis gigantea* (aak) was evaluated against *C. chinensis* under laboratory conditions. The extracts were assessed for contact toxicity, fumigant toxicity, and repellency activity. Their effect on detoxification enzyme activity in the gut of adult pulse beetles was investigated to elucidate the biochemical basis of toxicity. Methanolic botanical extracts exhibited significant insecticidal and repellent properties. Among all tested botanicals, *Zanthoxylum armatum* demonstrated the highest contact and fumigant toxicity, followed by *Ageratina adenophora*, *Azadirachta indica*, *Calotropis gigantea*, *Murraya koenigii*, and *Justicia adhatoda* in descending order. The order of insecticidal toxicity closely correlated with the degree of detoxification enzyme inhibition in the beetle gut, suggesting that suppression of enzymatic detoxification pathways is a key mechanism underlying the observed pesticidal activity. These findings highlight the potential of plant-based extracts, particularly those of *Zanthoxylum armatum*, as eco-friendly and sustainable alternatives to synthetic insecticides for the management of pulse beetle in stored chickpea.

Keywords: *Botanical insecticides, Callosobruchus chinensis, Contact toxicity, Detoxification enzymes, Fumigant toxicity, Repellent activity, Stored grain pest management*

Abstract ID 8161

Man-Powered Wheel-Type Harvesting Implement for Wheat and Rice

Ayush Rohilla, Vishwanath Singh & Dr. Sugam Gupta

Dept. of Applied Science & Humanities, Tula's Institute, Dehradun, Uttarakhand

Abstract

The utility model relates to a manual wheel-type harvesting implement for wheat and rice, which changes the traditional manner of stooping sickle harvesting into the form of walking upright push cutting. Compared with the other existing harvesting implements, the utility model which resultantly adopts a structure that a pair of walking wheels is installed under the chassis of the harvesting implement has the advantages of labour saving, portability, low labour intensity, and lasting operation. The work efficiency of the utility model is at least four times as great as sickle harvesting. The utility model has the advantages of simple structure, convenient use and repair. Furthermore, the machine can be effectively used in hilly and uneven areas where large combine harvesters cannot operate, making suitable for diverse agricultural conditions.

Abstract ID 8162

DaLa Application in India: A Review of Case Study Integration

Dr. Twinkle Razdan, Dr. Divyanshi Sharma, Dr. Anushree Srivastava, Dr. Mamta Gautam

Department of Applied Sciences & Humanities; ABES Engineering College, Ghaziabad (U.P), India

Abstract

The Damage and Loss Assessment (DaLa) methodology was developed by the Economic Commission for Latin America and the Caribbean (ECLAC) and has now become a base of the Post Disaster Needs Assessments (PDNAs) worldwide. India is susceptible to natural disasters which cause widespread agricultural and infrastructure damage resulting in heavy economic losses and claiming many lives. This review paper provides a comparative perspective on the case studies of Uttarakhand floods (2013) and the Kerala floods (2018) by looking into the operationalization of DaLa, the assessment of sectors and the achievement of the outcomes. The Kerala PDNA showed methodological maturity, integrating gender and resilience considerations in a systematic manner in contrast to Uttarakhand PDNA. The comparison review highlights the evolution of DaLa in India from a primarily quantitative tool to a more holistic framework involving actionable recovery planning for strengthening resilience in disaster prone regions. Key Words DaLa-Damage and Loss Assessment, PDNA-Post Disaster Needs Assessment, Resilience.

Abstract ID 8163

ANTIFUNGAL ACTIVITY OF WATER BORNE CONIDIAL FUNGI AGAINST SOME PLANT PATHOGENS

Ruchi Jalal¹ ; Saraswati Bisht²

¹Department of Botany, Surajmal Agarwal Private Kanya Mahavidyalaya, Kichha;

²Department of Botany, Indira Priyadarshini Govt. Girls P.G. College of Commerce, Haldwani;

Abstract

Water-borne conidial fungi are the prolific producers of secondary metabolites useful in medicinal, industrial, and agricultural areas. They are also known as aquatic hyphomycetes and are present as active colonizer of submerged decaying leaf litter. Antifungal activity of two aquatic hyphomycetes (*Cylindrocarpon aquaticum* and *Beltrania rhombica*) was tested against three phytopathogenic fungi (*Fusarium oxysporum*, *F. solani* and *Rhizoctonia solani*) using “Dual Culture” and “Agar Well Diffusion” method. *C. aquaticum* showed maximum percent inhibition against *F. oxysporum* (49.3 %) while minimum percent inhibition against *F. solani* (14 %) in case of dual culture method. In agar well diffusion method *C. aquaticum* showed maximum percent inhibition against *F. oxysporum* (46.8 %) while minimum percent inhibition against *R. solani* (14 %). *B. rhombica* showed maximum percent inhibition against *F. oxysporum* (34 %) while minimum percent inhibition against *R. solani* (13.5 %) in dual culture method. In agar well diffusion method *B. rhombica* showed maximum percent inhibition against *F. solani* (35.4 %) while minimum percent inhibition against *F. oxysporum* (21 %). The MIC of *C. aquaticum* was recorded to be 50 µg/ml against *F. oxysporum* and 25 µg/ml against *F. solani* and *R. solani* while MIC of *B. rhombica* was recorded to be 50 µg/ml against all the test fungi. Minimum Inhibitory Concentration and Activity index of hyphomycetous extracts indicated their potential more or less equivalent to that of Carbendazim, a commercial fungicide.

Keywords: *Antifungal activity; Agar-well method; Dual culture method; Fungicide*

Abstract ID 8164

Influence of Organic Fertilisation and Natural Farming Practices on Growth Attributes, Green Seeker-Based NDVI and Soil Quality in Rice Crop

Anil Kumar¹, A.K. Pant¹, Jai Paul¹, Veer Singh¹, Shri Ram¹ and Sunita T. Pandey²

¹Deptt. of Soil Science,

²Deptt. of Agronomy G. B. Pant University of Agriculture & Technology, Pantnagar.

Abstract

Rice (*Oryza sativa* L.) is one of the most important staple crops sustaining food security and rural livelihoods in South Asia. However, intensive cultivation practices involving excessive use of chemical fertilisers and pesticides have led to declining soil organic matter, reduced microbial activity, nutrient imbalances and deterioration of soil quality. In recent years, natural farming and organic nutrient management approaches have gained attention as sustainable alternatives for improving soil health while maintaining crop productivity. The present field experiment was conducted during 2024-25 at the Norman E. Borlaug Crop Research Centre, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, located in the *Tarai* belt of the Shivalik foothills (Mollisol), to evaluate the effect of natural farming and organic fertilisation practices on growth attributes, chlorophyll content, Green Seeker-based NDVI, nutrient uptake and soil quality in rice crop.

Keywords: *Natural farming, Jeevamrit, Beejamrit, Ghanjeevamrit, Vrikshayurveda, Direct-seeded rice, NDVI, Green Seeker, Soil quality, Sustainable agriculture*

Abstract ID 8165

Phytochemical profiling and GCMS Characterization of *Heliotropium curasavicum* L. with Ethnomedicinal Perspectives

Aarti¹, Jyoti Chauhan², Balkar Singh³, Ranjeet Singh*

¹ Research Scholar, Department of Botany, Kurukshetra University Kurukshetra- 136119,; Haryana India

² Assistant Professor, Department of Botany, Institute of Integrated & Honors Studies, Kurukshetra University Kurukshetra- 136119, Haryana

³ Department of Botany, Arya P.G. College, Panipat- 132103, Haryana, India;

* Professor, Department of Botany, Pt. CLS Government College, Karnal, Kurukshetra University Kurukshetra- 136119, Haryana India

Abstract

The family Boraginaceae comprises several genera of medicinal and ethnobotanical importance, among which the genus *Heliotropium* Tourn. ex L. are widely distributed across tropical and subtropical regions, 11 species are reported in Haryana. The present study aims to document the floristic diversity, phytochemical insights, ethnomedicinal relevance and Gas chromatography mass spectrometry (GCMS) characterization and of selected species *Heliotropium curasavicum* L. highlighting their potential significance in traditional healthcare systems and modern drug discovery. The ethnobotanical data were collected through field surveys and interaction with local people to record the traditional knowledge regarding the medicinal uses of the plant. Phytochemical screening of the reported species reveals the presence of diverse secondary metabolites such as alkaloids, flavonoids, phenolics, saponins, terpenoids, and cardiac glycosides, providing evidences for their traditional medicinal uses. GC-MS analysis enabled the identification of multiple bioactive compounds, including fatty acids, esters and other secondary metabolites that contribute to therapeutic potential. GC-MS characterization provides scientific validation of traditional uses and highlights the importance of *Heliotropium curasavicum* L. species as a rich source of natural bioactive compounds, integrating ethnobotanical information with phytochemical data. This study contributes to the preservation of indigenous knowledge and suggests the *Heliotropium curasavicum* L. can be further explored for drug development and pharmacological applications. In conclusion, the research emphasizes that combining traditional knowledge with modern analytical techniques can be significant for the discovery of novel plant based products.

Keywords: *Ethnomedicinal importance, GC-MS, Heliotropium curasavicum* L. , phytochemistry.

Abstract ID 8166

Influence of nano-urea application on growth and yield of tomato (*Solanum lycopersicum L.*)

Sakshi kandpal and Manoj Raghava

Department of Vegetable Science G.B Pant University of Agriculture and Technology, Pantnagar-263145, Udham Singh Nagar (Uttarakhand)

Abstract

Tomato (*Solanum lycopersicum L.*) is an important vegetable crop valued for its high nutritional content, wide adaptability, and consistent market demand. However, the excessive and imbalanced use of nitrogenous fertilizers has led to declining soil health, poor nitrogen-use efficiency (NUE), and environmental concerns. Recent studies have highlighted the potential of nano-fertilizers in improving nutrient efficiency and crop productivity. Nano-urea, a novel nano-fertilizer containing ultra-fine nitrogen particles (18–30 nm), offers advantages such as enhanced absorption, targeted delivery, and controlled nutrient release. Considering these advantages, the present field experiment was carried out during the Rabi season of 2024-25 at the Vegetable Research Centre, G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand. The study aimed to assess the impact of nano-urea in combination with soil-applied conventional urea on the growth and yield performance of tomato under open-field conditions. The experiment was conducted in a randomized complete block design (RBD) comprising eleven treatments, each replicated three times, to evaluate different nitrogen levels (100%, 75%, and 50%) applied through conventional urea in combination with foliar application of nano-urea (4 ml L⁻¹). The results revealed that the treatment receiving 100% recommended dose of nitrogen (RDN) along with two foliar sprays of nano-urea @ 4 ml L⁻¹ at 50 and 75 days after transplanting (DAT) recorded the maximum fruit equatorial and polar diameter at the 2nd and 4th pickings, required the least number of days to first fruit harvest, and produced the highest fruit yield per plant. This treatment was found to be the most economically viable and profitable, significantly enhancing growth, fruit quality, and overall yield of tomato.

Abstract ID 8167

Computational Investigation of Plant-Based Bioactives Against Psoriasis-Associated Inflammatory Proteins: Molecular Docking and ADMET Analysis;

Aastha Adhikari¹, Sneha Tiwari¹;

¹Department of Molecular Biology and Genetic Engineering, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Abstract

Psoriasis is a chronic inflammatory skin disease which is triggered by the immune response. It is characterized by excessive proliferation of the keratinocytes and the pro-inflammatory cytokines, such as the Tumour Necrosis Factor-alpha (TNF- α) and the Interleukin-17 A (IL-17A). These cytokines cause skin inflammation, epidermal hyperplasia in which the skin's outer layer grows thicker because its cells divide faster than normal cell division. This results in the formation of characteristic psoriatic plaques. Standard systemic treatments like methotrexate and cyclosporine are commonly used clinically due to their effectiveness against the disease but their prolonged use can cause considerable adverse effects. Methotrexate is associated with hepatotoxicity, leading to potential risks of hepatic fibrosis, cirrhosis, and bone marrow suppression whereas long term use of cyclosporine can cause nephrotoxicity and high blood pressure. This limits the long-term therapeutic use of these drugs. Thus, assessing plant-derived bioactive compounds such as Asiaticoside, glycyrrhizin, thymoquinone, wrightial (or wrightial flavonoids), and nimbolideas provides a safer and a more sustainable therapeutic alternative. These phytochemicals have anti-inflammatory, antioxidizing and immunomodulatory activities which makes them potential candidates for managing chronic inflammatory conditions like psoriasis. The present study is a computational evaluation of selected phytochemicals for their inhibitory potential against Tumour Necrosis Factor-alpha and Interleukin-17A. The protein structures were downloaded from protein data bank and a comparative molecular docking analysis was performed to assess the binding affinities and interaction stability. This study also highlights the amino acid residues involved in ligand binding. An in-silico ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) analysis was also performed to evaluate the pharmacokinetic properties and the safety profiles of the selected compounds. The results highlight the favourable binding energies, stable interaction patterns, and acceptable drug-likeness characteristics for the selected compounds

Keywords: *Psoriasis, molecular docking, bioactive compounds, Tumour Necrosis Factor-alpha, Interleukin-17A*

Abstract ID 8168

Sewage-Derived Bacteriophages as Emerging Therapeutics Against Multi-Drug-Resistant Clinical Pathogens

Khushi Tehri , Umesh Goutam

1Department of molecular biology and genetic engineering, School of bioengineering and biosciences, Lovely Professional University, Phagwara, Jalandhar, Punjab

Abstract

The microbial communities within sewage are highly diversified and thus they form big reservoirs in the production of therapeutic bacteriophages particularly in clinical infections that are multiple drug resistant (MDR). Hospital wastewater is of particular importance due to the presence of resistant bacterial strains released by patients, which cause selection pressure on phages, which can cause therapeutically relevant infections. Several studies have successfully obtained sewage-derived bacteriophages that have strong lytic activity against key MDR bacteria including *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Escherichia coli*. Some phages have shown remarkable efficacy, decreasing bacterial loads are high in short durations with no loss of activity against strains resistant to last-resort drugs like meropenem and colistin. Bacteriophages derived by sewage have other advantages to their therapeutic use which include high genetic diversity, cheap isolation, and adaptability to host resistance changes. Phage-based techniques have also seen an enhancement of clinical usefulness with advances in cocktail formulations, genetic engineering, and an expansion of host range. Moreover, they possess a dynamic advantage over the conventional antibiotics because of their ability to co-evolve with the bacterial hosts. Bacteriophages found in sewage can be a feasible and effective solution to combating MDR infections, and it offers a viable alternative to the next-generation antimicrobial therapies, despite challenges of environmental stability, host specificity, and regulatory frameworks.

Keywords: *next- generation antimicrobial therapies, Therapeutic bacteriophages, Multidrug-resistant (MDR) infections, Hospital wastewater*

Abstract ID 8169

Enhancing wheat yield and grain quality through Nano DAP under reduced Phosphorus fertilization

Adarsh Dangwal¹, Rajeew Kumar¹, Anil Shukla¹, Ajeet Pratap Singh², Kuldip Chandra Verma³ and Priyanka Pandey⁴

1Department of Agronomy, College of Agriculture, GBPUAT, Pantnagar

2Department of Soil Science, College of Agriculture, GBPUAT, Pantnagar

3Department of Biochemistry, CBSH, GBPUAT, Pantnagar

4Department of Molecular Biology and Genetic Engineering, CBSH, GBPUAT, Pantnagar

Abstract

A field experiment was conducted during the Rabi season of 2024-2025 at the N.E. Borlaug -Crop Research Centre, Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Uttarakhand, to evaluate the effect of Nano DAP on yield and nutritional quality of wheat (*Triticum aestivum* L.). The experiment was laid out in a randomized block design with treatments comprising different phosphorus levels (50-100% RDF) integrated with seed treatment and foliar application of Nano DAP. A control treatment (T11) with 100% recommended dose of fertilizers (RDF) without nano fertilizer application was included. Results indicated that Nano DAP significantly improved yield attributes and grain yield over the control. Treatment T10 (50% P + seed treatment + two foliar sprays @ 4 mL L⁻¹) recorded the highest grain yield, showing a 4.0% increase over T11, followed by T9 and T6. Yield parameters such as spike length and test weight were also enhanced under Nano DAP treatments. Grain quality improved significantly, with higher nitrogen and phosphorus content recorded in T10, whereas potassium content remained unaffected. The study demonstrates that Nano DAP, when integrated with reduced phosphorus levels (50-75% RDF), can outperform conventional fertilization, improving productivity, nutrient use efficiency, and grain quality, thereby offering a sustainable approach for wheat cultivation.

Keywords: *Nano DAP, Grain yield, Nutrient use efficiency, Grain quality, Sustainability*

Abstract ID 8170

Synergistic Effect of Microbial Inoculants, Nanoparticles and Biochar on Vegetative Growth of Strawberry Cultivated Under Shade Net Conditions

Ashok Kumar¹, Tejpal Singh Bisht²

¹Ph.D. Research Scholar, Department of Horticulture, School of Agriculture and Allied Science, H.N.B. Garhwal University, Srinagar (Garhwal) Uttarakhand India.

²Assistant Professor, Department of Horticulture, School of Agriculture and Allied Science, H.N.B. Garhwal University, Srinagar (Garhwal) Uttarakhand India.

Abstract

The present investigation was conducted to study the synergistic effect of *Trichoderma asperellum*, *Pseudomonas fluorescens*, *Bacillus subtilis*, ZnO, CuO, FeO Nanoparticles, and biochar on the vegetative growth of strawberry (*Fragaria × ananassa* Duch.) cv. Chandler. Cultivated under shade net conditions at the Horticulture Research Centre, Department of Horticulture, Srinagar, Garhwal, Uttarakhand, during the year 2024-25. The trial was conducted in a factorial completely randomised design (FCRD) and replicated thrice with 98 treatments. Findings of the research depicted that among all different treatments, the combined application of microbial inoculants *Trichoderma asperellum*, *Pseudomonas fluorescens*, and *Bacillus subtilis* @ 10 g. each, Nanoparticles ZnO, CuO @25 ppm and FeO NPs @5ppm and without Biochar and with Biochar @5% demonstrated significant effectiveness across various parameter of crop growth during the initial plant growth stage at 30, 60, and 90 DAT. Measurements were in growth parameter recorded under the combined treatment of bioinoculants, nanoparticles, and biochar. The enhancement in growth attributes is likely due to improved nutrient availability, enhanced rhizospheric microbial activity, and better soil structure and moisture retention. Nanoparticles further contributed by increasing micronutrient uptake efficiency. Thus, the synergistic application of microbial inoculants, nanoparticles, and biochar proved to be an effective and eco-friendly approach for enhancing the vegetative growth of strawberry.

Keywords: *Synergistic effect, strawberry, Shade net condition, Nanoparticles, Microbial inoculants.*

Abstract ID 8171

Trichoderma-Based Biological Seed Treatment for Enhancing Germination and Vigor in Garden Pea (*Pisum sativum L.*): A Sustainable Approach to Climate-Resilient Agriculture

Juhi Khanal

Independent Researcher, Kumaun, Uttarakhand

Abstract

The extensive reliance on synthetic seed treatments in modern agriculture has intensified concerns regarding edaphic health, ecological safety, and the sustainability of crop production systems. In this context, *Trichoderma* spp. has attracted considerable attention as multifunctional bio-agents with plant growth-promoting and antagonistic properties. The present study assessed the efficacy of *Trichoderma*-mediated seed treatment in garden pea (*Pisum sativum L.*) with respect to germination, seedling vigor, early biomass accumulation, and suppression of seed- and soil-borne pathogens.

Laboratory and pot trial observations were undertaken to compare *Trichoderma*-treated seeds with untreated controls. Germination percentage, seedling vigor index, root and shoot elongation, and biomass accumulation were recorded as primary growth parameters, while disease incidence and plant establishment were monitored to evaluate treatment performance under agronomic conditions. The treated seeds exhibited improved germination and more rapid early growth, accompanied by enhanced root architecture, greater seedling vigor, and higher biomass production relative to the control. A concomitant reduction in early disease incidence further indicated the biocontrol potential of *Trichoderma* against soil-borne pathogens. The findings underscore the dual functionality of *Trichoderma* as a rhizosphere colonizer and a biological seed treatment agent capable of promoting early crop establishment while mitigating pathogen pressure. This approach offers a scientifically credible and environmentally responsible alternative to conventional chemical seed treatments, particularly in low-input production systems. Overall, the study supports the integration of microbial inoculants into sustainable pea cultivation as a strategy for improving crop establishment, reducing chemical dependency, and strengthening climate-resilient agriculture. The work also aligns with current priorities in sustainable crop protection and integrated crop management.

Abstract ID 8172

Ethnomedicinal plants in Kangra District of Himachal Pradesh, India: A Study

*Bhagwati Prashad Sharma**

*Department of Botany, Sidharth Government College Nadaun, Himachal Pradesh, India

Abstract

Indigenous ethnomedicinal plant knowledge has been used since ages to cure maladies. This knowledge has been transferred from generation to generation orally since ancient time. As it passed orally from generation to generation, it couldn't be documented. So, it is still unrecorded. This indigenous knowledge has been used by people inhabiting isolated and remote areas for treatment of variety of ailments. Ethnobotany, which studies interrelationship between plants and indigenous people has emerged as a prominent branch of Botany in last few decades. This interaction includes use of local plants for treating ailments and for domestic, cultural and religious purposes. Himachal Pradesh, a state in northern part of India, located in Western Himalaya, has luxuriant plant wealth and rich tradition of knowledge of use of local plants for treatment of ailments. So, it represents suitable case for ethnobotanical studies. Study area Kangra district located in western part of Himachal Pradesh has diverse vegetation and topography. The people of the region inhabit Shiwalik and Dhauladhar ranges of Kangra. They have rich knowledge of use of local plants for treatment of human and cattle diseases. So, present research work was conducted in Kangra district to record ethnomedicinal knowledge of Kangra district and, identify and record the ethnomedicinal plants. The study revealed use of 32 plants utilized for treatment of various diseases in Kangra district of Himachal Pradesh. This traditional indigenous knowledge provides an important information base for further study and developing of new drugs for new maladies and epidemics.

Keywords: *Ethnobotany, Ethnomedicinal, Indigenous, Traditional knowledge, Maladies*

Abstract ID 8173

Evaluation of growth and production behaviour of *Pisum sativum* L. under an existing Agroforestry system in mid hills of Himachal Pradesh

Rupinder Kaur, Sugam Gupta, Suresh Kumar, Ankur Kumar, Simrat Kaur

^{1,3,4} Department of Agriculture, Tula's institute, Dehradun (UK)-248001, India.

² Department of Applied Science and Humanities, Tula's institute, Dehradun (UK)-248001, India.

⁵ Department of Chemistry, Mata Gujri College, Fatehgarh Sahib (PB) 140406, India.

Examining the growth, biomass, and productivity of *Pisum sativum* L. cultivated in a traditional agroforestry system in the Himachal Pradesh region of Solan was the goal of the current study. Along with crops and vegetables, trees are a part of a typical agro-forestry system. *Bauhinia variegata*, *Toona ciliata*, and *Grewia optiva* were among the tree species present. Plant height, crop density, number of legumes, number of leaves, number of grains, straw yield grain yield, and harvest index were investigated during both the years of study. Average plant height, number of leaves, and number of grains ranged from 41.2 to 45.4 cm, 46.45 to 39.26 cm, and 26.80 to 32.14, respectively. Sole crop (control) had the highest grain yield (13.81 Mg/ha), straw yield (9.04 Mg/ha) and highest harvest index (62.48%) during first year of study. Site S3 had the highest grain (15.82 Mg/ha) and straw (9.44 Mg/ha) yields in the second year while Site S1 has the highest harvest index (62.95%). The presence of trees clearly influenced the number of grains per plant, as it reduced when compared to the sole crop in the first year. Biomass varied from 8.29 to 11.97 Mg/ha, 18.42 to 24.88 Mg/ha, 4.31 to 5.16 Mg/ha and 8.43 to 9.16 Mg/ha in leaf, shoot, root and silique, respectively, during two years of study. The biomass of the four sites and the control site under study differed in ways that were statistically significant. The growth characteristics, grain yield, and straw yield were all impacted by the distance from the tree root. Furthermore, crops cultivated under trees may have lower crop production and harvest indices due to shade effects and root competition for nutrients and moisture. Tree branches in hilly regions that are part of the current agroforestry systems might be regularly pruned to control it, which would assist the rural community in many ways.

Keywords: *Biomass, Agroforestry, Growth, Productivity, Grain yield, Straw yield and Harvest index*

Abstract ID 8174

Kiwi- A Cash Crop & Key of Diversification For Uttarakhand Hill Agriculture

Suraj Joshi¹, Anoop Badoni² and Deepali Joshi³

¹Himalayan Institute of Technology (HIT), Dehradun

²PLANTICA- Indian Academy of Rural Development (IARD), Dehradun

Abstract

For a long time, farmers in the Uttarakhand hills have grown basic crops like wheat and millets, which do not earn much money. However, the cool climate of the mountains is perfect for growing Kiwi, a high-value fruit that is in great demand across India. Traditional farming in the hills is becoming difficult due to small land sizes, low profits, and animal attacks on crops, causing many people to leave their villages. The purpose of this study is to show how switching to Kiwi farming can act as a "cash crop" to increase farmers' income and stop rural migration. We collected simple data by talking to local farmers who started Kiwi plantations and compared their earnings with those growing traditional grains. The results show that Kiwi farmers earn 4 to 6 times more profit per acre than traditional farmers. Because Kiwi has a long shelf life and high market prices, it is a very stable and profitable choice for hill families. In conclusion, Kiwi is the "key" to modernizing Uttarakhand's hill agriculture. If farmers get better support for irrigation and selling their fruit, Kiwi farming can turn the mountain economy around and provide a bright future for local youth.

Keywords: *Kiwi Fruit, Cash Crop, Uttarakhand Hills, Farmer Profit, Rural Migration.*

Abstract ID 8175

Engineering Bacteriophages for Precision Biocontrol in Wastewater Systems: Advances and Translational Challenges

Harshal Gaikwad¹, Dr. Umesh Goutam¹

¹Department of Molecular Biology and Genetic Engineering, School of Bioengineering and Biosciences, Lovely Professional University, Phagwara, Jalandhar, Punjab, India

Abstract

Complex and robust microbial communities in industrial wastewater and sewage systems undermine the effectiveness of the treatment process and present dangerous threats to both the environment and human health. Traditional disinfection methods such as chemical oxidants and antibiotics are oftentimes non-selective, produce secondary pollutants and are contributory to the growth of antimicrobial resistance. These shortcomings highlight the need to urgently develop specific and environmentally friendly microbial control strategies. An alternative that is far more precise in its biocontrol is the bacteriophages, or virus, which is a viral bacteriophage and self-replicating, resulting in a highly specific method of biocontrol. This review is a critical review of the recent developments in the field of developing bacteriophages to improve their effectiveness in wastewater treatment. Much attention is paid to the alteration of host-recognition determinants such as tail fiber proteins and receptor-binding domains, which determine host specificity and efficiency of infection. New technologies like rational protein design, directed evolution, and modular genome engineering have been used to create phages with a broadened host range, better adsorption kinetics and activity against biofilm-forming and multidrug-resistant bacterial communities. In spite of these developments, the application of translationally is limited due to limitations of large-scale production, purification and stability under fluctuating physicochemical conditions that are characteristic of wastewater systems. New advances such as encapsulation technologies, surface immobilization, integration into engineered bioreactor systems show promise to enhance phage persistence and operational robustness. Together, engineered bacteriophages promise to be an effective and sustainable paradigm to manage microbes in wastewater treatment with precision.

Keywords: *Bacteriophage engineering, Wastewater biocontrol, Antimicrobial resistance (AMR), Sustainable wastewater treatment*

Abstract ID 8176

Effect of Plant Based Priming Agents on Germination Performance of Mung Bean (*Vigna radiata*)

Amit Kishore, Girish Chandra and Ummed Singh

Department of Seed Science & Technology, School of Agricultural Sciences, Shri Guru Ram Rai University Patel Nagar Dehradun-248001, Uttarakhand

Abstract

Seed priming is an effective technique to enhance germination and seedling vigor under controlled conditions. The present study evaluated the impact of different botanical and bio- based priming treatments on seed quality parameters. The experiment comprised seven treatments: T₁ Control, T₂ Hydropriming, T₃ Burans (*Rhododendron arboreum*) 5% solution, T₄ Moringa (*Moringa oleifera*) 5% solution, T₅ Kafal (*Myrica esculenta*) 5% solution, T₆ Nano N:P:K (25:25:25) @ 0.5 ml per 100 ml distilled water, and T₇ Rhizobium + Pseudomonas @ 0.5 ml per 100 ml distilled water. Seeds were primed for 4 hours and evaluated through a standard germination test at 25°C under laboratory conditions. The results showed significant variation among treatments for all parameters, including first count germination, final germination percentage, seedling length, seedling fresh and dry weight, Seed Vigour Index I and II. Among the treatments, T₄ (Moringa (*Moringa oleifera*) 5% solution) recorded the highest values for all parameters, followed by T₃ (Burans (*Rhododendron arboreum*) 5% solution) and the lowest performance was observed in T₁ (Control). The study concludes that botanical priming, particularly with Moringa (*Moringa oleifera*) 5% leaf extract, followed by Burans (*Rhododendron arboreum*) 5% solution and is an effective, eco-friendly, and economical approach to enhance seed germination and seedling vigor

Abstract ID 8177

Effect of different row spacing and seed rates on growth and seed yield of lentil

(Lens culinaris L)

Vijender Rana, Harish Purohit

Shree Dev Bhoomi Institute of Education Science & Technology, Dehradun

The field experiment entitled "Effect of different row spacing and seed rates on growth and seed yield of lentil (*Lens culinaris L*)" was conducted during Rabi season. The experiment was laid out in split plot design comprising three rows spacing viz., 20, 25 and 30 cm in main plots and three levels of seed rate @ 20, 40 and 60 kg seed rate/ha in sub plots. The results showed that 30 cm row spacing gave significantly highest grain yield (2144 kg/ha) which was 7.52 and 21.96 per cent higher over 25 and 20 cm row spacing, respectively. Similarly, 60 kg seed rate/ha produced maximum grain yield (2084 kg/ha) and was statistically at par with 40 kg seed rate/ha (2008 kg/ha) but significantly higher than 20 kg seed rate/ha (1804 kg/ha). Similar trend was observed in case of straw yield. The crop sown on 30 cm row spacing resulted in higher growth parameters i.e. plant height (44.28 cm), number of branches (8.20) and yield attributes i.e number of branches (8.20), number of pods per plant (153.26), pod length (1.0e cm) number of seeds per pod (2.07), seed index (2.69 g), biological yield (565 kg/ha) than other row spacing (20 and 25 cm) and the per cent increased seed yield with 30 cm row spacing was 7.52 and 21.96 over 25 and 20 cm row spacing respectively. Similarly, 60 kg seed rate/ha recorded higher growth parameters i.e. plant height (44.12 cm), number of branches per plant (8.26) and yield attributes i.e. number of pods per plant (156.07), pod length (1.08 cm) number of seeds per pod (2.11), seed index (2.72 g), biological yield (5739 kg/ha) as compared to other seed rates and the per cent increased in seed yield with 60 kg /ha seed rate was 3.74 and 15.53 over 40 and 20 kg /ha seed rates.

Keywords: *Lentil, Row Spacing, Seed Rate and Yield.*

Abstract ID 8178

CLIMATE CHANGE AND ITS IMPACT ON EMERGING PLANT DISEASES IN SUSTAINABLE AGRICULTURE

Anushka Trivedi

M.Sc. Plant Pathology; Department of Agricultural Sciences, SGRRU Pathribagh, Dehradun

Abstract

Climate change is affecting agriculture and becoming a serious challenge for agriculture globally. It also has a very strong impact on plant diseases. As the emergence of various diseases caused by pathogens like fungi and bacteria thrive under favourable climatic conditions. The change in climate leads to the development of different diseases. Changes in humidity, rainfall and temperature influence different pathogens to grow like fungal diseases (blights, rusts). Climate change, driven by greenhouse gas emissions from human activities, is increasing global warming which disrupts agricultural productivity. Due to these changes in climate like high temperature and high humidity the incidence of disease due to pathogens increases and becomes more severe. Climate change accelerates both existing and emerging plant diseases which threatens agricultural sustainability and productivity. We should follow sustainable solutions like integrated disease management, organic farming, use of resistant varieties, eco-friendly practices so that we can protect our environment. Developing sustainable strategies to ensure crop productivity and long term food security is crucial. **Keywords** Climate change, Sustainable agriculture, Plant diseases, Disease management “Sustainable Crop Residue Management through Biochar Application for Enhancing Soil Health and Reducing Emissions in Rice-Wheat Cropping System” Sumit Gaur, Sumit Chaturvedi, V. C. Dhyani, Sambita Bhattacharyya Department of Agronomy, COA, GBPUA&T, Uttarakhand *Corresponding author e-mail: sumitagronomy78@gmail.com Crop residue management in India has become a major challenge, particularly in the rice-wheat cropping system, due to the very short turnaround time between harvesting of rice and sowing of wheat. India produces approximately 500-550 million tonnes of crop residues annually, out of which nearly 90-120 million tonnes are burnt in situ, especially in north-western regions. This burning leads to substantial losses of soil organic carbon and essential nutrients; it is estimated that residue burning results in the loss of about 5.5 million tonnes of nutrients annually, including nitrogen, phosphorus, potassium and sulphur, along with significant carbon emissions into the atmosphere. Since rice and wheat are staple crops forming the backbone of Indian food security, such practices not only degrade soil health but also threaten long-term sustainability. In this context, sustainable residue management practices such as biochar application have gained importance. A field experiment at Norman E. Borlaug Crop Research Centre, Pantnagar, Uttarakhand, conducted during 2024-25 demonstrated that biochar amendments significantly improved soil properties and reduced greenhouse gas emissions compared to residue incorporation. Soil organic carbon increased more under enriched biochar than activated biochar, with improvements of up to 19.44% in wheat, while activated biochar showed relatively better performance in reducing N₂O emissions (up to 16.77% reduction). These findings highlight the dual benefits of biochar in enhancing carbon sequestration and mitigating emissions, offering a viable solution for residue management in intensive cropping systems.

Keywords: *Enriched Biochar, Activated Biochar, Essential Nutrient*

Abstract ID 8179

“Sustainable Crop Residue Management through Biochar Application for Enhancing Soil Health and Reducing Emissions in Rice-Wheat Cropping System”

Sumit Gaur, Sumit Chaturvedi, V. C. Dhyani, Sambita Bhattacharyya
Department of Agronomy, COA, GBPUA&T, Uttarakhand

Abstract

Crop residue management in India has become a major challenge, particularly in the rice–wheat cropping system, due to the very short turnaround time between harvesting of rice and sowing of wheat. India produces approximately 500-550 million tonnes of crop residues annually, out of which nearly 90-120 million tonnes are burnt in situ, especially in north-western regions. This burning leads to substantial losses of soil organic carbon and essential nutrients; it is estimated that residue burning results in the loss of about 5.5 million tonnes of nutrients annually, including nitrogen, phosphorus, potassium and sulphur, along with significant carbon emissions into the atmosphere. Since rice and wheat are staple crops forming the backbone of Indian food security, such practices not only degrade soil health but also threaten long-term sustainability. In this context, sustainable residue management practices such as biochar application have gained importance. A field experiment at Norman E. Borlaug Crop Research Centre, Pantnagar, Uttarakhand, conducted during 2024-25 demonstrated that biochar amendments significantly improved soil properties and reduced greenhouse gas emissions compared to residue incorporation. Soil organic carbon increased more under enriched biochar than activated biochar, with improvements of up to 19.44% in wheat, while activated biochar showed relatively better performance in reducing N₂O emissions (up to 16.77% reduction). These findings highlight the dual benefits of biochar in enhancing carbon sequestration and mitigating emissions, offering a viable solution for residue management in intensive cropping systems.

Keywords: *Enriched Biochar, Activated Biochar, Essential Nutrient.*

Abstract ID 8180

Structural Planning and Design of Greenhouses: Materials, Layout, and Orientation

Saurabh Kumar Rai and Naveen Chandra

Department of Agricultural Studies; Quantum University, Roorkee Uttarakhand

Abstract

Structural planning and design are fundamental determinants of greenhouse performance, durability, and economic viability in protected cultivation systems. A well-designed greenhouse structure ensures optimal light transmission, efficient ventilation, structural stability, and effective space utilization, thereby directly influencing crop productivity and quality (Jensen & Malter, 1995). The selection of appropriate construction materials, including framing and cladding components, plays a critical role in determining strength, insulation properties, and longevity under varying agro-climatic conditions. Additionally, internal layout planning such as bed arrangement, pathways, and irrigation placement enhances operational efficiency and resource management (Tiwari, 2003). Orientation of the greenhouse with respect to solar radiation and prevailing wind direction significantly affects microclimate regulation and uniform light distribution, particularly in tropical and subtropical regions (Singh, 2014). Structural considerations must also account for environmental loads such as wind, snow, and dead loads to prevent failures and ensure long-term sustainability. This chapter presents a comprehensive overview of structural components, material selection, layout strategies, orientation principles, and load considerations essential for scientific greenhouse design. The discussion aims to provide practical and theoretical insights for students, researchers, and practitioners engaged in protected cultivation systems.

Keywords Greenhouse design; Structural planning; Cladding materials; Layout planning; Orientation; Environmental loads; Protected cultivation.

Abstract ID 8181

Climate Resilient Smart Integrated Agriculture: A Sustainable Approach for Future Farming

Prateek kashyap , shikha sharma

Student, School of Agriculture, Forestry & Fisheries, [jigyasa university, Dehradun, INDIA

Abstract

Agriculture is increasingly challenged by climate change, leading to reduced productivity, resource degradation, and livelihood risks. Climate Resilient Smart Integrated Agriculture has emerged as a holistic and sustainable approach to address these challenges by integrating multiple farm enterprises such as crops, livestock, fisheries, agroforestry, and apiculture with modern technologies. This system incorporates advanced tools like IoT-based sensors, drone monitoring, GIS applications, and climate forecasting to enhance precision, efficiency, and decision-making. From a sustainability perspective, the model promotes resource recycling, where the waste of one component serves as an input for another, thereby reducing environmental impact and improving overall farm profitability. Practices such as rainwater harvesting, renewable energy utilization, organic nutrient management, and carbon sequestration further strengthen resilience against climate variability. Various studies highlight that integrated farming systems significantly improve productivity, income stability, and ecological balance. However, further research is required to optimize component interactions and assess long-term impacts under diverse agro-climatic conditions. Climate Resilient Smart Integrated Agriculture thus represents a promising strategy for achieving sustainable intensification, ensuring food security, and building resilient farming communities in the face of changing climate.

Keywords *Climate resilience, Integrated farming system, Smart agriculture, IoT, Sustainability, Carbon sequestration*

Abstract ID 8182

Design Criteria for Greenhouse Cooling and Heating Systems for Climate Control

Savi Saini¹ and Isha²

Department of agricultural studies, Quantum University, Roorkee, Uttarakhand

Abstract

Controlled environment agriculture through greenhouse technology has gained significant importance for enhancing vegetable crop production under diverse climatic conditions. Among various greenhouse management practices, the design and implementation of efficient cooling and heating systems are critical for maintaining an optimal microclimate essential for plant growth, development and productivity. Temperature fluctuations beyond the optimum range can adversely affect physiological processes, leading to reduced yield and quality. This study focuses on the design criteria and operational principles of greenhouse cooling and heating systems used for climate control. Cooling methods such as natural and forced ventilation, evaporative cooling (fan and pad system), and shading techniques are widely adopted to reduce excess heat inside greenhouse structures. In contrast, heating systems including solar heating, hot water pipe systems, unit heaters, and thermal screens are employed to maintain suitable temperature conditions during colder periods. The selection and design of these systems depend on factors such as climatic conditions, crop requirements, greenhouse structure, and economic feasibility. Furthermore, the integration of energy- efficient and sustainable approaches, including automated climate control systems, sensor-based monitoring, and renewable energy sources, is emphasized to enhance system performance and reduce environmental impact. The chapter highlights the importance of combining different climate control strategies to achieve efficient and sustainable greenhouse production systems.

Keywords *Greenhouse technology, Climate control, Cooling systems, Heating systems, Microclimate, Sustainable agriculture*

Abstract ID 8183

Enhancing Productivity and Water-Use Efficiency of Japanese Mint (*Mentha arvensis L.*) through Establishment Methods, Mulching, and Biostimulants under Summer Season Conditions of the Tarai Region of Uttarakhand

Sambita Bhattacharyya^{1*}, Sumit Gaur¹, Gurvinder Singh¹ and Sumit Chaturvedi²
1,2 Department of Agronomy, COA, GBPUA&T, Uttarakhand

Abstract

The summer season in the Tarai region of Uttarakhand is characterized by high evapotranspiration (ET) demand and low rainfall, resulting in water scarcity and moisture stress conditions that adversely affect crop productivity. A field experiment was conducted during the summer season of 2024 at the Norman E. Borlaug Crop Research Centre, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, to evaluate the performance of Japanese mint (*Mentha arvensis L.*) under different agronomic practices. The experiment was laid out in a split-split plot design with three factors: (i) establishment methods (flat and furrow) in main plots, (ii) mulching (sugarcane trash mulch @ 6 t ha⁻¹ and no mulch) in subplots, and (iii) growth regulators (control/water spray, humic acid @ 0.5%, and seaweed sap @ 0.5% applied at 30, 60, and 90 days after planting) in sub-subplots. The crop was sown during the second week of February 2024. The results revealed that the treatment combination of furrow planting + sugarcane trash mulch + seaweed sap (0.5%) recorded superior performance over all other treatments. The highest essential oil yield (266.4 kg ha⁻¹) was obtained under this treatment, representing a 37% increase over control (≈194 kg ha⁻¹). The maximum lateral spread (65 cm) was also recorded, showing a 30% increase over control (≈50 cm). Herbage yield exhibited a 33% increase, while irrigation water productivity improved by 35%, indicating efficient utilization of water under moisture stress conditions. Economic analysis further revealed that this treatment achieved the highest profitability, with a benefit–cost ratio increase of 42% over control. The superior performance of this treatment combination can be attributed to improved soil moisture conservation under furrow planting, reduced evaporation losses due to mulching, and enhanced physiological activity and stress tolerance induced by seaweed-based biostimulants. In conclusion, the integration of furrow planting, sugarcane trash mulching, and seaweed sap application provides an effective and sustainable strategy to enhance oil yield, plant growth, water productivity, and economic returns of Japanese mint under summer season water-deficit conditions of the Tarai region of Uttarakhand.

Keywords Japanese mint (*Mentha arvensis L.*); furrow planting; sugarcane trash mulch; seaweed sap; water productivity

Abstract ID 8184

Optimizing Linseed Productivity through Combined Application of Phosphorus, Potassium and Vermicompost.

*Meenakshi Joshi**, *Sonali Rajput*, *Shailendra Tiwari*
Dept. of Seed Science and Technology, H.N.B. Garhwal University

Abstract

Linseed (*Linum usitatissimum* L.) is a significant *Rabi* oilseed crop because of its rich source of omega-3 fatty acids and other nutritional and industrial applications. It needs to improve its productivity through efficient nutrient management, especially in low-input situations. The current experiment was carried out in *Rabi* season at the Department of Seed Science and Technology, H.N.B. Garhwal University, Srinagar, Uttarakhand, to determine the impact of the combination of phosphorus, potassium, and vermicompost on the growth and yield of linseed. The experiment would be carried out in a Randomized Block Design (RBD) with 9 treatments and 3 replications each. Various proportions of phosphorus, potassium, and vermicompost had been used including a control. Growth parameters including plant height, number of branches, shoot length, root length, biomass accumulation, and yield parameters such as number of pods, grain yield and straw yield were observed. It was revealed that a balanced phosphorus and potassium (P @ 200 g + K @ 150 g) application had a considerably positive effect on vegetative growth by achieving the maximum plant height (66.8 cm) and greatest number of branches and roots. Using phosphorus, potassium, and vermicompost (T8) enhanced biomass growth and yielded the greatest number of pods per plant (98). However, the highest grain (10.17 g/m²) and straw yield (26.7 g/m²) were obtained with (P @ 250 g + vermicompost @ 150 g).

Keywords *Linseed, Potassium, Phosphorus, Vermicompost, Omega-3, Fatty acid, Alpha-linolenic acid*

Abstract ID 8185

Millet Cultivation and Institutional Ecosystems: A Study of Farmer Motivation in Uttarakhand

Himanshu Malhotra¹, Rajeev Kumar²

Doon University, Dehradun, Uttarakhand

Abstract

Millet cultivation has re-emerged as a climate-resilient and nutrition-sensitive strategy in India, yet relatively little is known about the motivational drivers that shape farmers' adoption decisions, especially in ecologically vulnerable regions such as Uttarakhand Kumaun and Garhwal hills. This qualitative study explores how institutional ecosystems mediate farmer motivation to cultivate millets, moving beyond narrow economic rationality to account for social and aspirational dimensions. A purposive sample of 20 millet farmers across Kumaun and Garhwal was selected, and data were collected through semi-structured interviews. Thematic analysis following Braun and Clarke (2006) reveals that farmers' motivation is shaped by a combination of three interrelated factors: (1) economic drivers such as income stability, risk reduction, and market access; (2) social drivers such as institutional trust, participation in Self-Help Groups, and peer networks; and (3) aspirational drivers such as skill development, entrepreneurship, and intentions to expand farming activities. The findings suggest that these motivational dimensions do not operate in a strict hierarchy but as an interconnected system, reinforced by the local institutional ecosystem. By situating farmer motivation within this broader institutional context, the study contributes to the literatures on sustainable agriculture, crop diversification, and rural development in mountainous regions of India.

Keywords *Millet cultivation; Farmer motivation, Sustainable agriculture; Uttarakhand; Institutional support*

Abstract ID 8186

Unravelling Chilling Requirements and Yield Dynamics of Selected Apple Cultivars in Mid- Hill Regions of Himachal Pradesh, India

*Sanjeev Kumar**, *Garima*

Department of Basic Sciences, College of Forestry, Dr. Yashwant Singh University of Horticulture and Forestry Nauni Solan, Himachal Pradesh, India

Abstract

The present study investigated the seasonal chilling accumulation and its influence on productivity of apple cultivars under contrasting mid-hill environments of Himachal Pradesh, India. The experiment was conducted over two consecutive years (2023–2025) at two locations differing in altitude: YS Parmar University of Horticulture and Forestry, Nauni (1,300 m AMSL) and Regional Horticultural Research and Training Station, Mashobra (2,286 m AMSL). Three commercially important apple cultivars—Gale Gala, Red Velox, and Jeromine—were evaluated to understand their response to varying chilling regimes. Chill units (CU) were estimated from November to April using hourly temperature data and the Utah Model. The higher elevation site, Mashobra, consistently recorded greater chilling accumulation, with total values of 1212 CU in 2023–24 and 1183 CU in 2024–25, compared to 872.5 CU and 887.5 CU at Nauni during the respective years. Peak chilling accumulation was observed in December at both locations. Despite receiving lower chilling, Nauni exhibited slightly higher overall yields. Among the cultivars, Jeromine demonstrated superior performance across both sites and years. At Nauni, it recorded yields of 11.84 kg per tree (47.60 MT/ha) in 2023–24 and 12.05 kg per tree (48.20 MT/ha) in 2024–25. At Mashobra, corresponding yields were 11.52 kg per tree (46.30 MT/ha) and 11.74 kg per tree (46.96 MT/ha). The results indicate that yield performance is not solely dependent on chilling accumulation but is also influenced by cultivar adaptability and site-specific conditions. Overall, the study highlights the importance of matching cultivar requirements with local chilling profiles. Such insights are crucial for optimizing apple productivity and developing climate-resilient horticultural strategies in the Himalayan region under changing climatic scenarios.

Keywords *Chilling requirement · Apple cultivars · Yield dynamics · Climate variability · Phenology*

Abstract ID 8187

Heat stress in medicinal flora

Dr. Neeru Kaushal

Gautam College Hamirpur

Abstract

Heat stress is an increasingly significant environmental challenge that adversely affects the growth, development, and productivity of medicinal plants, particularly in the context of global climate change. Elevated temperatures can disrupt key physiological processes, including photosynthesis, respiration, and water balance, leading to reduced plant vigor and yield. In medicinal plants, heat stress is of special concern as it not only impacts biomass production but also alters the synthesis and accumulation of secondary metabolites, which are responsible for their therapeutic properties. Changes in the concentration and composition of these bioactive compounds can compromise the quality and efficacy of plant-derived medicines. At the cellular level, heat stress induces the overproduction of reactive oxygen species (ROS), resulting in oxidative damage to proteins, lipids, and nucleic acids. To counteract these effects, medicinal plants activate various defense mechanisms, including the enhancement of antioxidant enzyme activities, accumulation of osmoprotectants, and synthesis of heat shock proteins that help maintain cellular stability. Additionally, plants may undergo morphological and biochemical adjustments to improve their tolerance to high temperatures. Recent research has focused on developing strategies to mitigate the adverse effects of heat stress in medicinal plants. These include the use of plant growth regulators, improved cultivation practices, and advanced approaches such as genetic improvement and biotechnological interventions. Understanding the physiological and molecular responses of medicinal plants to heat stress is crucial for ensuring their sustainable production and preserving their medicinal value in a warming climate.

Keywords *Heat stress, Medicinal plants, Secondary metabolites, Oxidative stress, Antioxidant enzymes, Heat shock proteins, Climate change, Plant adaptation, Abiotic stress, Bioactive compounds*

Abstract ID 8188

Climate change and its impact on the honeybee population.

*Dr Sunita Saklani**

Department of Zoology, Sidharth Govt. Utkrisht College Nadaun, District Hamirpur, Himachal Pradesh, India

Abstract

Climate change is one of humanity's most challenging issues, and the undeniable and confided problem affects global biodiversity. Its effects are profound in agriculture, and apiculture is most distinct for its major role in crop and horticultural production. It is evident from the number of studies conducted that climate change is a major stressor for honeybee species and beekeepers, increasing population decline and, in turn, income loss. Presently, there are no comprehensive strategies to deal with challenges imposed by climate change due to the lack of proper identification, estimation, and quantification of the impact that bees face. Therefore, climate change mitigation is insufficient at present. The present study is an attempt to understand the effect of climate change on apiculture and potential strategies that can be beneficial in dealing with the effects of climate change.

Keywords *Biodiversity, Climate Change, Honeybees' Importance, Conservation.*

Abstract ID 8189

Integrated Nutrient Management for Enhancing Productivity, Soil Health and Sustainability of Field Pea (*Pisum sativum*): A Review

Kartik Panchal^{1}, Ramavath Umadevi¹ Yuvraj Yadav¹ and Rahul Sandhu¹*

¹School of Agricultural Sciences, Geeta University, Naultha, Panipat (132 145), Haryana (India)

Abstract

Field pea (*Pisum sativum* L.) is a cool-season leguminous crop of immense nutritional, agronomic, and economic importance across tropical and temperate farming systems. Integrated Nutrient Management (INM) represents a holistic strategy that harmonizes organic, inorganic, and biological nutrient sources to optimize crop productivity, improve soil health, and promote long-term agricultural sustainability. This review synthesizes published research on INM in field pea cultivation, examining the interactive effects of chemical fertilizers (NPK), organic amendments (farmyard manure, vermicompost, green manure), and biofertilizers (Rhizobium, phosphate-solubilizing bacteria, mycorrhizal fungi) on crop growth, yield components, grain quality, biological nitrogen fixation, soil physicochemical properties, and microbial diversity. Evidence consistently demonstrates that integrated approaches outperform sole application of either organic or inorganic inputs, reducing chemical fertilizer requirements by 25–50%, enhancing nodulation and nitrogen fixation, improving grain protein content, and sustaining soil organic carbon pools. The review further addresses the role of INM in mitigating greenhouse gas emissions associated with nitrogen fertilization and enhancing the resilience of field pea systems under variable climatic conditions. Gaps in knowledge, particularly regarding site-specific nutrient management, long-term soil health monitoring, and INM under water-limiting environments, are identified, and future research directions are proposed.

Keywords: *Pisum sativum*, biofertilizers, organic amendments, chemical fertilizers, nitrogen fixation, soil health, grain yield, sustainable agriculture.

Abstract ID 8190

Nutraceutical Value of Traditional Medicinal Plants of Amarkantak, India

Neha Tiwari

Department of Botany, Indira Gandhi National Tribal University, Amarkantak, M.P., India

Abstract

The ethnomedicinal plants of Amarkantak represent a valuable source of nutraceutical compounds with significant health-promoting properties. The present study aims to explore the nutraceutical potential of selected traditional medicinal plants from this region with particular emphasis on their phytochemical composition and associated health benefits. Commonly used plants such as *Pterocarpus marsupium* (Vijaysar), *Withania somnifera* (Ashwagandha), *Curcuma aromatica* (Wild turmeric), *Cuscuta reflexa* (Amarbel), *Gymnema sylvestre* (Gudmar), *Curculigo orchioides* (Kali musli), *Cassia fistula* (Amaltas), *Eclipta alba* (Bhringraj), *Andrographis paniculata* (Kalmegh), *Terminalia chebula* (Haritaki), *Gloriosa superba* (Kalihari), *Azadirachta indica* (Neem) and *Ocimum sanctum* (Tulsi) are rich source of bioactive compounds including phenolics, flavonoids, alkaloids and terpenoids. These compounds exhibit significant antioxidant, anti-inflammatory, antidiabetic, antimicrobial and immunomodulatory activities, supporting their traditional therapeutic uses. The study integrates ethnobotanical knowledge with the recent scientific findings to highlight the potential of these plants as functional foods and nutraceutical agents. Furthermore, the study emphasizes the need of systematic pharmacological validation, standardization and conservation of these valuable plant resources for sustainable utilization and development of plant-based nutraceutical formulations.

Keywords: *Ethnomedicinal plants, Nutraceuticals, Bioactive compounds.*

Abstract ID 8191

Energy and Exergy evaluation of developed ohmic heating pressure cooker (OHPC)

Manibhushan Kumar^{1}, Pramod K Prabhakar², and Brijesh Srivastava¹*

¹Department of Food Engineering and Technology, Tezpur University, Tezpur Assam, India

²Department of Food Science and Technology NIFTEM, Kundli Haryana, India

Abstract

Ohmic heating is one of the current electrical heating techniques, alternating current through the product between two electrodes, and is an increasingly current electrical heating technique in food applications. This approach became an essential area for researchers because of its potential to generate improved product quality, reduce cooking time, cut capital costs, improve energy efficiency, and be an environmentally friendly procedure. In this research, we studied the thermal performance evaluation of a lab-type ohmic pressure cooker (OPC) and compared it with the traditional method. Different applied voltage (200, 300, 400V) and salted water (SW) (0.02, 0.04, 0.06, and 0.08%) were considered. The salt water electrical conductivity increased linearly with temperature, and the EFS impact was negligible. During OH, processing time reduces significantly ($p < 0.05$) at higher SW and EFS. So, lower processing time will help to preserve food quality. Both energy (77–98 %) and exergy efficiency (52 – 87 %) increase with salt concentration and EFS. Destruction exergy was calculated from exergy and entropy balance equations and showed close agreement. The developed OHPC can cook various food products that contain electrically conductive mediums, such as liquid and solid-liquid foods. This technology also promises to provide shorter cooking time due to the high volumetric heating rate and enhance energy-exergy efficiency.

Keywords: *Ohmic heating pressure cooker, energy efficiency, exergy efficiency, thermal analysis*

Abstract ID 8192

In-Vitro and In-Vivo Efficacy of Aquatic Hyphomycetes Against *Xanthomonas Oryzae*

Saraswati Bisht^{1*}; Ruchi Jalal²

²Department of Botany, Indira Priyadarshini Govt. Girls P.G. College of Commerce, Haldwani

¹Department of Botany, Surajmal Agarwal Private Kanya Mahavidyalaya, Kichha

Abstract

Ohmic heating is one of the current electrical heating techniques, alternating current through the product between two electrodes, and is an increasingly current electrical heating technique in food applications. This approach became an essential area for researchers because of its potential to generate improved product quality, reduce cooking time, cut capital costs, improve energy efficiency, and be an environmentally friendly procedure. In this research, we studied the thermal performance evaluation of a lab-type ohmic pressure cooker (OPC) and compared it with the traditional method. Different applied voltage (200, 300, 400V) and salted water (SW) (0.02, 0.04, 0.06, and 0.08%) were considered. The salt water electrical conductivity increased linearly with temperature, and the EFS impact was negligible. During OH, processing time reduces significantly ($p < 0.05$) at higher SW and EFS. So, lower processing time will help to preserve food quality. Both energy (77–98 %) and exergy efficiency (52 – 87 %) increase with salt concentration and EFS. Destruction exergy was calculated from exergy and entropy balance equations and showed close agreement. The developed OHPC can cook various food products that contain electrically conductive mediums, such as liquid and solid-liquid foods. This technology also promises to provide shorter cooking time due to the high volumetric heating rate and enhance energy-exergy efficiency.

Keywords: *Ohmic heating pressure cooker, energy efficiency, exergy efficiency, thermal analysis*

Abstract ID 8193

Occurrence of Multidrug-Resistant Bacteria in the Environment: A Serious Concern in Environmental Sustainability

*¹*Neha Chauhan & ²Chhaya Singh*

¹*Department of Microbiology, School of Paramedical & Allied Health Sciences, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand.

²Department of Botany, Govt. PG College, Thallisain, Pauri Garhwal, Uttarakhand.

Abstract:

The repetitive occurrence and environmental contribution of multidrug-resistant (MDR) bacteria presents an impactful threat to ecosystem integrity and global sustainability. Environmental compartments such as soils, aquatic systems, sediments, wastewater treatment plants, and agricultural ecosystems has a specific role as reservoirs and exchange platforms for antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs). Human-induced environmental stressors such as indiscriminate use of antibiotics in healthcare and livestock production, **Drug manufacturing effluents**, and insufficient wastewater treatment intensify selective stress, promoting resistance evolution and persistence. Current review exhibits evidences on the environmental resistome, emphasis on molecular drivers of resistance dissemination, specifically horizontal gene transfer i.e plasmid, integrons, transposons, and bacteriophage mediated. The presence of biofilms, sub-inhibitory antibiotic concentrations, heavy metals, and microplastics as co-selective agents is critically examined. Environmental reservoirs are strongly identified as sources of clinically relevant resistance determinants, reinforcing the interconnectedness of environmental, animal, and human health systems. The consistent existence of multidrug-resistant (MDR) bacteria in environmental systems can significantly impact natural microbial communities, interfere with essential biogeochemical processes, have deleterious effects on soil fertility, and disrupts water quality. These disturbances in ecological not only affect environmental health but also compromise critical ecosystem services. Combating this challenge poses urgency in requirement of metagenomic analysis and comprehensive resistome profiling as advanced tools. Antibiotic stewardship, technology-driven wastewater treatment approaches, such measures can help in limiting resistance spread and promote long-term environmental stability and resilience.

Keywords: Multidrug-resistant bacteria, environmental resistome, antibiotic resistance genes, sustainability, metagenomics.

Abstract ID 8194

Climate-Driven Antimicrobial Resistance: A One Health Approach within Climate-Smart Agricultural Systems

*¹Papiya Sinha, ²N. Seema Devi

¹Assistant Professor, Department of Medical Lab Technology & Medical Microbiology, School of Paramedical & Allied Health Sciences; Shri Guru Ram Rai University, Patel Nagar, Dehradun.

²Assistant Professor & Head IQAC, Pratap University Jaipur, Rajasthan.

Abstract

Antimicrobial resistance (AMR) is emerging as a critical global health challenge, increasingly influenced by climate change and environmental degradation. Within the framework of Climate-Smart Agriculture (CSA) and environmental sustainability, this review explores the complex mechanistic links between changing climatic variables and the evolution and dissemination of antibiotic-resistant microorganisms. Rising ambient temperatures have been strongly associated with accelerated bacterial growth, mutation rates, and the selection of resistant strains. Additionally, climate-induced stressors such as altered precipitation patterns, extreme weather events, and ecosystem disruptions contribute to enhanced horizontal gene transfer, environmental contamination of water systems, and the spread of resistant pathogens across human, animal, and agricultural interfaces. Agricultural practices play a pivotal role in this nexus, as the extensive use of antimicrobials in livestock, aquaculture, and crop production—combined with inadequate waste management—facilitates the persistence and transmission of resistance genes in soil and water ecosystems. Climate-smart agricultural strategies, including sustainable farming, improved waste treatment, reduced antimicrobial usage, and climate-resilient infrastructure, offer promising pathways to mitigate these risks while ensuring food security and environmental protection. Adopting a One Health approach, this review underscores the need for integrated, interdisciplinary strategies that align climate mitigation, antimicrobial stewardship, and sustainable agricultural policies. Strengthening surveillance systems, promoting eco-friendly farming practices, and enhancing global cooperation are essential to curb the amplification of AMR under changing climatic conditions. Failure to act may accelerate resistance trends, compromise therapeutic efficacy, and threaten global health security, making immediate and coordinated action imperative for a sustainable future.

Keywords: *Antimicrobial resistance, Climate change, One Health, Agriculture, Environmental sustainability.*

Abstract ID 8195

Design and Evaluation of Rice Husk–Derived Mesoporous Silica as a Carrier System for Controlled Delivery of NPK Nutrients with Molecular Interaction Analysis

Rafiqi Mohammed Abdul Rahman¹, Mahendran Peyandi Paraman¹, Sharmila Rahale Christopher², Kannan Pandian²

¹Department of Soils and Environment, Agricultural College and Research Institute, Madurai 625 104, Tamil Nadu, India

²Centre for Agricultural Nanotechnology, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

Abstract

Mesoporous nanosilica (MSN) was synthesized from rice husk ash using the sol–gel method and the MSN was used to develop a slow-release NPK nanocomposite by loading nitrogen (N), phosphorus (P), and potassium (K). The resultant product was characterized for its size (PSA), stability (zeta potential), functional group (FTIR), crystallinity (XRD), shape (FESEM), surface area (BET), thermal stability (TGA), and morphology (TEM). The average sizes and zeta potentials of MSN before and after loading with NPK were 72.9 nm and 151.6 nm and 44.7 mV and 42.9 mV, respectively. The EDAX confirmed the presence of NPK (12.1% N, 5.91% P, and 10.3% K). Molecular docking confirmed compatibility between the NPK and MSN structures. Nutrient release studies were done using a percolation reactor and fit into various kinetic models, with these, the second-order model showing the best fit (R^2 : N = 0.92, P = 0.92, and K = 0.93) in soil. The nutrient release of all three from the composite ceased to exist within a period of 30 days while the release of nutrients from conventional fertilizers was hardly detected within 7 days. Overall, the study clearly demonstrated that the MSN serves as the excellent carrier to retain and release all the three NPK nutrients in a regulated pattern that may improve the fertilizer use efficiency, economize the fertilizer use while ensuring environmental quality.

Keywords: *Rice husk, Mesoporous nanosilica, Controlled release NPK nanocomposites, Kinetics, Molecular docking*

Abstract ID 8196

Impact of Integrated Nutrient Management on Nutraceutical properties of Finger millet

Shagun^{1*}, Megha Suman²

^{1*}Assistant Professor, Department of Agronomy, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun Uttarakhand.

² Assistant Professor, Department of Plant Pathology, School of Agricultural Sciences, Shri Guru Ram Rai University, Dehradun Uttarakhand.

Abstract

Finger millet (*Eleusine coracana*), considered as a “super cereal,” is gaining renewed attention for its remarkable profile of health-promoting, nutraceutical compounds. Rich in essential amino acids like lysine and methionine—rare in plant foods—along with high dietary fiber, vital minerals (notably calcium and iron), and an array of phytochemicals. Finger millet stands out as a functional food with the potential to combat malnutrition and chronic diseases including diabetes, cardiovascular conditions, and anemia. Integrated Nutrient Management (INM), which combines the use of organic, inorganic, and biofertilizer sources, is emerging as a transformative approach. By nurturing soil vitality and offering a more balanced nutrient supply, INM can foster better crop health and productivity. Importantly, recent research suggests that adopting INM can profoundly influence the nutraceutical qualities of finger millet by enhancing concentrations of beneficial phytochemicals (polyphenols, flavonoids) and minerals, and by improving antioxidative capacity and bioavailability of key nutrients. Integrated nutrient management impacts the composition and bioactivity of finger millet, focusing on the interplay between nutrient sources and the biosynthesis of health-promoting components. Emphasizing both scientific insight and practical implications. Use of INM not only improves the soil health but also helps in enhancing the quality of nutrients present in Finger millet.

Keywords: *INM, Finger Millet, Phytochemicals*

Abstract ID 8197

Soil Variability Across Topographic Gradients of North-Eastern Coastal Plains Agroclimatic Zone of Odisha

Prava Kiran Dash^{1,2}, Antaryami Mishra^{1,3}*

¹Department of Soil Science and Agricultural Chemistry, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India-751003

²Regional Research and Technology Transfer Station, Mahisapat, Dhenkanal, Odisha, India-759013

³Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India-751029

Abstract

Understanding soil variability across heterogeneous landscapes is crucial for connecting soil characterization with effective land management practices. This study investigates soil variability across diverse topographic settings in the Keonjhar district of Odisha, eastern India, with the objective of integrating morphological and physico-chemical characterization, soil classification, and their implications for land management while addressing existing regional knowledge gaps. A total of 17 soil profiles were examined across multiple landforms, including two transects consisting of three profiles each representing foothill, mid-slope, and stream terrace positions. In total, 96 horizon samples were collected and analyzed for key soil parameters. The results indicate that the soils are predominantly sandy in texture (61.3–82.5% sand), with moderate bulk density (1.4–1.9 Mg m⁻³), low to medium soil organic carbon content (0.10–1.12%), acidic to near-neutral pH (4.45–6.93), and non-saline characteristics. Soil pH, clay content, cation exchange capacity, and base saturation were observed to increase with depth and towards lower topographic positions, suggesting processes such as clay illuviation and lateral translocation. Transect-based analysis further revealed a consistent increase in clay content, soil organic carbon, pH, and exchangeable bases from foothill to stream terrace positions. The soils were classified into Entisols, Inceptisols, and Alfisols, with 13 distinct subgroups identified, including several newly reported subgroups for the region. Land capability classification categorized the soils into subclasses IIs, IIIes, IIIsw, and IVes, indicating moderate to good agricultural potential with certain limitations related to erosion, drainage, and soil fertility. Overall, the findings underscore the influence of both macro- and micro-topographic variations on soil variability and provide baseline data to support future soil research and land management planning across diverse landscapes.

Keywords: *Soil variability; Physico-chemical properties; Taxonomic classification; Toposequence; Eastern India*

Abstract ID 8198

A Comprehensive Survey of Fish Markets in Doon Valley, District Dehradun

¹Deepali Rana, ²Skalzang Dolkar, ³Rahul Rana, ⁴Dhyal Singh, ⁵Shefalee Singh and ⁶Ganesh Datt Bhatt

* ^{1,2}Department of Zoology, Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehradun, India

³Wildlife Institute of India, Dehradun,

⁴Department of Zoology, School of Life & Applied Sciences, SGRR University,

⁵School of Applied and Life Science, Uttarakhand University, Dehradun, India.

⁶College of Agriculture Sciences Teerthanker Mahaveer University Moradabad Uttar Pradesh.

Abstract

This study investigates the retail fish market system in the Doon Valley of Uttarakhand, India, focusing on species diversity, sourcing patterns, pricing variability, market infrastructure, and vendor practices. Field surveys conducted across five fish markets revealed 26 fish species, with Indian Major Carps (IMCs) like Rohu and Catla being the most prevalent. The survey highlights critical challenges, including the lack of cold-chain infrastructure, sanitation, and standardized pricing, while emphasizing the growing consumer demand for diverse and fresh fish. Findings inform fisheries policy, local infrastructure development, and urban food planning.

Keywords: *Fish Market, Doon valley, Fish Survey, Doon Valley*

Abstract ID 8199

SMART AGRICULTURE vs SMART VILLAGES

Shivendra Kumar Mishra, Vanshika, Ankit Kumar Gupta, A.B. Riyansh, Hariom
Department of Agriculture, Tulas Institute Dehradun

Abstract

Over recent years, the challenges arising from the social and economic, but also wider changes of people's communities, rural and urban, have been increasingly addressed through the lenses of technological developments and digitalization. In this paper, we have focused on the applications of the Smart Village concept and the importance of digital transformation for rural areas, always drawing parallels between the findings and insights from different regions. We aim to use these new insights in developing the framework of the Smart digital transformation of villages. Furthermore, to make the concept of "smart development" more accessible and useful for our case of Smart Villages, we have made an evaluation of the projects and programs based on criteria that define "smartness" in the broader sense within the framework of GoI policies. For deeper understanding of smart development in specific regions, it is important to make an in depth analysis of different possible approaches. Below, we are presenting a short analysis of the chosen examples according to the GoI pillars/drivers of Smart Villages: (i) Responding to depopulation and demographic change; (ii) Finding local solutions; (iii) Exploring linkages with small towns and cities; (iv) Accelerating the role of rural areas in low-carbon circular economy; and (v) Promoting digital transformation. By agricultural activities and high rates of unemployment. Smart development solutions were therefore mainly addressing the ways to create opportunities for local employment and alleviate living conditions. On the other hand, the role of transition to circular economy has been accelerated in the case of Lapland where the main issue to address was to stop the outflow of money especially in connection with the energy and food self-sufficiency. In the case of Smart Villages, the digital transformation was at the forefront. Investing in digital connectivity within the villages and within the broader regional community was therefore also to improve opportunities for local/regional and circular economy and to enhance the sustainable development of the area. It is to look for strategies and solutions based on local or regional knowledge, even more so when striving for a sustainable future. Rural areas are not uniform, and the smart development must be applied in combination with a place-based approach. In our context, the approach must be in line with cultural and geographical specifics of an area, as well as with more specific local characteristics. In line with this, one of the main outputs of the Smart Villages project will be a digital exchange platform intended for the exchange of practices. Another important output will be embodied in the form of a Smart Villages Toolbox, based on insights from our pilot, local-based activities. As such, it will have a great impact on further development and implementations of the concept into reality-based environments and will contribute to better framework conditions for (digital) innovation in societal and technical parts as smart village vs smart agriculture.

Keywords: *Smart agriculture, smart villages, activities, digitalization, pillars*

*About Our
Diamond Sponsor*





Acharyapuram Agri Business Management School (ABMS), Greater Noida, is an emerging and innovative "Agri B-School" committed to building the next generation of professionals and leaders in agribusiness management. **Founded by Dr. Rahul Dev Pandey**, an alumnus of **G. B. Pant University of Agriculture & Technology (GBPUA&T), Pantnagar**, and **Indian Institute of Foreign Trade (IIFT), New Delhi**, ABMS brings decades of industry expertise to education.

Dr. Rahul Dev Pandey is a seasoned agribusiness professional with **over 20 years of experience** and **global exposure across 50+ countries**, having served in senior roles with **Bayer Crop Sciences, Syngenta, Mahyco, Tata Chemicals, and Mahindra Agri Solutions**.

ABMS Greater Noida offers a **unique Skill-Integrated certification "AIOCP"** (Agro Industry Oriented Certification Program) along with **MBA - Agribusiness Management from UGC-recognized universities**, creating an unmatched blend of **academic credibility and industry readiness**.

This model equips students with communication skills, practical understanding, corporate behaviour, and job-oriented competencies that go beyond traditional classroom learning, ensuring **100% Placement Guarantee** and **3 Years Post-Placement Support** to every **ACHARYAPURian**.

Supported and mentored by senior agribusiness leaders and veterans, ABMS Greater Noida ensures its training systems reflect real industry expectations and deliver measurable career outcomes.

FOUNDER & CHAIRMAN

Dr. Rahul Dev Pandey
Chairman and Founder,
Acharyapuram Agri Business Management School (ABMS)

Alumnus :

- Ph.D. - G.B. Pant University of Agriculture & Technology, Pant Nagar
- EPGDIB - Indian Institute of Foreign Trade, New Delhi

Dr. Rahul Dev Pandey, a seasoned agribusiness professional with over 20 years of experience in Agri Industry and global exposure of 55+ countries in different senior roles in reputed brands mentioned below

Served in :

Mahindra AGRI BUSINESS, mahyco grow, BAYER, syngenta, TATA CHEMICALS LIMITED



ABMS Greater Noida places strong emphasis on outcomes. Its academic and training model is designed to help students become confident professionals capable of contributing in areas such as:

- Agribusiness operations
- Agri-input and seed industry
- Sales and marketing
- Supply chain and logistics
- Dairy and food businesses
- Research, consulting, and many more

The institution's **100% Placement Guarantee** and **3 Years Post-Placement Support** reflect its deep commitment to student success and accountability. These features demonstrate not only confidence in the quality of training but also genuine responsibility toward student careers. **ABMS Greater Noida** represents a broader educational philosophy where agribusiness learning is seamlessly connected with employability, discipline, communication, and industry expectations. Through **Dr. Rahul Dev Pandey's visionary leadership**, the **MBA – Agribusiness Management + AIoCP certification model**, and **mentorship and support from agribusiness veterans**, ABMS Greater Noida is redefining professional education in agriculture.

ABMS Greater Noida stands for **skill, opportunity, and transformation**, helping students move from education to employment with confidence and direction under the guidance of proven industry leadership.



*About Our
Gold Sponsor*





Innovative Soil Solutions

Today's Agriculture & The Role of Biologicals

MODERN AGRICULTURE TRENDS



SUSTAINABILITY & REGENERATIVE PRACTICES



PRECISION AGRICULTURE



CLIMATE-RESILIENT FARMING



REGULATORY PRESSURE ON CHEMICALS



The Power of Biologicals in Agriculture

Natural Solutions for Sustainable Farming



Soil Health Enhancement

Improved Nutrient Cycling



Nutrient Efficiency

Biofertilizers & Microbes



Plant Growth Promotion

Biostimulants & Extracts



Biological Crop Protection

Biopesticides & Natural Enemies



Stress Tolerance

Drought & Heat Resistance

Advanced Innovations



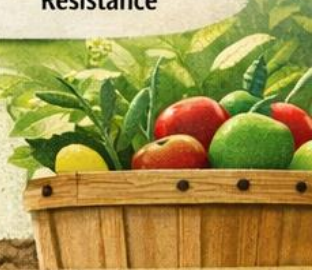
Nano Encapsulation



Microbial Consortia



Peptide-Based Formulas



Biologicals vs. Chemicals

Low Impact	High Impact	Chemical Residues
Environmental Impact	Low Impact	Chemical Residues
Residue Concerns	Minimal Residues	High Resistance
Resistance Risk	Low Resistance	Degrades Soil
Soil Health	Improves Soil	Degrades Soil
Sustainability	Highly Sustainable	Limited Sustainability

The Future of Agriculture

Integrating Biologicals for a Greener, Safer Tomorrow

धरती के लिए जानदार फसलों के लिए शानदार



LALIT CHEMICALS & FERTILIZER INDUSTRIES

- **Corp. Office :** #123 Tricity Plaza, Peer Muchalla, Zirakpur, SAS Nagar (Mohali), Punjab
- **Contact :** +91-9876339896
- **Website :** www.lalitchemical.com & www.lalitchemicals.co.in
- **Unit - I :** Lehla Khurd, Lehragaga Distt. Sangrur, Punjab, Pin-148031
- **Unit - II :** Khasra No. 46//17 & 46//24, Mouli-Hangoli Road, Village-Mouli, Tehsil-Barwala, Distt-Panchkula, Haryana, India Pin -134118



LALIT CHEMICALS & FERTILIZER INDUSTRIES

AN ISO 9001 : 2015, 14001 : 2015, 45001 : 2018 CERTIFIED COMPANY

Bio Fertilizers • Organic Fertilizers • Chemical Fertilizers

• Specialty Liquid Fertilizers • PGR • Bio Stimulants • Bio Pesticides



आधुनिक तकनीक अपनाएं उत्पादकता में वृद्धि लाए



हर कदम हर डगर किसान का हमसफर



8TH PSRM

National Conference on Innovation,
Integration, and Sustainability in
Agricultural, Applied and Life
Sciences for Future India

17 & 18 April, 2026

Venue

Tula's Institute, Dehradun

*Industry &
Knowledge
Partner*



www.pgrindias.in