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Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment [IHASE-2025]



Organized by

Goa College of Agriculture
Mahatma Gandhi Udyaniki evam Vanikee Vishwavidyalaya, Durg, Chhattisgarh
Agriculture Forum for Technical Education of Farming Society
Vital Biotech Edu. Group, Kota

on

20- 22 November 2025

- Dr. Suresh Kunkalikar
- Dr. Govind Parab
- Dr. Toran Lal Sahu
- Dr. M.S. Paikra
- Dr. Rajeshwari Sahu
- Mr. Sanjay Nitave

VITAL BIOTECH PUBLICATION

INTERNATIONAL CONFERENCE ON

IHASE-2025

Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment

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MGUVV, Durg, Chhattisgarh

Under the aegis of

Agriculture Forum for Technical Education of Farming Society (AFTEFS)
VITAL BIOTECH EDU. GROUP, KOTA

on

20th-22nd November, 2025

Editors

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Head, Production (Higher Education and Professional) & Publishing Director
Dr. Jitendra Mehta

Product Manager
Dr. Manoj Kumar Jhariya

General Manager
Jaya Mehta

Graphic Designer
Ghanshyam Rawal

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Office Address:

VITAL BIOTECH PUBLICATION
772, Basant Vihar, Kota,
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Visit us at: http://www.vitalbiotech.org
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DR. PRAMOD SAWANT
CHIEF MINISTER, GOA

शुभकामना संदेश

मुझे यह जानकर अत्यंत हर्ष हो रहा है कि अंतर्राष्ट्रीय सम्मेलन "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)" का आयोजन 20 से 22 नवम्बर, 2025 के दौरान किया जा रहा है। यह सम्मेलन गोवा कॉलेज ऑफ एग्रीकल्चर, महात्मा गांधी उद्यानिकी एवं वाणिकी विश्वविद्यालय (MGUVV), दुर्ग (छत्तीसगढ़), एग्रीकल्चर फोरम सोसाइटी, तथा वाइटल बायोटेक एजुकेशनल ग्रुप के संयुक्त तत्वावधान में आयोजित किया जा रहा है।

यह सम्मेलन कृषि एवं उससे संबंधित विज्ञानों के क्षेत्र में नवाचार, अनुसंधान और सतत विकास के विचारों के आदान-प्रदान के लिए एक उत्कृष्ट मंच प्रदान करता है। इस सम्मेलन की थीम सतत कृषि विकास और पर्यावरण संरक्षण की दिशा में उठाया गया एक महत्वपूर्ण कदम है, जो आने वाली पीढ़ियों के लिए खाद्य एवं पोषण सुरक्षा सुनिश्चित करने में सहायक सिद्ध होगा।

गोवा अपनी जैव विविधता, प्रगतिशील कृषि पद्धतियों और पर्यावरणीय संतुलन के लिए जाना जाता है। ऐसे अंतर्राष्ट्रीय सम्मेलन का आयोजन हमारे लिए गर्व का विषय है, जो वैज्ञानिकों, शिक्षाविदों, शोधकर्ताओं और नीति निर्माताओं को एक साझा मंच पर लाता है ताकि वे कृषि क्षेत्र में नवाचार और स्थायित्व को बढ़ावा दे सकें।

मुझे पूर्ण विश्वास है कि IHASE–2025 से प्राप्त निष्कर्ष और सुझाव भारत सहित समस्त विश्व के कृषि परिदृश्य में उत्पादकता, संसाधन दक्षता और पारिस्थितिक संतुलन को सुदृढ़ करने में महत्वपूर्ण भूमिका निभाएंगे।

मैं इस आयोजन की सफलता के लिए आयोजकों, सभी प्रतिभागियों एवं सहयोगी संस्थाओं को हार्दिक बधाई एवं शुभकामनाएँ देता हूँ। आशा है कि यह सम्मेलन कृषि के सतत और समृद्ध भविष्य की दिशा में एक प्रेरणादायक मील का पत्थर सिद्ध होगा।

Sawant.

(डॉ. प्रमोद सावंत)

MANTRALAYA, SECRETARIAT COMPLEX, PORVORIM, GOA, 403 521, INDIA
PH: 0832-2419841/42 Fax: 0832-2419840/46 EMAIL: cm.goa@nic.in

रानी लक्ष्मी बाई केन्द्रीय कृषि विश्वविद्यालय
ग्वालियर रोड, झाँसी 284 003 (उत्तर प्रदेश) भारत
Rani Lakshmi Bai Central Agricultural University
Gwalior Road, Jhansi 284 003 (U.P.) India

डॉ. अशोक कुमार सिंह
कुलपति
Dr. Ashok Kumar Singh
Vice-Chancellor

Phone : 0510-2730777
E-mail : vcrlbcau@gmail.com
Website : www.rlbcau.ac.in

Message



I am delighted to extend my heartfelt congratulations to the organizers of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)", scheduled from November 20–22, 2025, jointly organized by Goa College of Agriculture, MGUVV Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Educational Group.

This conference will provide a dynamic platform for scientists, academicians, students, policymakers, and industry experts to exchange innovative ideas and research insights in the field of agricultural and allied sciences. In the era of climate change and environmental challenges, such collaborative endeavours are essential to ensure sustainable growth, resource efficiency, and food security for future generations.

The deliberations and discussions during IHASE–2025 will undoubtedly contribute to advancing cutting-edge innovations and practical solutions for sustainable agricultural development. I am confident that the knowledge shared and networks built during this event will strengthen interdisciplinary collaborations and inspire young minds toward scientific excellence.

I convey my best wishes for the grand success of this international conference and commend the organizers for their dedication and vision in fostering global dialogue for a sustainable and resilient agricultural future.

(A. K. Singh)

ಡಾ. ಪಿ. ಎಲ್. ಪಾಟೀಲ
ಕುಲಪತಿ ಎಂ.ಎಸ್ಸಿ. (ಕೃಷಿ), ಪಿಎಚ್.ಡಿ.
Dr. P. L. Patil
M.Sc. (Agri.), Ph.D.
VICE-CHANCELLOR

ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD
www.uasd.edu

No.: UASD/VC/2025-26 Date : 06.11.2025



MESSAGE

It is heartening to note that the *International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"*, is being organized from November 20–22, 2025, by Goa College of Agriculture, Mahatma Gandhi University of Veterinary and Animal Sciences (MGUVV), Durg, Chhattisgarh, in collaboration with the Agriculture Forum Society and VITAL BIOTECH Educational Group.

This distinguished event serves as a remarkable platform for researchers, academicians, students, and professionals to share their innovative ideas, discuss emerging challenges, and explore sustainable solutions that can significantly contribute to agricultural growth and environmental well-being. Such intellectual gatherings not only foster collaboration but also inspire the exchange of progressive scientific approaches for future-ready agriculture.

In the era of climate change and global sustainability concerns, this conference holds immense significance in promoting resilient and eco-friendly agricultural practices through scientific advancements and cross-sectoral innovations. I am confident that the deliberations and outcomes of IHASE-2025 will pave the way for impactful research, policy recommendations, and fruitful collaborations among the participating delegates.

I convey my heartfelt wishes for the grand success of this conference and hope it becomes a milestone in promoting sustainable development through innovation and knowledge sharing.

(P. L. PATIL)

YETTINAGUDDA CAMPUS, KRISHINAGAR, DHARWAD-580005, KARNATAKA (INDIA)
Phone : (O) +91-836-2447783 E-mail: vc@uasd.in Mobile: +91 9448861025

डॉ. रवि आर. सक्सेना
कुलपति
Dr. Ravi R. Saxena
Vice-Chancellor

महात्मा गाँधी उद्यानिकी एवं वानिकी विश्वविद्यालय,
दुर्ग – 491111 (छ.ग.)
MAHATMA GANDHI UDYANIKEE EVAM VANIKEE VISHWAVIDYALAYA, DURG – 491111 (C.G)

Phone: 0771-2001
E-Mail: vc@mguvv.ac.in

D.O. No. VC-Cell/2025/
Dated 29 / 10 /2025



Greetings Message

It gives me immense pleasure to extend my heartfelt best wishes to all the organizers, participants, and delegates of the **International Conference on Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)** being held from **November 20–22, 2025**, jointly organized by **Goa College of Agriculture**, **Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh)**, **Agriculture Forum Society**, and **VITAL BIOTECH Educational Group**.

This international conference serves as a vibrant platform for scientists, academicians, researchers, students, and professionals from diverse agricultural disciplines to come together, share innovative ideas, and deliberate on sustainable approaches for environmental and agricultural development. In the era of climate change, technological advancements, and evolving global challenges, such collaborative forums play a crucial role in nurturing scientific dialogue and promoting eco-friendly innovations that can ensure food security and ecological balance.

I am confident that **IHASE–2025** will provide valuable insights into cutting-edge research, novel technologies, and practical strategies aimed at strengthening the agricultural and allied sectors. The exchange of knowledge and experiences during this conference will undoubtedly contribute to shaping a more sustainable and resilient future for our farming communities.

I extend my sincere appreciation to the organizing committee for their commendable efforts in bringing together such an esteemed gathering of experts and visionaries. May this conference be a grand success and inspire new milestones in agricultural innovation, sustainability, and environmental stewardship.

With warm regards and best wishes for the grand success of IHASE–2025!

29/10/25

Prof. R. R. Saxena
Hon'ble Vice-Chancellor
MGUVV, Durg,

राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय
राजा पंचम सिंह मार्ग, ग्वालियर (म.प्र.) – 474002
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002
(An ISO Certified 9001:2008)
Tel: 0751-2970502, E-mail: vcrvsaugwa@mp.gov.in; vc@rvskvv.net

Vice-Chancellor
कुलगुरु

Prof. Arvind Kumar Shukla
प्रो. अरविन्द कुमार शुक्ला



No./VC/2025-26/.2972..
Dated: 07.11.2025

Message

I am delighted to extend my warm greetings and heartfelt best wishes to the organizers and participants of the International Conference on **"Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)"**, being held from November 20–22, 2025, jointly organized by Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh, Agriculture Forum Society, and VITAL BIOTECH Education Group.

This prestigious event serves as a remarkable platform for academicians, researchers, students, and industry professionals to exchange ideas, present innovations, and explore collaborative opportunities aimed at addressing the challenges of sustainable agricultural development and environmental conservation.

The focus on integrating horticulture, agriculture, veterinary, and fisheries sciences highlights the multidisciplinary approach required to ensure food security, improve livelihoods, and promote ecological balance. Such gatherings play a pivotal role in fostering innovation, advancing research, and inspiring young minds to contribute meaningfully to global agricultural growth.

I am confident that **IHASE–2025** will lead to fruitful discussions, productive networking, and valuable outcomes that will strengthen the scientific community's collective efforts towards sustainable progress.

I convey my best wishes for the grand success of this conference and for the continued advancement of agricultural and allied sciences worldwide.

(Arvind Kumar Shukla)

GOA COLLEGE OF AGRICULTURE

Affiliated to Goa University, Govt of Goa
SAMETI-Ela Farm, Old Goa. Goa 403402
College Registration no: AC 32 email: goaagricollege@gmail.com Phone: 0832 2917498

Date: 10-11-2025



Greetings Message

It is with immense pride and joy that I extend my heartfelt greetings and best wishes to all organizers, participants, and delegates of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)", scheduled to take place from November 20–22, 2025.

The Goa College of Agriculture, in partnership with Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Educational Group, has taken a commendable initiative in organizing this important academic event. The theme of the conference is in perfect harmony with the pressing need for innovation and sustainability in contemporary agriculture and related sectors, which are fundamental to our economy and environmental health.

In the face of today's rapidly evolving world, the agricultural sector encounters a multitude of challenges—climate change, soil degradation, and diminishing resources. Tackling these challenges necessitates scientific collaboration, innovative technologies, and sustainable practices. I am optimistic that IHASE-2025 will provide a dynamic platform for the exchange of ideas, encourage interdisciplinary discussions, and inspire actionable results that will contribute to sustainable agricultural development and environmental preservation.

I sincerely commend the organizing team for their dedication and commitment in uniting experts and emerging researchers on a single platform to deliberate on the latest advancements and future trajectories in agriculture and allied sciences.

May IHASE-2025 achieve remarkable success and stand as a landmark event in fostering innovation, sustainability, and global collaboration in agricultural research and education.

With warm congratulations and best wishes for a productive conference!

Prof. (Dr.) Suresh Kunkalikar
Principal and Dean,
Goa College of Agriculture, Ela farm Old Goa, Goa

Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg
Amleshwar-Patan Road, Sankara, Durg – 491 111 (Chhattisgarh)



Greetings Message

It is a matter of great pride and pleasure to convey my **heartiest congratulations and best wishes** to the organizers of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)", being held from **20th to 22nd November, 2025** at **Goa**.

The collaboration of **Goa College of Agriculture**, **Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, (MGUVV), Durg, Chhattisgarh**, **Agriculture Forum Society**, and **VITAL BIOTECH Education Group** in organizing this international event truly reflects a shared vision for promoting innovation, sustainability, and scientific excellence in the agricultural and allied sectors.

Today's world demands a shift from traditional practices to more innovative, sustainable, and eco-friendly approaches. Conferences like IHASE–2025 serve as a beacon of knowledge, offering an excellent opportunity for scientists, researchers, academicians, entrepreneurs, and students to exchange their ideas, showcase their innovations, and explore collaborative avenues for future development.

This event will undoubtedly provide an intellectual platform where scientific minds converge to address the challenges of sustainable agriculture, environmental balance, and food security through advanced research and practical solutions. The discussions and deliberations during the conference will inspire innovative thinking and contribute significantly to achieving the goals of sustainable development.

I extend my sincere appreciation to the organizing committee for their vision and dedication in bringing together experts and stakeholders from diverse fields under one roof. May this conference emerge as a milestone event in promoting innovation and sustainability in the agricultural sciences.

Wishing IHASE–2025 grand success and fruitful deliberations ahead!

Dr. M. S. Paikra
MGUVV, DURG



Greetings Message

It is indeed a matter of great pride and joy to convey my warm greetings and best wishes to the organizers and delegates of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)"**, scheduled from **November 20–22, 2025**.

The joint efforts of the **Goa College of Agriculture**, **Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh**, **Agriculture Forum Society**, and **VITAL BIOTECH Educational Group** in organizing this significant event are truly commendable. Such collaborative initiatives play a crucial role in promoting scientific dialogue, technological innovation, and sustainable development in the agricultural and allied sectors.

At a time when global agriculture is confronted with the dual challenges of ensuring food security and preserving environmental balance, this conference provides a timely and meaningful platform for researchers, academicians, policymakers, and practitioners to exchange ideas and share innovative solutions. The focus on sustainability and environmental harmony aligns perfectly with the vision of achieving resilient, eco-friendly, and inclusive agricultural growth.

I firmly believe that the deliberations and research outcomes emerging from IHASE–2025 will contribute significantly toward developing modern yet sustainable practices that benefit both farmers and the environment. The insights shared here will help shape future policies and technological interventions for holistic rural advancement.

I extend my heartfelt congratulations to the organizing committee for their dedicated efforts and wish the conference grand success. May IHASE–2025 serve as a beacon of innovation and collaboration for a sustainable agricultural future.

Shri Sandeep B. Foldessai
Director of Agriculture (Horticulture)
Directorate of Agriculture, Krishi Bhavan, Goa

डॉ. मनीष श्रीवास्तव
अधिष्ठाता
Dr. Manish Srivastav
Dean

उद्यानिकी एवं वानिकी महाविद्यालय
College of Horticulture and Forestry
रानी लक्ष्मी बाई केन्द्रीय कृषि विश्वविद्यालय
ग्वालियर रोड, झाँसी - 284 003 (उत्तर प्रदेश) भारत
Rani Lakshmi Bai Central Agricultural University
Gwalior Road, Jhansi - 284 003 (U.P.) India



Greetings Message

It is truly a matter of great satisfaction that *International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)" is* scheduled to be held from *November 20–22, 2025.*

This remarkable event, jointly organized by *Goa College of Agriculture, MGUVV, Durg (Chhattisgarh), Agriculture Forum Society,* and *VITAL BIOTECH Education Group,* will serve as a vibrant platform for academicians, scientists, researchers, and professionals from across the globe to exchange ideas, share innovative technologies, and deliberate on future strategies for sustainable agricultural and environmental growth.

In the present era of climate challenges and resource limitations, promoting scientific innovations and interdisciplinary collaboration in horticulture and allied sciences has become more crucial than ever. Conferences like IHASE–2025 not only strengthen research linkages but also inspire young minds to contribute meaningfully toward achieving global sustainability goals.

I extend my heartfelt congratulations to the organizers for their commendable initiative and thoughtful efforts in bringing together such a distinguished forum. I am confident that the deliberations and outcomes of this conference will significantly contribute to advancing knowledge and fostering innovation in the agricultural and allied sectors.

Wishing the organizers and participants a grand success in this noble endeavor.

(Manish Srivastav)

E-mail: deancohf.rlbcau@gmail.com
Mobile: +91 9868461663 Telephone No.: 0510-2730802



Greetings Message

I am delighted to extend my warm greetings and best wishes to the organizers and participants of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"**, being held from **November 20–22, 2025**, in Goa.

This remarkable initiative jointly organized by **Goa College of Agriculture**, **Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh)**, **Agriculture Forum Society**, and **VITAL BIOTECH Education Group**, provides an exceptional platform for academicians, scientists, entrepreneurs, and policymakers to exchange innovative ideas and research insights that can shape the future of sustainable agriculture and allied sectors.

In the current era of rapid climate change and resource challenges, the integration of scientific innovation with traditional agricultural wisdom has become essential for ensuring food, nutritional, and environmental security. Conferences like IHASE-2025 play a vital role in fostering interdisciplinary collaboration, promoting eco-friendly technologies, and motivating young researchers to contribute toward the advancement of resilient and sustainable agricultural systems.

I firmly believe that the deliberations and outcomes of this conference will contribute significantly to policy formulation, research advancement, and practical implementation in horticulture, agriculture, veterinary, and fisheries sciences for the betterment of farmers and society at large.

I convey my hearty congratulations to the organizers for their dedicated efforts in bringing together experts from diverse disciplines on a common platform. I wish the conference grand success and hope it leads to fruitful discussions and impactful collaborations for a greener and sustainable future.

Best wishes for a highly successful IHASE-2025!



Shri. Dattaprasad Desai
Deputy Director of Agriculture (Horticulture), Government of Goa
Directorate of Agriculture, Krishi Bhavan, Goa

भाकृअनुप-केन्द्रीय कृषिवानिकी अनुसंधान संस्थान
पहूज बाँध के पास, झाँसी–ग्वालियर मार्ग, झाँसी–284003 (उ0 प्र0)
ICAR-Central Agroforestry Research Institute
Near Pahuj Dam, Gwalior Road, Jhansi-284003 (U.P.)
Ph: 0510 – 2730214, 2730154 Fax : 0510 –2730364 Web : www.cafri.res.in

Greetings Message



I am delighted to extend my heartfelt best wishes to the organizers and participants of the *International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"*, being held from November 20–22, 2025, jointly organized by Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Education Group.

This conference serves as an excellent platform for researchers, academicians, policymakers, and industry professionals to come together and exchange innovative ideas and research outcomes that will drive sustainable growth in the agricultural and allied sectors. The integration of horticulture, veterinary, fisheries, and agro-environmental sciences under one umbrella will foster multidisciplinary collaborations and open new avenues for technology transfer and policy interventions.

In the face of global challenges such as climate change, resource degradation, and food security, such scientific gatherings are the need of the hour. I am confident that IHASE-2025 will contribute significantly toward developing resilient and eco-friendly agricultural systems for a sustainable future.

My sincere congratulations to the organizing team for their commendable efforts and best wishes for the grand success of this international conference.

Handa

Dr. A. K. Handa
Nodal Scientist
ICAR-Central Agroforestry Research Institute

भाकृअनुप-केन्द्रीय कृषिवानिकी अनुसंधान संस्थान
पहूज बाँध के पास, झाँसी–ग्वालियर मार्ग, झाँसी–284003 (उ0 प्र0)
ICAR-Central Agroforestry Research Institute
Near Pahuj Dam, Gwalior Road, Jhansi-284003 (U.P.)
Ph: 0510 – 2730214, 2730154 Fax : 0510 –2730364 Web : www.cafri.res.in

Greetings Message



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This conference serves as a remarkable platform for academicians, researchers, students, and professionals to share their innovative ideas, latest research findings, and practical solutions aimed at transforming the agricultural and allied sectors. In today's era of climate uncertainty and resource constraints, the need for sustainable and integrated approaches across agriculture, horticulture, veterinary, and fisheries sciences has become more critical than ever.

I am confident that the deliberations and discussions during this event will foster collaborative research, promote knowledge exchange, and inspire new innovations contributing to food security, environmental sustainability, and rural prosperity.

I wholeheartedly appreciate the collective efforts of the organizing team for creating such a valuable opportunity to connect science with society and nurture sustainable development.

Wishing the IHASE–2025 Conference grand success and all participants a highly enriching and memorable experience.

Naresh

Dr. Naresh Kumar
Principal Scientist
ICAR-Central Agroforestry Research Institute

GGJ GOVERNMENT COLLEGE, HISAR
('B+' Grade, NAAC Accredited ; Model Degree College Under RUSA)
Ph.: 01662-236384, 239988
E-mail : gchisar1950@gmail.com, principal_gc_hisar@yahoo.co.in
Website : www.gchisar.com

No. ..... *Dated* .....

Greetings Message



I am delighted to extend my heartfelt greetings and best wishes to the organizers, participants, and delegates of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)", being held from November 20–22, 2025, jointly organized by Goa College of Agriculture, MGUVV, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Education Group.

This prestigious conference serves as a valuable platform for researchers, academicians, and professionals from diverse disciplines to share their knowledge, innovations, and research outcomes that can contribute significantly to sustainable agricultural development and environmental conservation. The integration of modern technologies with traditional practices will undoubtedly play a pivotal role in addressing global challenges related to food security, climate change, and ecosystem balance.

I truly appreciate the efforts of the organizing committee for fostering such a collaborative environment where scientific minds can exchange ideas, build networks, and inspire one another toward achieving common goals of progress and sustainability.

May this conference lead to fruitful discussions, innovative collaborations, and actionable outcomes that benefit society at large. I extend my warm wishes for the grand success of IHASE–2025 and hope it becomes a milestone event in advancing the frontiers of agricultural and allied sciences.

Dr. Vivek Kumar Saini
Principal
GGJ Government College, Hisar, Haryana

Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg
Amleshwar-Patan Road, Sankara, Durg – 491 111 (Chhattisgarh)



Greetings Message

It is indeed a matter of great delight and honor to convey my heartfelt wishes to all the organizers and participants of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)"**, scheduled to be held from **November 20–22, 2025**, at Goa. This remarkable event reflects a visionary initiative aimed at bringing together experts, researchers, academicians, and professionals from across the globe to discuss innovative approaches for advancing sustainable development in agriculture and allied sectors.

The collaborative organization of this conference by **Goa College of Agriculture, MGUVV, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Educational Group** deserves special appreciation. Such joint efforts symbolize the true spirit of academic unity and scientific progress. IHASE–2025 will undoubtedly serve as an excellent platform for sharing path-breaking research, exchanging knowledge, and fostering fruitful collaborations among participants.

In the context of global climate change and environmental challenges, the need for sustainable and innovative agricultural practices has become more crucial than ever. This conference will contribute significantly to shaping policies, technologies, and research directions aimed at achieving resilience and sustainability in food systems.

I extend my sincere congratulations to the entire organizing committee for their hard work and commitment in conceptualizing and executing this grand academic event. I wish IHASE–2025 great success and hope it ignites new ideas, partnerships, and inspirations for a brighter and more sustainable future.

With warm regards and best wishes for a productive and memorable conference!

Rajeshwari 29/10/25

Dr. Rajeshwari Sahu
OSD TO HVC
MGUVV, DURG

GOA COLLEGE OF AGRICULTURE

Affiliated to Goa University, Govt of Goa
SAMETI-Ela Farm, Old Goa. Goa 403402
College Registration no: AC 32 email: goaagricollege@gmail.com Phone: 0832 2917498

4/100/SAMETI/GCA/ADMIN/2025-26/1052 Date: 10-11-2025



Greetings Message

It is a matter of immense pride and joy to extend my **warmest congratulations and best wishes** to the organizers and participants of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025)"**, scheduled to be held from **November 20–22, 2025**, in the beautiful and vibrant state of **Goa**.

This prestigious event—jointly organized by the **Goa College of Agriculture**, **Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh**, **Agriculture Forum Society**, and **VITAL BIOTECH Educational Group**—is a commendable initiative that brings together a galaxy of **scientists, innovators, academicians, and young researchers** from across the globe.

In a world facing ever-growing challenges of **climate change, resource depletion, and sustainability**, IHASE–2025 provides a dynamic platform to explore innovative ideas, modern technologies, and transformative strategies that will **redefine the future of agriculture and allied sciences**.

Such gatherings not only promote knowledge sharing but also strengthen collaborations, inspire creativity, and nurture a collective vision for a **sustainable and eco-friendly tomorrow**.

I wholeheartedly appreciate the tireless efforts of the organizing team for curating such a meaningful and visionary event. May this conference be filled with **inspiring discussions, innovative discoveries, and fruitful collaborations** that contribute significantly to the progress of global agriculture and environmental stewardship.

Wishing **IHASE–2025** grand success and every delegate an enriching and memorable experience in Goa!

Dr. Govind Parab
Assistant Professor
Goa College of Agriculture, Goa

Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg
Amleshwar-Patan Road, Sankara, Durg – 491 111 (Chhattisgarh)



Greetings Message

I am truly delighted to extend my heartfelt best wishes to the organizers and participants of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"**, scheduled to be held from **November 20–22, 2025**, at **Goa**, organized jointly by **Goa College of Agriculture**, **Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg (C.G.)**, **Agriculture Forum Society**, and **VITAL BIOTECH Educational Group**.

This conference stands as a remarkable platform for scientists, academicians, researchers, and practitioners from diverse fields to exchange innovative ideas, share scientific advancements, and explore sustainable solutions for the challenges facing agriculture and allied sectors. The integration of horticulture, veterinary, fisheries, and environmental sciences under one forum highlights the holistic approach needed for achieving long-term agricultural sustainability and ecological balance.

The deliberations and discussions during this event are expected to inspire collaborative research, promote technological innovations, and encourage the adoption of eco-friendly practices that align with global goals for sustainable development. Such gatherings are essential for strengthening the bond between science, society, and the environment.

I am confident that **IHASE-2025** will contribute significantly to shaping new perspectives and strategies that will benefit farmers, researchers, and policymakers alike. My sincere congratulations to the organizing committee for their dedicated efforts in bringing together such an esteemed assembly of experts and innovators.

I wish the conference grand success and hope it becomes a milestone event in promoting sustainable agricultural and environmental development.

Best wishes for a fruitful and inspiring IHASE-2025!

Dr. Toran Lal Sahu
Assistant Professor,
MGUVV, DURG

AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY (AFTEFS)
KOTA, RAJASTHAN
REG. NO.- COOP/2023/KOTA/201080
Contact us :
9784677044
info@aftefs.com
www.aftefs.com
Plot No. A-73 Shubh Aangan,
Kota, Rajasthan Pincode : 324004

MESSAGE FROM CONFERENCE DIRECTOR & SOCIETY PRESIDENT



It gives me immense pleasure to extend my heartfelt best wishes to the organizing team and all participants of the International Conference on Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE–2025) scheduled to be held from November 20–22, 2025, jointly organized by Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh, Agriculture Forum Society, and VITAL BIOTECH EDUCATIONAL GROUP.

This grand international event stands as a remarkable platform that brings together eminent scientists, academicians, young researchers, entrepreneurs, and policymakers from across the globe to share their knowledge, innovations, and experiences. Such conferences are essential in today's era of climate change, technological advancement, and sustainable development, as they foster interdisciplinary dialogue and inspire new ideas for a resilient and eco-friendly agricultural future.

The theme of **IHASE–2025** truly reflects the global need to integrate modern innovations with traditional wisdom to ensure food security, sustainable production systems, and environmental conservation. I firmly believe that the valuable discussions and scientific exchanges during this conference will contribute significantly towards achieving the United Nations' Sustainable Development Goals (SDGs) in the agricultural and allied sectors.

I commend the efforts of the entire organizing committee for their dedication and vision in curating such a meaningful event. I wish the conference grand success and hope it paves the way for fruitful collaborations, impactful research outcomes, and enduring partnerships.

Best wishes for a fruitful and impactful conference!

Dr. Jitendra Mehta
PRESIDENT, AFTEFS

SURESH GYAN VIHAR UNIVERSITY



Greetings Message

It is truly an honor to extend my warm wishes to the organizers, delegates, and participants of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)", being held from November 20–22, 2025.

This remarkable event, jointly organized by Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Education Group, represents a significant step toward advancing scientific collaboration and promoting sustainable practices in agriculture and allied sciences.

The conference will provide an excellent platform for academicians, researchers, professionals, and students to share their insights, research findings, and innovative ideas aimed at addressing the global challenges of food security, climate change, and environmental conservation. Such initiatives play a crucial role in fostering interdisciplinary dialogue and encouraging the adoption of modern technologies for sustainable growth in the agricultural and allied sectors.

I am confident that the deliberations and outcomes of this international gathering will contribute meaningfully to shaping future research directions, policy frameworks, and practical solutions for a resilient and eco-friendly agricultural system.

My heartfelt congratulations to the entire organizing team for their dedicated efforts in bringing together experts from diverse fields. I wish the conference grand success and hope it inspires new partnerships, innovations, and sustainable outcomes for a better tomorrow.

Best wishes for a highly successful IHASE-2025!

Sh. Ram Singh Goura
Joint Director
Suresh Gyan Vihar University, Jaipur



Greetings Message

I am truly delighted to extend my warm greetings and heartfelt best wishes to the organizers and participants of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)", scheduled to be held from November 20–22, 2025, jointly organized by Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh), Agriculture Forum Society, and VITAL BIOTECH Education Group.

This international gathering stands as a remarkable platform for scientists, researchers, academicians, policymakers, and students from across the globe to share innovative ideas, research outcomes, and emerging technologies that can transform the agriculture and allied sectors. Such collaborative efforts are essential for addressing the pressing challenges of food security, climate resilience, and environmental sustainability.

The conference theme beautifully aligns with the global vision of promoting sustainable development and environmental harmony through scientific advancement and innovation. It will undoubtedly provide valuable insights into modern practices, interdisciplinary collaborations, and policy frameworks that can enhance productivity while safeguarding natural resources.

I commend the organizers for their commitment to fostering scientific dialogue and creating opportunities for networking and knowledge exchange among diverse stakeholders.

I sincerely wish the conference grand success and hope it inspires new partnerships, innovative research endeavors, and actionable outcomes contributing to a sustainable and prosperous agricultural future.

With warm regards and best wishes for IHASE-2025.

Dr. Bhawesh Kumawat
Registrar, Madhav University
Aburoad, Sirohi, Rajasthan



Greetings Message

It is truly heartening to extend my warmest congratulations and best wishes to the organizers and participants of the *International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"*, scheduled to be held from November 20–22, 2025, in Goa.

This grand academic gathering, jointly organized by *Goa College of Agriculture*, *Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh*, *Agriculture Forum Society*, and *VITAL BIOTECH EDUCATIONAL GROUP*, reflects a commendable commitment to promoting research, innovation, and collaboration in the field of agriculture and allied sciences.

In the present era, where the world faces multifaceted challenges related to climate change, food security, and environmental degradation, such conferences serve as vital platforms for sharing scientific insights, technological advancements, and sustainable practices. The interdisciplinary discussions among eminent researchers, academicians, and young scientists will undoubtedly inspire new ideas and solutions to build a resilient and sustainable agricultural future.

I am confident that IHASE-2025 will foster valuable collaborations and contribute significantly toward achieving the goals of sustainable development. The collective efforts of participating institutions and researchers will surely pave the way for innovations that strengthen the agricultural ecosystem and improve livelihoods.

I extend my heartfelt best wishes for the grand success of this prestigious conference. May it lead to fruitful deliberations, enduring partnerships, and impactful outcomes for the global agricultural and environmental community.

Prof. Shiv Singh Tomar
Dean, School of Agricultural Sciences
GD Goenka Universit

MADHAV UNIVERSITY
Dedicated to Excellence



Greetings Message

I am truly delighted to extend my warmest wishes to all participants, delegates, and organizers of the International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)", scheduled to be held from November 20–22, 2025, at Goa.

This prestigious event, jointly organized by the Goa College of Agriculture, Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh, Agriculture Forum Society, and VITAL BIOTECH Education Group, serves as a remarkable platform for scientists, academicians, researchers, and professionals from across the globe to share their innovative ideas, research outcomes, and experiences for the advancement of agriculture and allied sciences.

In the present era, the challenges of climate change, environmental degradation, and resource scarcity call for scientific innovation and sustainable strategies. I am confident that IHASE-2025 will contribute significantly to promoting interdisciplinary collaboration and generating practical solutions that will enhance agricultural productivity, environmental resilience, and rural livelihoods.

I sincerely appreciate the efforts of the organizing institutions and committees for bringing together such a distinguished gathering of experts and young researchers. May this conference inspire new thoughts, foster global partnerships, and lead to impactful outcomes that benefit our farming communities and the planet at large.

Wishing IHASE-2025 grand success and all participants a fruitful, enriching, and memorable experience.

Dr. Gitam Singh
Dean, College of Agriculture
Madhav University, Abu Road, Rajasthan



Greetings Message

It is truly a matter of great delight and honor to extend my warm congratulations and best wishes to the organizers and participants of the **International Conference on "Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment (IHASE-2025)"**, scheduled to be held from **November 20–22, 2025**, at the beautiful venue of **Goa**.

This remarkable event, jointly organized by **Goa College of Agriculture**, **Mahatma Gandhi Udyaniki Evam Vanikee Vishwavidyalaya (MGUVV), Durg, Chhattisgarh**, **Agriculture Forum Society**, and **VITAL BIOTECH EDUCATIONAL GROUP**, represents a visionary effort to unite scientists, academicians, researchers, and professionals from diverse domains to deliberate on cutting-edge innovations shaping the future of agriculture and allied sciences.

At a time when **sustainability, environmental conservation, and food security** are at the forefront of global priorities, such academic gatherings provide a valuable opportunity to exchange knowledge, share innovations, and explore collaborative pathways for developing eco-friendly and sustainable practices. I am confident that IHASE-2025 will emerge as a dynamic forum fostering meaningful discussions, technological advancements, and scientific collaborations that will contribute significantly to sustainable agricultural development.

I sincerely commend the organizers for their dedication and vision in bringing together experts from across disciplines for this noble cause. May this conference inspire innovative ideas, nurture global partnerships, and pave the way for a more sustainable, resilient, and prosperous future for all.

Wishing IHASE-2025 grand success and impactful deliberations!

Dr. Arpita Sharma
Associate Professor & Research Coordinator
School of Agricultural Sciences
GD Goenka University

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Research & Training Institute
KOTA (RAJASTHAN)
basic to learn



MESSAGE FROM FOUNDER & CEO VITAL BIOTECH

On behalf of VITAL BIOTECH, I am delighted to extend my best wishes to *Madhav University, Abu Road* and *MB College, Tonk* for jointly organizing the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, scheduled on 19th–20th September 2025.

This prestigious conference, under the esteemed banner of AFTEFS, is a landmark initiative that brings together renowned experts, academicians, researchers, and practitioners to deliberate on emerging challenges and opportunities in agriculture and allied sciences. By integrating agriculture with humanities and public health perspectives, the conference offers a unique platform for cross-disciplinary collaboration and exploration of innovative ideas that can shape a sustainable and healthier future.

At VITAL BIOTECH, we are deeply committed to fostering technological and scientific advancements in agriculture. We strongly believe that platforms like this are crucial for bridging the gap between research, policy, and practice. The deliberations and knowledge exchange during the conference will not only enrich scientific understanding but also yield practical solutions for farmers, industries, and policymakers to enhance productivity, ensure sustainability, and safeguard environmental and public health.

I am confident that the discussions and outcomes of this conference will inspire groundbreaking innovations, foster meaningful collaborations, and contribute to nation-building through sustainable agricultural and societal development.

Wishing the organizers, speakers, and participants grand success in making this conference a milestone event and a beacon of knowledge for the global community.

Jaya.

Best regards,
Ms. Jaya Mehta
Founder & CEO, VITAL BIOTECH Kota, Rajasthan, India

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IHASE-2025/55	Unravelling the Biotechnological Basis of Phosphorus Use Efficiency in Chickpea	Sakshi Gupta[1], Ashutosh K. Srivastava[2*], Anshuman Singh[3], Maneet Rana[4], Sharwan Shukla[5], Ashutosh Singh[6]

IHASE-2025/56	Optimizing Oyster Mushroom Cultivation: Exploring Low-Cost Local Substrates for Sustainable Farmer Livelihoods in Goa.	Pankaj Mapari, Aarti S Gauns[1], Deepashree Naik[2] and Govind V. Parab
IHASE-2025/57	Design, fabrication, and performance of ohmic heater to process whole milk	Rashmi Kumari*, Jui Lodh, and M. L. Bal
IHASE-2025/58	Agrivoltaics: Sustainable Food and Agriculture Approach for Indian Farmers	Vinod T. Atkari*, Govind V. Parab
IHASE-2025/59	Comparative Analysis of The Treated and Untreated Vegetable Oil Mill Effluents	Durga Lal Regar[1], Poonam Jaiswal[2]
IHASE-2025/60	Study of the Antibacterial Activity of Propolis Obtained from Local Honey Bees (Apis mellifera L.) Against Staphylococcus aureus and Escherichia coli Strains	Asilakhon Khasanova Mustaqim qizi, Abdug'aniyiva Pokiza Yo'lchi qizi, Po'latova Malika oybek qizi
IHASE-2025/61	Isolation of oil-degrading bacterial strains from oil-contaminated soils in the Bukhara region of the Republic of Uzbekistan and study of their bioremediation efficiency	Po'latova M.O; Abduganiyeva P.; Hasanova A. Kadirova Z.A
IHASE-2025/62	Composition And Changes Of The Aral Sea Microflora	Malohat Abdurasulovna Nematova[1] Xilola Toirbek qizi Rajabboyeva[2]
IHASE-2025/63	Isolation and identification of bacterial strains (Pseudomonas spp., Bacillus spp.) from local environments that accelerate polyethylene degradation.	Abdug'aniyeva P.Y
IHASE-2025/64	Effect of abiotic factors on the population dynamics of major sucking pests infesting upland cotton (*Gossypium hirsutum* L.)	Chitralekha[1], A.K. Mehta[2], Sudha Bishnoi[3] And Prince[4]
IHASE-2025/65	Isolation and biocontrol potential of endophytic bacteria associated with *Glycyrrhiza glabra L.*	Sokhibjon Abdusamatov[1,2], Numonjon Sultanov[2], Ziyoda Karimova[2], Dilfuza Jabborova[1,2]

IHASE-2025/66	Effect of Agricultural Commercialization on Farmers: An Indian Approach	Dr. Mahender Pal*
IHASE-2025/67	Green Biosynthesis and Characterization of Zinc Oxide Nanoparticles Using Neem (*Azadirachta indica*) Leaf Extract and Their Antibacterial Potential	Reju J[1], Sherin J S[2], Devika Sukumaran[3] and Swaliha Fathima V N[4]
IHASE-2025/68	Integrating Biodiversity Restoration and Service Learning: A Post-Flood Ecological Revival Model from UCC India	Suman George[1] and Justin R Nayagam[2]
IHASE-2025/69	Shifting cultivation: An old age agriculture practice in forests, and measures to improve its productive and protective functions	Rajesh Kumar
IHASE-2025/70	Effect of Different Levels and Combinations of Panchgavya and Jeevamrit on Growth Parameters of Mango (*Mangifera indica* L.) under Organic Production System at SKUAST-J, Chatha	Ankush, Shalini Devi
IHASE-2025/71	Precision Agriculture: Role of Sensor Technology in Crop Monitoring and Sustainable Farm Management	Abhijit Singh[1], Shalini Devi[2]
IHASE-2025/72	Effect of Iron and Sulphur on Ascorbic acid, Phenolic, and Glutathione Content in Different Stages of Contrasting Varieties of Pearl millet Under NFT System	Sunil[1*] and Vinod Kumar[2]
IHASE-2025/73	Comparative Extraction of Sulphated Polysaccharides from Red Algae and Biomedical Evaluation of a Sulphated Polysaccharide Hydrogel from *Gracilaria corticata*	Rithika. R

IHASE-2025/74	Innovations in Emerging Bioplastics and their Future Prospects	Nisha Rana
IHASE-2025/75	Impact of Arbuscular Mycorrhizal (AM) Inoculation on Establishment and Shoot Growth Performance of Potted Litchi *(Litchi chinensis* Sonn.) Plants	Shalini Devi
IHASE-2025/76	Accumulation of Heavy Metals in the Soil-Plant System and Associated Risk Assessment of Forages Irrigated by Sewage Water	Mahendra Prasad[1*], Sonu Kumar Mahawer[1], M.M. Das[1], M. Vassanda Coumar [2], J.K. Saha[2]
IHASE-2025/77	Sustainable Use of Shrimp Waste to Improve Pigmentation and Growth in Three-Spot Gourami *Trichopodus trichopterus*	Krina Patel[*1], Rajkumar Dabhi[2]
IHASE-2025/78	Evaluation and optimizing the effectiveness of water harvesting structures to ensure water security through groundwater recharge for the Kanari River's revival	Ayushi Trivedi[1*], MK Awasthi[2] and Nirjharnee Nandeha[3]
IHASE-2025/79	Effect of Biodynamic Preparations and Organic Inputs on Growth Dynamics, Yield Attributes, and Economics of Different Wheat Varieties	Nirjharnee Nandeha[1*]and Ayushi Trivedi[2]
IHASE-2025/80	Exploring the Green Niche: Consumer Insights into the Exotic Vegetable Market of South Gujarat	Swati Sharma[1*]
IHASE-2025/81	Determination Of Marketed Surplus Of Farm Production	Dr. Ravi Singh Chouhan
IHASE-2025/82	Development, Characterization and Evaluation of cubosomes nanoparticles (CUBNPs) for co-delivery of 5-Fluorouracil (5-FU) and 4-MTBlTC (Er), A synergistic approach	Sharabjit Singh[a*], Prabhjot Kaur[a], Shivani Attri[a], Saroj Arora[a*]

IHASE-2025/83	Satellite-Based Spatiotemporal Crop Health and Stress Analysis: A Case Study of Ludhiana District, Punjab	Devansh Negi
IHASE-2025/84	Optimizing Floral Productivity in *Ixora* Loose Flower Cultivation through Precision Foliar Application of Secondary and Micronutrients	Reshma R[1], Ganga M[2], Visalakshi M[3], Irene Vethamoni P[4] and Chitdeshwari T[5]
IHASE-2025/85	Ethnopharmacology and therapeutic potential of macrolichens of Kilbury region, Nainital	Neha Pantola[*], Balwant Kumar and Prachi Joshi
IHASE-2025/86	Softwood Grafting: A Progressive Approach to Enhance Tamarind (*Tamarindus indica* L.) Propagation and Sustainability	J. Uma Devi[1], M. Madhavi[2], E. Padma[3] and P. Subbaramamma[4]
IHASE-2025/87	Elucidation of Genetic Diversity of Mulberry Germplasm through Microsatellite Markers	Yawer A. Dar, Shabir A. Wani and Sadaf Rashid Malik
IHASE-2025/88	Climate-smart Agriculture and Carbon farming as an adaptation strategy	Anita Kerketta[1], Ayusha Gupta[2], Suresh Kumar Wakre[2], Richa Sao[1], Amit Dixit[3]
IHASE-2025/89	Nutraceuticals and functional foods, a new health needs	Ayusha Gupta[1], Anita Kerketta[2] and Amit Dixit[3]
IHASE-2025/90	Identification of potential landraces of rice (*Oryza sativa* L.) with high yield and Nutritional traits.	Mayuri Megha. T[1,2], Neeraja C.N[2] Suman. K[2], Vaidurya P. Sahi[1]
IHASE-2025/91	In-Vitro Micropropagation of *Senegalia* (*Acacia*) *catechu* (L.f.) Mature Seeds.	Ratnamala Ghosal[*], Chitra Kashyap[*], Aditya Raj[*], Kalpana Chaurasia
IHASE-2025/92	Public–Private Partnerships in Delivering Digital Extension Services	P. Akhila[*], P. Lakshmi Priya, Dubasi Abhigna
IHASE-2025/93	Algorithm-Fortified Biofuel Robust for Next-Gen Climate-Intelligent Agriculture	T. Porchelvan[1*] and P. Sudhakar[2*]

IHASE-2025/94	*Cyprinus Carpio* in catch of Gobind Sagar Reservoir during two years	Krishan Lal
IHASE-2025/95	Biopesticides As A Sustainable Alternative For Aphid Management In Mustard	Pawar Shubham Tarasing
IHASE-2025/96	Accessing the feasibility of growing strawberry in Vertical farming using PVC pipes	L.Shruthi Reddy[a], M.Rajasekhar[b]
IHASE-2025/97	Comparative Evaluation of Growth, Biometric Parameters, and Survival of the Indian Pearl Oyster, *Pinctada fucata* (Gould, 1850) Under Onshore and Natural Rearing Systems	Rajkumar Dabhi[1], Hitesh Kardani[1*], Piyush Vadher[1], Ajay Ram[1], Sunil Shekh[1] and Pinak Bamaniya[1]
IHASE-2025/98	Medicinal Plants In Cancer Therapy: Mechanisms, Efficacy And Future Prospects	Sahil Ahmad Dar
IHASE-2025/99	Influence of ohmic heating on physico-chemical and rheological properties of whole milk	Rashmi Kumari*, Jui Lodh, Diwakar Mishra, M. L. Bal and Sanjeev Kumar
IHASE-2025/100	Effect of Gamma Radiation on Floral Characters of Commercial Cultivars of Dahlia (*Dahlia Variabilis* L.)	Bharti Sao* and Amit Dixit[1]
IHASE-2025/101	Chemical and Microbial Assessment of Industrial Effluents in Pali, Rajasthan: A Comparative Review	Deepshikha Khangarot
IHASE-2025/102	Advancing Sustainability in the Flower Industry with Biodegradable Floral Foams	Syed Ayesha[1], Dr. T. Suseela[2], Dr. A.V.D Dorajee Rao[3]
IHASE-2025/103	Assessment of Industrial Air Pollution in Riico Industrial Area-Kukas Jaipur and its impact on local vegetation via APTI Tool	Pawan Kumar Chaudhary[1*], Dr.Manjul Mishra[2]
IHASE-2025/104	Optimizing Rearing and Reproductive Conditions of Common Carp (*Cyprinus carpio*) in Semi-Intensive Farming System	Ajmair Singh Sodhi[1], Romisa Gull[2]

IHASE-2025/105	Toxicological Evaluation of Mycotoxins Contaminating Cereal-Based Foods: Experimental Assessment of Aflatoxin B_1 Induced Biochemical, Hematological, and Histopathological Alterations in Rats	Dr. Sowmya K.L[1] & Dr. Ramalingappa. B[*]
IHASE-2025/106	Antimicrobial Resistance and the Role of *Allium sativum* (Garlic) in Combating Carbapenem-Resistant *Escherichia coli.*	Sandhya
IHASE-2025/107	Nature's Pharmacy within Endophytic Fungi of Medicinal Plants as a Source of Anti-Obesity Pancreatic Lipase Inhibitors	Mohammed Asif Killedar[1] & Ramalingappa B[*]
IHASE-2025/108	Study of Biotic Homogenisation of Birds in Rapidly Urbanizing Kota City (Rajasthan, India)	Gajanan Charpe[1] and Meenakshi Mayanger[2]
IHASE-2025/109	Modulatory Effects of Gibberellic Acid Concentrations and Culture Media on Root Morphogenesis in Jamun (*Syzygium cumini* L. Skeels)	P. Lepakshi[1], Dr. P. Vinaya Kumar Reddy[2]
IHASE-2025/110	Study of Biotic Homogenisation of Birds in Rapidly Urbanizing Kota City (Rajasthan, India)	Gajanan Charpe[1] and Meenakshi Mayanger[2]
IHASE-2025/111	Pseudocyclic Podand-Based Liquid Membranes for Environmental and Metallurgical Ion Purification	Rekha Vijay[1,2], Poonam Hariyani[1*] and Barkha Shrivastava[2]
IHASE-2025/112	Analysis of Physico-Chemical Parameters of Chambal River Water Around Kota Industrial Area, Rajasthan, India.	Dr. Bhartiy Sharma,[1] Nikita Vijay[2]

IHASE-2025/113	Impact of Organic and Inorganic Nutrient Management on Yield Performance of Cluster Bean (*Cyamopsis tetragonoloba* L.) var. Pusa Navbahar under Chhattisgarh Plains	Anamika Jain Badkul and Ritu Chandrawanshi
IHASE-2025/114	Effect of venom extraction on hygienic and defensive behaviour of honey bees, *Apis cerana* (Hymenoptera: Apidae)	Mousumi Bharali[1], M.K. Deka[2] and Partha P.G. Das[3]
IHASE-2025/115	Overview of Soil Fertility Management: Approaches and Strategies in Nepal	Shree Prasad Vista
IHASE-2025/116	Phosphate and Zinc Solubilization Activity of Endophytic Bacteria Isolated from *Plantago lanceolata* L.	Sokhibjon Abdusamatov[1,2*], Numonjon Sultanov[2], Dilfuza Jabborova[1,2]
IHASE-2025/117	Hydrogen Cyanide Production Activity of Endophytic Bacteria Isolated from *Plantago lanceolata* L.	Sokhibjon Abdusamatov[1,2*], Numonjon Sultanov[2], Dilfuza Jabborova[1,2]
IHASE-2025/118	Factors Influencing Test-Day Milk Yield in Jsersey Crossbred Cattle	V. V. Potdar* , Syed Meraj Ahmed Ismail, Shivarudrappa B, Sachin Joshi and Jayant Khadse
IHASE-2025/119	Effect of abiotic factors on the population dynamics of major sucking pests infesting upland cotton (*Gossypium hirsutum* L.)	Chitralekha[1], A.K. Mehta[2], Sudha Bishnoi[3] And Prince[4]
IHASE-2025/120	Microbiological Study and Contaminant Analysis on Sambhar Lake of Jaipur, Rajasthan to Evaluate the Toxicity Risk for Birds, Aquatic Life and Humans	Prakriti Pareek[1*], Dr. Manjul Mishra[2]
IHASE-2025/121	Unlocking the Economic Potential of Orchid Flowers through Drying and Value Addition	Neelima Khunte*, Dr. Rajeshwari Sahu, Dr. Toran Lal Sahu, Suvigya Gautam

IHASE-2025/122	Horizontal and Vertical Growth Dynamics of Natural Farming in Andhra Pradesh: A Pathway towards Sustainable and Climate-Resilient Agriculture	K. Gurava Reddy[1] and B. S.S .Siddartha Naik[2]
IHASE-2025/123	Amelioration of heat stress in broilers via dietary electrolytes and herbal supplements (*P. emblica)*.	Dr. Vipin Maurya[1], Dr. Utkarsh Kumar Tripathi[1], and Dr. Santosh Marandi[2]
IHASE-2025/124	Ethical Animal Production: Merging Welfare, Sustainability, and Productivity	Dr. Nikita Mangal
IHASE-2025/125	Identification and comparison of mirror repeats in mRNA isoform of the muscular dystrophy gene: The largest human gene	Priya*, Namrata Dangi**
IHASE-2025/126	effect of fertigation and nano formulated nutrients on the soil nutrient status of pole bean (*Phaseolus Vulgaris* L.)	Bandi Leeshini Indira*, Dr. Raveendra S. Jawadagi, Mr. H. P. Hadimani, Yashvantha Kumar K.H and Sanjeevareddi G. reddy
IHASE-2025/127	Effect of some Macro-nutrients and Micro-nutrients in nutritive value of germinating wheat	Archana Singh
IHASE-2025/128	Spectrum of mirror repeats in gustatory receptor gene Gr37 of yellow fever mosquito: *Aedes aegypti* (Linn.)	Deepti[1], Vikash Bhardwaj[2*] and Kavita Saini[3]
IHASE-2025/129	Nutraceuticals and functional foods, a new health needs	Ayusha Gupta[1], Anita Kerketta[2] and Amit Dixit[3]
IHASE-2025/130	Genetic Modification and Gene Editing Approaches in Bioremediation: Innovations for Sustainable Agriculture and Environmental Health	Dr Hardik Pathak
IHASE-2025/131	Nanotechnology in Medicine: Challenges and Opportunities for Sustainable Healthcare Solutions	Dr Saurabh Dave

IHASE-2025/132	Effect of Heavy metal-induced Oxidative Stress on Growth and Chlorophyll content of freshwater algae Chlorella vulgaris	Bhaswati Chakraborty[1], Dr. Joel Jose[1*]
IHASE-2025/133	Effect of different chemical preservatives on keeping quality and vase life of Gerbera cv. Livia	Richa[1], Manisha Kashyap[2], Sushil kashyap[2]
IHASE-2025/134	Echoes of the Wild: Morphological and Ethnobotanical Exploration of Orchids in Chhattisgarh for Sustainable Floriculture and Conservation	Suvigya Gautam[*], Dr. Rajeshwari Sahu, Dr. Toran Lal Sahu, Neelima Khunte
IHASE-2025/135	Detecting Adulteration in Ghee: A Synthesis of Classical Constants, Rapid Screens, and Modern Instrumental Methods	Tanmay Hazra[1], Rohit Sindhav[1] and Anamika Das[2]
IHASE-2025/136	Effect of Dietary Supplementation of *Kappaphycus Alvarezii* (Marine Macroalgae) Vis-A-Vis Bacitracin Methylene Disalicylate on Blood Profile, Oxidative Stress Indices and Immune Response in Commercial Broiler Chickens	S.Navaneetha Krishnan[1*], Anchal Keshri[2], A.K. Patil[3], Naresh Kurechiya [4], Joycee Jogi[5] and Kurukuti Sailesh Sai[6]
IHASE-2025/137	Studies on Pollen Morphology of *Bougainvillea* Cultivars: A Popular Ornamental Plant of Hyderabad District, Telangana State, India	Dr.Chaya Pallati[*]
IHASE-2025/138	Unraveling Mirror Repeats and Transcript Diversity in the Human PAH Gene	Laxita Singh
IHASE-2025/139	Length-Weight Relationship and Growth Pattern Analysis of Channa punctatus from the Ganga River, Bijnor and Cirrhinus mrigala from Ram Taal Lake, Meerut: A Comparative Study of Allometric Growth and Environmental Influence	Shagun Rathi, Dr. Neeru Singh[*], Dr. Mohd. Faisal Siddiqui

IHASE-2025/140	Synergistic Advances in Biopharmaceuticals, Bioinformatics, and Genetics in Horticultural Sciences	Richa Sao, Anita Kerketta, Bharti Sao and Amit Dixit
IHASE-2025/141	Cellulose–ZnO Nanocomposite Coatings: A Green Chemistry Approach for Food Preservation	Dr. Ram Bilas Meena
IHASE-2025/142	Rhizosphere microbial diversity and its functional role in Khasi mandarin (*Citrus reticulata* Blanco) - a mini review	Buddhisatya Dowarah[1*] and Pauline Alila[2]
IHASE-2025/143	Evaluation of Water Quality and its suitability for fish culture in Surwal Dam Reservoir, Rajasthan	Dr. Rajendra Singh Rajawat
IHASE-2025/144	The Role of Chemistry in Enhancing Food Preservation and storage Life	Dhanraj
IHASE-2025/145	Biopolymer Chemistry in Food Preservation	Dr. Suresh Kumar Meena
IHASE-2025/146	Ai and Ml Integrated Soil Moisture Based Automatic Irrigation System	A. P. Bowlekar, S. T. Patil, U. S. Kadam, M. S. Mane, S. B. Nandgude and N. K. Palte
IHASE-2025/147	Association of *Vibrio* spp. with algal bloom induced stress and deteriorating water quality in shrimp ponds of Haryana, India	Funde Aniket[1*], Shivam Pandey[1], Rachna Gulati[1], Md. Idrish Raja Khan[1]
IHASE-2025/148	The Hidden Harvest: Quantification and Characterization of Microplastics in Agricultural Runoff from the Dam Catchment	Rohan R Kundapur[1] , Dr. Manu M Joseph[1]
IHASE-2025/149	Integrated Fungicide–Bacterial Biocontrol Strategy Against Charcoal Rot in Chrysanthemum.	D. Shanmuga Priya[1*], K. Eraivan Arutkani Aiyanathan[2] and S. Harish[1]
IHASE-2025/150	Evaluating the Coefficient of Variation for body weight in Malabari goat populations	Charlotte Coretta Rodricks, K.A. Bindu and Pramod S.

IHASE-2025/151	Comparison Of Antimicrobial And Antioxidant Activity Between Aqueous Methanolic Extracts Of Neem And Tulsi Leaves	Shaurya Mitra1, Jobi Xavier*
IHASE-2025/152	The effect of different media on seed germination and seedling performance of *Adenanthera pavonina* L.	Karanjalker Gourish and Avni Karanjalker
IHASE-2025/153	Effect of cashew seed nut orientation on germination and growth parameters	Karanjalker Gourish
IHASE-2025/154	Mapping of Tree Outside Forest (TOF) and Retrieval of their Biophysical Parameters at district Sonipat, Haryana, India	Darshana Duhan[1], Dharmendra Singh[2] and Sandeep Arya[3]
IHASE-2025/155	Exploring the Antioxidant and Antimicrobial Potential of Plantain (Malbhog sp.) inflorescence	Prasasti Sarma[1], Dr. Arun K B[1*]
IHASE-2025/156	Extraction of Chitinase Enzyme from Bacterial Strain for Bioremediation of Textile Effluents	Chitra Kashyap[1], Surbhi Vijay[2], Lavleen Rajawat[3], Aryan Khan[4]
IHASE-2025/157	Identification And Characterization Of Bacterial Species From Dump Yard	Ratnamala Ghosal[1], Gajendra Lodha[2], Himanshu Sharma[3], Palak Bhatnagar[4], Chitra Kashyap[5]
IHASE-2025/158	Sustainable Maize Diseases Management Strategies in India	S. I. Harlapur
IHASE-2025/159	An Economic Analysis of Costs and Returns of Off-Season Vegetables in The Hilly Area of Uttarakhand	Dr Subhash Chandraa
IHASE-2025/160	Advancement in Post Harvest Management of Aonla (Emblica officinalis)	Dr. Tejraj Singh Hada
IHASE-2025/161	Role of Molecular Marker in Fruit Processing	Dr. Tejraj Singh Hada

IHASE-2025/162	Recent Advancements and Innovations in Post-Harvest Handling, Storage, and Technology for Vegetables: A Review	Neetesh Kumar Sharma, Assistant Professor
IHASE-2025/163	Microbial-Nanotechnology for Green and Sustainable Environment	Suriya Rehman[1*], Zainab Alsalem[1], and Aleem Qureshi[2]
IHASE-2025/164	Agricultural Waste Management For Sustainable Environment	Prince Tripathi
IHASE-2025/165	Correlation and Path Coefficient Analysis for Yield and Its Component in Fenugreek (*Trigonella foenum-graecum* L.) under Chhattisgarh Plains	Anand Prakash Minj[*1], Rajeshwari Sahu[*2], Nutan Bhardwaj[*3]
IHASE-2025/166	Novel Herbal and Antibiotic Therapeutic Approach for Improving Milk Composition in Subclinical Mastitis Affected HF Crossbred Cows	Aruna Yadagiri*, Nidhi S. Choudhary, H.K. Mehta, Kamlesh Choudhary, Pawan Maheshwari, R.K. Bagherwal, Rakesh Dangi.
IHASE-2025/167	Influence of Edible Coatings and Packaging Materials on the Post-harvest Quality and Shelf Life of Strawberry (*Fragaria* × *ananassa*) variety Winter Dawn under Ambient Conditions	Ms. Bhawna Panda[1] & Riya Bohidar[2]
IHASE-2025/168	Characterization of *Pseudomonas fluorescens* Isolates from Chilli Rhizosphere Based on Biochemical and Morphological Traits	R.J. Choudhari *, R.M. Gade[1] and A.D. Theng [2]
IHASE-2025/169	Varietal evaluation of African marigold (Tagetes erecta) under Chhattisgarh plain	Nutan Bhardwaj, Rajeshwari Sahu and Anand Prakash Minj.
IHASE-2025/170	Impact of Ultrasound as a Pretreatment on the Malting Properties of Ragi and Foxtail Millet.	Gitasri Paul[1*], Labanyamayee Tudu[2], Dipsikha Kalita[3]
IHASE-2025/171	Overview on Plant Genetic Resources and Their Utilization in Goa	P.P. Patil[1*].; S.S. Nitave[2].; V.A. Atkari[3].; S.S. Jadhav[4] and D. P. Gawas[5]

IHASE-2025/172	Animal Health and Welfare, Integrating Human, Animal and Environmental Health (One Health Approach)	Ravikant Verma
IHASE-2025/173	Harnessing the Resilience of Horse Gram: A Climate-Smart Approach to Sustainable Nutrient Management	Muthamma M.B1, Mohan TC1, Charukesi R[1*]
IHASE-2025/174	Learning from Weeds: Deciphering nutrient use efficiency mechanism in *Parthenium hysterophorus* and implications for the development of Nutrient-Efficient crops, insights toward reducing fertilizer dependency	Subrahmanya Hegde[1], Mohan T C[1], Charukesi R[1*]
IHASE-2025/175	Odisha's Journey Towards Blue Transformation in Fisheries and Aquaculture	Sushree Ratnamanjari Senapati
IHASE-2025/176	Integrating Traditional and Modern Agronomy for Climate-Resilient Agriculture	Sonu Kumar[*]
IHASE-2025/177	Myoinositol: Antidiabetic compound identification and *in-silico* studies in cape gooseberry (*Physalis peruviana* L.) genotypes	Mohamed Jassim J[1*], Saraswathy S[1*], Veeranan Arun Giridhari V[2], Anitha T[3] and Umadevi M[4]
IHASE-2025/178	Advancing Interpretability of Spatial Machine Learning for Digital Soil Salinity Mapping	Ramesh Abhishek[1], Shobhit Maheshwari[1], Neeraj Saini[1], Naveen Sharma[2]
IHASE-2025/179	Bioefficacy and Residue Dynamics of Insecticides against *Bactrocera dorsalis* in Guava	Meenakshi Devi and Surendra Singh Shekhawat
IHASE-2025/180	Integrating Smart Farming, Climate-Resilient Practices, and Sustainable Value Addition for Strengthening Agri-Food Systems	Heena[1], Farhana Majid[2]
IHASE-2025/181	Formulation and Quality Evaluation of Drumstick-Based Ready-to-Serve (RTS) Fruit Blends	Dr. Pooja Pant

IHASE-2025/182	A Machine Learning Approach to Predict the Maize (Corn) Productivity in India	Suman
IHASE-2025/183	Digital Innovations and Agribusiness Transformation: Enhancing Efficiency and Sustainability in Agri-Value Chains	Naveen Sharma[1], Ramesh Abhishek[2*]
IHASE-2025/184	International Conference Organised By Goa College Of Agriculture And Mguvv,Durg,Chhattisgarh	Mr. Narendra Meel
IHASE-2025/185	Green synthesis of zinc oxide nanoparticles using the root extracts of *Trigonella foenum graecum* and evaluation of their antioxidant, photocatalytic, and cytotoxic properties.	Anis Kumar Mishra
IHASE-2025/186	Advancing the Innovative Approaches of Detecting Pesticidal Residues in Vegetables: A Review of Technological Innovations	Poonam
IHASE-2025/187	Sustainable Pigments from Indigenous Goan Flora: A Study	Dr. Andrew D'Souza 1 , Fr. Dr. Bolmax Pereira 2 , Dr. Mira Parmekar 1, Mrs. Milagrina D'Souza1, Mrs. Juliette Ravel Roy Chowdhury
IHASE-2025/188	Effect of herbal material (Amla) on growth performance of Common carp *(Cyprinus carpio)*	*Nitish Bansal[1], R.K. Gupta[2], Gajender Singh[3] and Shruthi H.V.[1]
IHASE-2025/189	Exploring phenolic diversity in Indian Cashew (*Anacardium occidentalae* L.) cultivars through LC–MS/MS and multivariate analysis for functional utilisation	*Manjesh G.N., Veena G.L., and Jamboor Dinakara Adiga
IHASE-2025/190	Formalin Residues in Marketed Fish of Haryana: Effects on Quality Attributes and Strategies for Mitigation	Sanjeev Sharma [1]*, Dalip Kumar Bishnoi [1], Maloth Mohan [1], Nitish Bansal [1], Krishan Kumar Yadav [1], Pallavi Bhalavey [1], Rishi Pal Yadav [1], Khushbu Gurawa [1], Nirmal Patel [1], and Deeksha Hooda [1]

IHASE-2025/191	Evaluation of garlic ecotypes (*Allium sativum* L.) performance on growth and yield attributes	Siddappa, R[1#], M. Ananthan[2] and, N. K. Hegde[3]
IHASE-2025/192	International Conference Organised By Goa College Of Agriculture And Mguvv,Durg,Chhatisgarh	Mr. SURESH KUMAR
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IHASE-2025/01

Impact of Seriboost treated mulberry leaves on parental silkworm races

Amardev Singh
Scientist-C & Incharge, Silkworm Seed production Centre, Udhampur, J&K UT.

A study was conducted at SSPC, Udhampur during the year 2022-23 in a well-established chawki mulberry garden of S_{-1635} variety to determine the efficacy of Seriboost (a formulation containing triacontanol) sprayed mulberry leaves after 25 days of sprouting on seed crop rearing under three different seed zone in spring season. After application of foliar spray on chawki mulberry garden had a very positive impact on the seed crop rearing an average yield of 64.01 Kg/100 dfls was achieved in seed zone Suntha, 63.34 Kg/100 dfls in seed zone Thill and highest average yield of 66.36 kg/100 dfls was achieved under seed zone Hartrayan. The seed recovery per kg of seed cocoons was attained above norms of all four parental races. This finding led to the conclusion that mulberry cultivation should include an application of 2.5 ml/litre Seriboost for attaining quality mulberry leaves, which has very positive effect on seed cocoon productivity and overall seed cocoons production under the seed zones during spring season.

Key words: *Seed cocoons, seed crop, foliar spray, Seriboost, yield, seed recovery.*

IHASE-2025/02

Electric field based green remediation of dyes from irrigation water

Aditya Kumar, Monika Kundu*, Ananta Vashisth, P. Krishnan
Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute,
New Delhi-110012
*gkmk07@gmail.com, 8809404566

The rapid growth in urbanisation, resource consumption, climate change, food requirements has led to water shortage. Industrial effluents containing dyes and other contaminants when discharged into water bodies untreated, further exacerbate the shortage of water to be used for irrigation purpose. Also, synthetic dyes production is on the increase due to their high demand, most especially in textile and clothing industries. Thus, farmers are ultimately utilising water, carrying dyes and other chemical contaminants. Such water if used for long time, has detrimental impacts on environment in term of soil quality, crop, animal as well as human health. However, for dye removal from irrigation water, electric field based advanced oxidation technique have been used in our study. UV-Vis spectroscopy for rapid and non-destructive detection of selected dyes and Graphite electrode to be used in electrolysis process, is selected. Using response surface methodology (RSM), optimization of Voltage, initial concentration and operating time was performed. it was observed that highest Removal efficiency for Methyl orange and Congo red was 99.22% and 98.4% respectively for 0.5 ppm at operational time of 40 min at 20 Volt. Thus, Electric field-based system developed using Graphite electrode plays a significant role in ecofriendly, less time consuming, and cost-effective, high efficacy dye remediation strategies.

Keywords*: Electric field-based system, Methyl orange, Congo red, Irrigation water, UV-Vis spectroscopy, Response surface methodology, Removal Efficiency*

IHASE-2025/03

Genetic variability and correlation studies for yield and quality in advanced breeding lines of rice (*Oryza sativa* L.)

Kadthala Bhargava[1], Sreedhar, M.[2], Jhansi Lakshmi, V.[3], Parimala, K.[4], and Vanisri, S.[5]

[1]College of Agriculture, Professor Jayashankar Telangana Agricultural University (PJTAU), Rajendranagar, Hyderabad, Telangana-500030. kadthalabhargava.agricos14@gmail.com
[2]Regional Agricultural Research Station (RARS), Palem, Telangana-509215.
[3]Indian Council of Agricultural Research-Indian Institute of Rice Research (IIRR), Rajendranagar, Hyderabad, Telangana-500030.
[4]Agricultural Research Institute, Tandur, Vikarabad (dist), Telangana-501141.
[5]Institute of Biotechnology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rajendranagar, Hyderabad, Telangana-500030.

The Brown planthopper is a major biotic constraint to rice production across Asia, posing a serious threat to food security. Developing resistant varieties through marker-assisted backcrossing is the most effective and eco-friendly management strategy. Advanced breeding lines provide an opportunity to combine pest resistance with high yield and desirable grain quality**,** enabling stable selection of promising lines. This study aimed to evaluate genetic variation, heritability, genetic advance, and trait relationships among yield, yield-related attributes, and physical grain quality characteristics in 56 BC_2F_3 progenies derived from a cross between recurrent susceptible parent, Telangana Sona (TS), and donor parent, an Assam landrace, 10-3. During Rabi 2022–23, all 56 BC_2F_3 progenies carrying the QTL qbph-1-1 were evaluated in an alpha lattice design with two replications, along with parents and two high-yielding checks (KNM 1638 and JGL 3844). ANOVA revealed significant variation among the BC_2F_3 progenies for all the traits. High GCV and PCV were observed for kernel breadth (KB), while panicle length (PL), 1000-seed weight (TW), grain yield per plant (GYP), and KB exhibited high heritability with high genetic advance, indicating strong genetic control. Grain yield showed significant positive correlations with the number of tillers per plant (TT), number of productive tillers (PT), panicle length (PL), and filled grains per panicle (FG). Based on superior yield, reduced plant height, and similarity to Telangana Sona in flowering, maturity, and kernel traits**,** 12 BC_2F_3 lines were shortlisted for further physical, chemical, and cooking quality analysis. Among them, three lines exhibited favorable cooking and chemical quality**,** comparable to Telangana Sona. These findings highlight the potential of these lines to combine BPH resistance, high yield, and superior grain quality**,** making them promising candidates for advanced yield trials and varietal release**.**

Keywords*: Brown planthopper (BPH); correlation; genetic advance; and heritability.*

IHASE-2025/04

Pesticides Impact on Butterfly Diversity and Abundance: A Case Study from Semi-arid Region, Kota, Rajasthan, India

Kiran Gocher[1] and Dr. Kusum Dang[2]
[1]Research scholar, University of Kota, Kota
Email: gocherkiran98@gmail.com
[2]Professor, Department of Zoology,
Government College Kota, Rajasthan
Email: drkusumdang@gmail.com
Section: Department of Zoology, Government College Kota.

Butterflies are not just beautiful insects- they are also excellent indicators of the health of our environment. This study showed that how the use of pesticides affects the diversity and abundance of butterflies. For the study two adjacent plots of land was selected, located near, Kota, Rajasthan, India. To assess the impact of pesticides use on butterfly diversity and abundance, one plot was treated with two pesticides (Biopesticide & Chemical Pesticide), while the other was maintained as control set of experiment without any pesticide application. These two lands were cultivated with a range of flowering plants and vegetable crops to stimulate a diverse agriculture environment. The selected plant species included marigold (*Tagetes erecta*), periwinkle (*Catharanthus roseus*), and vegetables such as red and green chili (*Capsicum annuum*), tomato (*Solanum lycopersicum*), brinjal (*Solanum melongena*), spinach (*Spinacia oleracea*), and cauliflower (*Brassica oleracea var. botrytis*).This setup allowed for a comparative analysis of butterfly diversity and abundance under treated and untreated conditions. Over a duration of 3 months (October- December), butterflies were observed in areas with and without pesticide use, counting how many there were and noting the different species present.

When the biopesticide is applied on the crops, the larvae stop feeding their growth and molting is interrupted and there is high mortality. There is minimally direct effect on the adult stage but the egg laying declines as the adult feeds on treated nectar. Sensitive species were immediately affected, there was decline in their abundance whereas the generalist species survived. So there is moderate reduction in species diversity. When the chemical pesticide is applied as foliar spray there is reduction in species richness and abundance. Whereas in control set of experiment all butterfly species naturally occurring in the habitat are present.

In the present investigation in the control set of experiment 9 species of butterflies were documented. Out of these 4 species (mottled emigrant, lime swallowtail, common grass yellow and common leopard) are sensitive species and 5 are generalist. In the current experiment pesticide treatment allowed survival of

generalist species but sensitive species were eliminated. Generalist species survived with pesticide application but there was a decline in abundance.

These findings highlight the importance of using pesticides carefully and exploring alternatives, like natural pest control or creating butterfly-friendly spaces, to protect these insects. Keeping butterfly populations healthy is important not only for nature but also for agriculture, as they help pollinate plants. Overall, this study shows that pesticides can significantly reduce both the variety and number of butterflies, and taking steps to manage their use can make a big difference for the environment.

IHASE-2025/05

Scope and Status of Mutation Breeding in Fruit Crops

Ashish Kumar[1], Dr. S.S. Lakhawat[2] and Naval Kishore Meena[3]
Research Scholar, Professor and Research Scholar
[1,2,3]Ph.D Scholar, Department of Horticulture (Fruit Science), RCA (MPUAT), Udaipur, Raj.
Corresponding Author: email- ashishchoudhary1528@gmail.com
Mobile number- 9587730502

Mutation breeding has emerged as a promising and effective approach in fruit crop improvement, providing new avenues for creating genetic variability, enhancing trait selection, and developing superior cultivars (Suprasanna *et al*., 2015). The application of physical and chemical mutagens has successfully induced desirable mutations such as dwarfism, disease resistance, seedlessness, early maturity, and improved fruit quality in several fruit crops (Campa *et al*., 2024). Remarkable achievements include the development of PAU Kinnow-1, a low-seeded mutant of Kinnow mandarin, and M-828, a seedless mutant in grapevine (Rattanpal *et al*., 2019). These successes highlight the potential of mutation breeding as a complementary strategy to conventional and molecular breeding methods.

Unlike traditional breeding, mutation breeding enables improvement even in asexually propagated and long-duration crops by breaking undesirable genetic linkages and enhancing specific traits of interest (Suprasanna *et al*., 2015). Since spontaneous mutations occur at a very low frequency (10^{-5} to 10^{-8}) (Ossowski *et al*., 2010), induced mutagenesis using gamma rays, X-rays, EMS, and other mutagens offers a rapid and efficient alternative for generating useful variability (Bado *et al*., 2015).

Future prospects lie in integrating mutation breeding with modern genomic tools, such as TILLING, whole-genome sequencing, and molecular marker-assisted selection, to identify, characterize, and stabilize useful mutations. Additionally, optimizing combined mutagen treatments and the use of growth regulators may further enhance mutation efficiency and trait uniformity.

In conclusion, mutation breeding continues to hold significant promise for accelerating genetic improvement in fruit crops, particularly those with complex reproductive barriers, thus contributing to sustainable fruit production and genetic diversification.

Keywords: *Mutation breeding, fruit crops, genetic variability, seedlessness, gamma irradiation, induced mutagenesis.*

IHASE-2025/06

Comparative Evaluation of Fruit Physical Characters in Guava (*Psidium guajava* L.) Genotypes

Naval Kishor Meena[1], Prof. C.P. Suresh[2,] Nidarshana Baruah[3] and Ashish Kumar[4]

Research Scholar[1], Professor[2], Research Scholar[3], Research Scholar[4]

Department of Horticulture (Fruit Science), Rajasthan College of Agriculture, MPUAT, Udaipur, 313001, (Raj.)[1, 4], Department of Horticulture, North- Eastern Hill University, Tura Campus, Chasingre, 794002, Meghalaya[2] and Department of Fruit Science, College of Horticulture and Forestry, Pasighat, CAU[3]

Corresponding author email – navalkishor022018@gmail.com , Mo. 7240296031

The present investigation was conducted to evaluate the variability in physical fruit characters among twenty guava (*Psidium guajava* L.) genotypes at genotypes in West Garo Hills region of Meghalaya" was carried out in West Garo Hills region of Meghalaya, India during 2023-24 in the Department of Horticulture, North Eastern Hill University, Tura Campus, West Garo Hills, Meghalaya. Data were recorded on fruit weight, fruit length, fruit diameter, fruit volume, pulp weight, pulp thickness, pulp percent, and specific gravity. Significant differences were observed among the genotypes for all traits studied. Fruit weight varied from 40.83 g (WGHG-18) to 111.94 g (WGHG-06), with an average mean of 62.94 g. Fruit length ranged from 3.81 cm (WGHG-18) to 5.81 cm (WGHG-06), with an average mean of 4.99 cm. while fruit diameter varied between 4.04 cm (WGHG-18) and 6.14 cm (WGHG-06), with an average mean of 4.76 cm. Fruit volume recorded the highest value in WGHG-06 (107.45 ml) and the lowest in WGHG-18 (40.23 ml), with an average mean of 61.60 ml. Pulp weight ranged from 31.12 g (WGHG-18) to 104.67 g (WGHG-01), with an average mean of 55.55 g. whereas pulp thickness varied from 0.57 cm (WGHG-18) to 1.03 cm (WGHG-01), with an average mean of 0.74 cm. Pulp percent was found maximum in WGHG-01 (97.49%) and minimum in WGHG-18 (76.22%), with an average mean of 86.55%. Specific gravity showed narrow variation ranging from 1.01 (WGHG-18) to 1.04 (WGHG-06), with an average mean of 1.02. Among the evaluated genotypes, WGHG-06 and WGHG-01 consistently performed superior for most physical fruit characters, while WGHG-18 recorded the lowest values across traits. These findings highlight the existence of substantial variability among guava genotypes, which can be effectively utilized in selection and breeding programs aimed at developing superior cultivars with desirable physical attributes.

Keywords: *Guava, Genotypes, Fruit characters, Variability, Pulp quality, Fruit weight*

IHASE-2025/07

Ethical Animal Agriculture for a Greener Planet

Mahima Gaur
Associate Professor, Department of English, SPC Govt.College Ajmer

The intensification of livestock production has precipitated profound ecological, ethical, and socio-economic challenges, underscoring the imperative for sustainable and morally responsible animal husbandry. Ethical animal agriculture represents an integrative paradigm that aligns animal welfare, ecosystem integrity, and resource-efficient production within a framework of environmental stewardship and ethical accountability. This approach emphasizes the facilitation of species-specific behaviors, minimization of physiological and psychological stress, and optimization of overall animal well-being, while simultaneously mitigating environmental degradation through regenerative land management, sustainable grazing practices, and reduced reliance on industrial feed inputs. By enhancing soil health, promoting biodiversity, and facilitating carbon sequestration, ethical livestock systems contribute directly to climate change mitigation and ecological resilience. Furthermore, innovations such as precision nutrition, waste valorization, and circular bioeconomy models maximize production efficiency and minimize ecological externalities. The widespread adoption of ethical animal agriculture constitutes a scientifically and ethically robust strategy for advancing global food security, ecological sustainability, and a greener planetary future.

IHASE-2025/08

Population fluctuations of rice sheath mite, *Steneotarsonemus spinki Smiley* in Rajeshwari rice under transplanted and direct-seeded systems, Raipur, Chhattisgarh

Jaimala Barwa[1], Sanjay Sharma[2], Mukesh Kumar Prajapati[3], Mohite Prajakta Anil[4], Soumya Ashana Singh[5]

[1]Ph.D. Scholar, Dept. of Entomology, IGKV, Raipur, Chhattisgarh
[2]Principal Scientist, Dept. of Entomology, IGKV, Raipur, Chhattisgarh
[3]Assistant Professor, Dept. of Plant Pathology, Bhartiya college of Agriculture, Durg, Chhattisgarh
[4]Ph.D. Scholar, Dept. of Entomology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir
[5]Ph.D. Scholar, Dept. of Entomology, JNKVV, Jabalpur, Madhya Pradesh.

Corresponding Author
Jaimala Barwa
Gmail- barwajaya0905@gmail.com
Contact- 8224036263, 9770263257

The observation trial was conducted with rice cultivar Rajeshwari (R-1) grown under transplanted (TP) and direct-seeded (DS) conditions in the irrigated midland ecosystem at the Research Farm, College of Agriculture, IGKV, Raipur (C.G.), during *Kharif* 2023–2024. The population fluctuation of the rice sheath mite (*Steneotarsonemus spinki* Smiley) was monitored in both cultivation systems. Pooled observations indicated a gradual increase in mite populations from 36 to 47 SMW (Standard Meteorological Week), with peak densities of 14.5 mites/mm² in TP and 12.5 mites/mm² in DS. Early-season activity (SMW 36–40) was negligible due to high rainfall (56–175 mm) and elevated relative humidity (69–91%), whereas peak infestations occurred under lower minimum temperatures (15–18°C), moderate relative humidity (35–55%), minimal rainfall (0–1.25 mm), and extended sunshine hours (5–7 hr/day), suggesting that dry, cooler, and well-illuminated conditions favor mite proliferation. Transplanted rice consistently supported higher mite densities, highlighting the influence of cultivation practices on pest dynamics. Correlation analysis revealed strong negative associations of minimum temperature ($r = –0.759^{**}$ to $–0.738^{**}$) and evening relative humidity ($r = –0.804^{**}$ to $–0.814^{**}$) with mite populations, while rainfall and sunshine hours also exhibited significant negative correlations depending on the cultivation system. Maximum temperature and morning relative humidity had minimal influence. These findings underscore the pivotal role of climatic variables in regulating *S. spinki* populations and provide critical insights for predictive pest management and environmentally sustainable control strategies in rice agroecosystems.

Keywords: - *direct-seeded, Population dynamics, sheath mite, SMW (Standard Meteorological Week), Steneotarsonemus spinki Smiley, Transplanted.*

IHASE-2025/09

Growth Regulator-Mediated Enhancement of Natural Colourant Potential and Pigment Stability in Gomphrena (*Gomphrena globosa*)

Akshya A[1]*, K. Swarajya Lakshmi[2], M. Raja Naik[3], M. Jayaprada[4]
[1*] Ph.D Scholar, Department of Floriculture and Landscaping, TNAU, Coimbatore
[2]Professor, Department of Horticulture
[3] Professor, Department of Floriculture and Landscaping
[4]Associate Professor, Department of Floriculture and Landscaping
[2,3,4] Dr. Y. S. R. Horticultural University, College of Horticulture, Anantharajupeta, Andhra Pradesh, 516 105.
(*Corresponding author E-mail: akshyaarjun11@gmail.com)

An experiment was carried out in 2024 at the Floriculture Block, Dr. YSRHU – College of Horticulture, Anantharajupeta, Andhra Pradesh, to examine the influence of different growth regulators on the postharvest quality and biochemical composition of *Gomphrena* flowers. The study was designed in a Randomized Block Design (RBD) with treatments comprising GA_3, NAA, BA, Paclobutrazol, Cycocel, and an untreated control, all applied 30 days after transplanting. The objective was to assess their effects on shelf life, vase life, anthocyanin content, total phenolics, and sensory attributes of the flowers, along with the quality of lemon RTS (Ready-To-Serve) beverage fortified with *Gomphrena* flower extract. Among the treatments, foliar application of GA_3 at 200 ppm recorded the maximum shelf life (14.67 days) and vase life (19.74 days), indicating its effectiveness in delaying senescence and maintaining freshness. GA_3 also promoted the highest accumulation of anthocyanins (44.03 mg 100 g^{-1}) and phenolic compounds (2.79 mg 100 g^{-1}), contributing to enhanced colour intensity and antioxidant potential. Furthermore, GA_3 treatment maintained better anthocyanin stability in natural colour extracts stored at 4°C for 10 days. Sensory analysis of lemon RTS enriched with *Gomphrena* extract revealed that GA_3 @ 300 ppm (T_3) achieved the highest scores for colour, flavour, taste, and overall acceptability. Thus, GA_3 application proved most effective in improving the aesthetic, biochemical, and sensory qualities of Gomphrena flowers and their value-added products.

Key words: *GA_3, shelf life, vase life, anthocyanin and lemon RTS*

IHASE-2025/10

Enhancement of Knowledge and Livelihood Security through Adoption of Climate Resilient Technologies: a Comparative Assessment between NICRA and Non-NICRA Villages in Malda District of West Bengal.

Victor Sarkar*[1], Prabhat Kr Pal [2],Rakesh Roy[3], BC Rudra[4], Subhajit Chakraborty[5] & Adwaita Mondal[6]

[1,3,4 ,5,6,]Malda Krishi Vigyan Kendra, Ratua, Malda-732205

[2,5,] Department of Agricultural Extension, Pundibari, Coochbehar-736165

Uttar Banga Krishi Viswavidyalaya, West Bengal,

[*]Corresponding author email id: sarkar.victor53@gmail.com

The study evaluates the impact of climate-resilient agricultural interventions on the livelihood and knowledge levels of farmers in NICRA and non-NICRA villages of Malda district, West Bengal. The study was conducted in the command areas of Malda KVK under Uttar Banga Krishi Viswavidyalaya. The study compared one NICRA-adopted village (Ramayanpur) and one non-NICRA village (Paschim Rukundipur), with 100 respondents each selected randomly. Results revealed that farmers in NICRA villages demonstrated higher adoption of climate-smart technologies, better risk orientation, and improved income stability compared to their non-NICRA counterparts. Training participation and exposure to mass media significantly enhanced awareness and adoption of climate-resilient sustainable practices such as integrated farming systems, soil and water conservation measures, and use of weather-based advisories. The findings highlighted that NICRA interventions substantially strengthened adaptive capacity, productivity, and income security. However, non-NICRA villages still rely on traditional practices, facing constraints in institutional support and knowledge dissemination. The study concludes that scaling up NICRA-driven models through participatory extension, policy integration, and inter-village knowledge sharing could bridge the resilience gap and promote sustainable rural development.

Keywords: *Climate-resilient agriculture, NICRA, knowledge level, livelihood improvement, sustainable farming*

IHASE-2025/11

Empowering Communities through Food and Nutrition Extension Education

Madhulika Gautam
Professor Dayalbagh Educational Institute (Deemed to be University),
Dayalbagh, Agra-282005
Corresponding Author e-mail: madhulikagautam@dei.ac.in & 9411249552

Food and nutrition insecurity remain pressing global challenges, with over 2.4 billion people facing moderate to severe food insecurity and 45 million children under five suffering from wasting, while 148 million experience stunting due to chronic undernutrition (FAO, 2023; UNICEF, 2024). In India alone, 36% of children under five are stunted and 18.7% are wasted (NFHS-5, 2021), reflecting persistent gaps in nutrition education, dietary diversity, and access to safe, nutritious food. Despite advancements in agricultural productivity, the disconnect between food availability and nutrition utilization continues to undermine public health, particularly among women, children, and marginalized rural populations.

Food and nutrition extension education acts as a crucial conduit linking scientific knowledge with grassroots practices. Evidence from community-based interventions shows that nutrition-focused extension activities can improve dietary diversity scores by 25–40% and reduce micronutrient deficiencies when combined with women-led training and behavior change communication (FAO, 2022). Through participatory learning, farm-family nutrition schools, and ICT-enabled communication, extension programs empower households to adopt better meal planning, food hygiene, and sustainable food preparation using locally available, functional foods.

This subtheme underscores the need to strengthen community-driven nutrition education, integrate nutrition-sensitive agriculture into extension curricula, and enhance capacity building of extension professionals for impactful outreach. Embedding nutrition messages in agricultural, health, and social development initiatives can multiply impact, ensuring that communities not only grow food but also consume it wisely, safely, and sustainably. By empowering individuals—especially women and youth—with scientific understanding and life skills, extension education plays a transformative role in achieving SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being). Strengthening the interface between research, policy, and grassroots implementation will be key to transforming food security into true nutritional security for all.

Keywords: *Community-based interventions, Community empowerment, Extension education, Food and nutrition security, Sustainable development*

IHASE-2025/12

The Unseen Nexus: Integrating Animal Welfare into India's Sustainable Development Framework for a Truly Inclusive Green Transition

Chandan Kumar
Associate Professor, DUVASU Mathura (UP)

India's ambitious "green transition" marks a monumental shift toward sustainable development. Yet, prevailing strategies frequently overlook a vital element: the welfare of animals in production systems. This lecture contends that without the deliberate integration of animal welfare, India's sustainability objectives are inherently incomplete and potentially counterproductive. This presentation will illuminate the intricate nexus between animal welfare, environmental health, and socio-economic prosperity, revealing a critical gap in the current One Health dialogue. It will demonstrate how animal welfare directly strengthens key sustainable development pillars: Environmental Sustainability: By promoting efficient resource use, reducing pollution from waste, and enhancing biodiversity. Public Health Resilience: By combating antimicrobial resistance (AMR) through reduced prophylactic antibiotic use and lowering the risk of zoonotic disease outbreaks. Economic and Social Equity: By securing the livelihoods of smallholder farmers through improved animal productivity, higher product quality, and access to discerning markets. Moving beyond problem identification, the lecture will propose a concrete, actionable roadmap for policy integration. We will outline strategic approaches for embedding animal welfare principles into national agricultural, environmental, and public health policies, thereby weaving it into the very fabric of India's development agenda. In conclusion, recognizing animal welfare as a cornerstone of the One Health approach is not merely an ethical obligation but a strategic imperative for building a more resilient, healthy, and sustainable future for India.

Key words:- *Animal Welfare, One Health, Sustainable Development, Green Transition, Policy Integration*

IHASE-2025/13

Intensive Insight About an Adaption of Macronutrients and Ramification of Glucose metabolism

Anshita Bedi[1] and Yashwant Kumar Patel[2]
[1]Intern, Deptt. of FPT, UTD, ABVV, Bilaspur|, Chhattisgarh, |India
(Anshitaa6@gmail.com and |8827977221)
[2]Asstt. Prof. and HOD, Deptt. of FPT, UTD, ABVV, Bilaspur|, Chhattisgarh, |India

Intermittent fasting (IF) does not need an introduction, it has already gained the fame and become the popular among present generation, yet to define IF, we can say it is a period between feasting and fasting. To understand its dietary approach and process of using macronutrient in the body as a source of energy. When we are in our fasting window the glucose levels go down and body switched into fat to use as a source of fuel, it is basically known as metabolic switch. Over the following practice body starts burning fat more competently, which results in insulin sensitivity, which helps in maintaining glucose more effectively and also, it conserves protein which help in muscle maintenance in fewer calories or smaller meals. During Intermittent fasting the adaptation of macronutrient has a substantial way. During metabolic switch liver produce glucose through non carbohydrate source (lactate, amino-acid, gycerol) the process is called gluconeogenesis. In this process the fat breakdown and become successive energy source for brain and preserve muscles loss. This mechanism helps to improve mitochondrial efficacy and reduce oxidative stress. It helps to prevent the post meal sugar spike, which ultimately helps in reversing diabetes type 2 and insulin resistance. To Sum it up the right metabolic approach give flexibility to optimize nutrient based on its availability & improve Glucose regulation by lowering risk of obesity, diabetes and cardiovascular disease.

Keywords *– Macronutrients, Intermittent Fasting, Gluconeogenesis, Insulin Resistance and Metabolic Switch.*

IHASE-2025/14

Sustainable Pomegranate-Based Agri-Horti System for Saline land of Pali District, Rajasthan

Noor mohamed, M.B.[1*], A.K. Shukla[2], Keerthika, A.[3], Dipak Kumar Gupta[4], B.L. Jangid[5], R.S. Mehta[6] and P.L. Regar[7]

[1]Senior Scientist (Agroforestry), ICAR-Central Arid Zone Research Institute, Regional Research Station, Pali Marwar- 306401, Rajasthan (India)

[2]Principal Scientist (Horticulture), ICAR-Central Arid Zone Research Institute, Regional Research Station, Pali Marwar- 306401, Rajasthan (India)

[3]Senior Scientist (Agroforestry), ICAR-Central Research Institute for Dryland Agriculture Hyderabad- 500 059, Telangana (India)

[4]Senior Scientist (Environmental Sciences), ICAR-Indian Agricultural Research Institute, Hazaribagh- 825 405, Jharkhand (India)

[5]Principal Scientist (Agriculture Extension), ICAR-Agricultural Technology Application Research Institute, Jodhpur- 342 005, Rajasthan (India)

[6]Principal Scientist (Agronomy), ICAR-Central Arid Zone Research Institute, Regional Research Station, Jaisalmer- 345001, Rajasthan (India)

[7] Scientist (Senior Grade), ICAR-Central Arid Zone Research Institute, Regional Research Station, Pali Marwar- 306401, Rajasthan (India)

*Corresponding Author: Dr. M.B. Noor mohamed
Senior Scientist (Agroforestry)
ICAR-CAZRI, RRS, Pali Marwar
Email: mb.mohamed@gmail.com

Pomegranate (*Punica granatum*) is grown as the perennial fruit crop integrated with seasonal intercrops in the transitional plains of the Luni Basin, covering the districts of Jalore, Pali, and parts of Sirohi and Jodhpur in Rajasthan, represent a hot semi-arid agro-ecological region. This region characterized by harsh climatic conditions, saline-alkali soils, and poor-quality groundwater, leading to fragile agriculture and limited livelihood options. Among these, the Pali district is particularly affected by high soil salinity and water scarcity, making conventional agriculture both fragile and economically unviable for smallholder farmers. Pomegranate-based agri-horti farming system was developed to address these challenges and to enhance system productivity, optimize resource use and improve farm income. The Pomegranate variety Bhagwa planted at a spacing of 8m × 3m and the system integrated with seasonal intercrops with green gram, cluster bean and okra during kharif season and mustard, fenugreek and cabbage during rabi season. Pomegranate fruit production started with fourth year onwards. The pomegranate fruit yield recorded under the okra- cabbage system was 4402.32 kg ha-1. The Pomegranate + Okra- Cabbage

system is recommended for the maximum system productivity (23,099.2 kg/ha) and yield along with significant improvement in growth parameters compared to sole pomegranate (3662.2 kg/ha). The highest net economic return can be obtained from the Pomegranate + Okra- Cabbage system, with a benefit-cost ratio of 1.16 over the sole pomegranate (0.35). The land equivalent ratio was 1.77 in pomegranate + okra-cabbage system over the sole pomegranate (1.00). Additionally, soil fertility parameters also improved under intercropping, with higher NPK, pH (8.0), EC (0.30 dS/m), and organic carbon (7.19 g/kg) compared to the sole pomegranate cultivation indicating better adaptability to the saline-alkali conditions prevalent in Pali district. This pomegranate-based agri-horti system offers a sustainable and profitable farming approach, particularly beneficial for farmers and similar semi-arid regions compared to sole pomegranate cultivation under the saline and arid conditions of Rajasthan.

Keywords: *Pomegranate (Punica granatum), Agri-horti system, Saline-alkali soils, System productivity, Rajasthan*

IHASE-2025/15

Handheld Sensor–Based AWD Pipes for Quantifying Water Savings in Rice: Evidence from Farmer Fields in Punjab, India

Harleen Kaur, Sony Bora, Pragya Naithani and Dhananjay Kumar
Manav Vikas Sansthan, Kapurthala, Punjab, India
E-mail: harleenkaur@mvs.org.in

Rice, the principal kharif crop of Punjab, requires intensive irrigation, driving severe groundwater depletion. Alternate Wetting and Drying (AWD) offers a water-saving strategy, yet adoption remains limited due to the lack of precise, farmer-friendly tools for soil water monitoring. This study, under Project PRANA, evaluates Cultyvate's handheld sensor–based AWD pipes as a data-driven solution for quantifying water use efficiency in real farmer fields. A total of 3,400 AWD pipes were installed across Patiala (1,500), Sri Fatehgarh Sahib (1,000), Moga (500), Ludhiana (300), and Malerkotla (100), in fields planted with PAU-recommended short- and medium-duration rice varieties.

Each PVC pipe (~30 cm long) featured perforations in the lower 15–20 cm and centimeter-scale depth markings for visual monitoring of ponded water. The pipes were linked via QR codes to Cultyvate's mobile app, enabling field staff (Kisan Mitras) to measure water levels every two days using handheld sensors, with readings automatically uploaded for real-time visualization, irrigation advisories, and decision support. This standardized approach minimized subjective assessments and facilitated consistent monitoring across multiple locations.

Results showed that over 95% of pipes recorded three or more drying cycles per season, leading to 15–20% irrigation water savings without yield loss; in several cases, yields improved due to reduced disease incidence. Farmers also reported ₹1,000/acre reduction in pesticide costs, primarily from lower sheath blight and bacterial leaf blight incidence. The study demonstrates that Cultyvate handheld sensor–based AWD pipes are reliable, scalable, and farmer-compatible tools for promoting water-efficient, sustainable rice cultivation in Punjab.

Keywords: *Alternate Wetting and Drying (AWD), handheld sensors, Cultyvate, rice irrigation, water savings, sustainable agriculture, Punjab*

IHASE-2025/16

Digital Soil Mapping and Spatial Variability Analysis in the Shiwalik Hills of Jammu

Tamanna Sharma[1], Vikas Sharma[2], Vivak M. Arya[3] and Nikhil Thakur*[4]
[123]Division of Soil Science and Agriculture Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, India.
[4] Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, India.
Corresponding ID: tamanna.25011999@gmail.com

Digital mapping plays a vital role in understanding spatial variability and supporting sustainable land and resource management. The present study focuses on the digital mapping of Samba district in Jammu and Kashmir, employing advanced remote sensing (RS), geographic information system (GIS) and machine learning models to generate detailed spatial datasets for environmental analysis. High-resolution satellite imagery from multiple temporal datasets was processed to delineate land use/land cover (LULC), soil type, slope, drainage, elevation, and vegetation indices (NDVI). The integration of geospatial tools enabled precise interpretation of landscape dynamics and detection of land transformation trends over the past decade. Results revealed significant agricultural expansion, urbanisation, and deforestation in certain zones, altering the natural resource base and soil characteristics. Digital soil mapping indicated spatial variability in fertility status, pH, and organic carbon content, closely linked to topography and land use patterns. The study also highlighted the influence of anthropogenic pressures and climatic variations on land degradation processes. By integrating diverse spatial datasets, the mapping framework supports precision agriculture, watershed prioritisation, and sustainable land-use planning. These digital outputs serve as a baseline for policymakers and researchers to design region-specific management strategies that enhance productivity while conserving natural resources. Overall, the study demonstrates how digital mapping acts as a decision-support tool for monitoring environmental change and promoting resilient and sustainable development in the ecologically sensitive landscapes of Samba district, Jammu and Kashmir.

Keywords: *Digital, Degradation, Satellite, Urbanisation, Deforestation, Watershed.*

IHASE-2025/17

Evaluation of Flowering Behavior in Different Strawberry (*Fragaria* × *ananassa* Duch.) Cultivars under Three Agro-Climatic Zones of Jammu Division

Robin Kumar
Division of Fruit Science, SKUAST-J, Chatha, Jammu and Kashmir, India, 180009
Contact detail: Robinkamboj771@gmail.com, 9729834660
Corresponding Author- Robin Kumar

The present investigation was conducted during 2024–2025 to assess the flowering behavior of twelve strawberry (*Fragaria* × *ananassa* Duch.) cultivars under open field conditions across three agro-climatic zones of Jammu Division. The experiment was laid out in a Randomized Block Design with three replications, maintaining uniform cultural practices as recommended in the Package of Practices for Fruit Crops by SKUAST-Jammu. Each plot measured 1.5 m × 1.8 m with a planting spacing of 30 cm × 45 cm, accommodating twenty runners per plot. The treatments comprised twelve strawberry cultivars: Winter Dawn (A1), Camarosa (A2), Nabila (A3), Capri (A4), San Andreas (A5), Aliana (A6), Flavia (A7), Flaminia (A8), Brilliance (A9), Florida Beauty (A10), R1 (Aprica) (A11), and Chandler (A12). Observations were recorded on flowering parameters such as days to first flowering, days to full bloom, number of primary, secondary, and tertiary flowers, and total number of flowers per plant. Significant differences were observed among cultivars for all parameters. The cultivar 'Nabila' (A3) exhibited superior flowering performance, characterized by early flowering, a shorter duration to full bloom, and a maximum number of flowers, indicating its adaptability and potential for high productivity under Jammu conditions. In contrast, 'Flavia' (A7) recorded the least flowering response across all parameters. The study highlights the varietal influence on floral development and identifies 'Nabila' as a promising cultivar for commercial cultivation in the diverse agro-climatic zones of Jammu Division.

Keywords*: Strawberry, Flowering behavior, Nabila, Flavia, Jammu, Agro-climatic zones, Randomized Block Design.*

IHASE-2025/18

Fungi Fortune: Oyster Mushroom Cultivation Driving Rural Development in Gujarat, India

Dr. B. M. Vahunia [1], Dr. P. P. Javiya[2] and Dr. S. A. Patel[3]
Krushi Vigyan Kendra, Navsari Agricultural University,
Navsari, Gujarat, India (394730)
Email ID – bipinmv94@nau.in
Mobile No. 8141802632

In many nations nowadays, mushroom cultivation is practiced and the amount of mushrooms produced is rising. In Gujarat, amongst all the edible mushrooms, especially cultivation of oyster mushroom (*Plurotus* spp) has increased tremendously because of their abilities to grow at a wide range of temperature and utilizing various agro-based residues and easy availability of the raw materials. In order to educate farmers about the potential of mushroom cultivation in job creation, KVK, N.A.U., Dang (Gujarat), has undertaken Front Line Demonstration (FLD) activities. The oyster mushroom crop was collected as part of the demonstration programmes in four flushes from 15 bags packed with 5 kg of spawn; the highest yield of nearly 65 kg was reported in the month of December, followed by 60 kg in the month of January. The month of April saw the lowest yield, with 37 kg. The results of the economic analysis of oyster mushroom production showed that, with a B:C ratio of 3.8, farmers were able to achieve the highest net income of Rs. 6300 per unit (5 kg of spawn in 1 mushroom unit). Accordingly, a small farmer who invested Rs. 1300 in a single unit would receive between Rs. 6000 to Rs. 6500 back.

Keywords: *FLD, Mushroom, Oyster, Plurotus, Yield*

IHASE-2025/19

On-Farm crop response to plant nutrients in rice-wheat cropping system and their impact on crop-livestock-human continuum

A.K. Mehta,[1] And Chitralekha[2]
[1]Department of Agronomy, Cotton Research Station, Sirsa, Haryana, India
[2]Department of Entomology, Cotton Research Station, Sirsa, Haryana, India
Corresponding author Email: akmehta66@gmail.com

An experiment was conducted at farmer's field in villages of district Fatehabad. To assess the response of major crops to nutrients in predominant cropping systems in different agro- ecosystem and to estimate the impact of nutrient deficiency on crop-livestock-human continuum during *Kharif* 21-22. A total of seven treatments were taken *i.e.* T_1: Control, T_2: Nitrogen (N), T_3: Nitrogen (N) + Phosphorus (P), Nitrogen (N) + Phosphorus (P), T_4: Nitrogen (N) + Potassium (K), T_5: Nitrogen (N) + Phosphorus (P) + Potassium (K), T_6: Nitrogen (N) + Phosphorus (P) + Potassium (K) + Zinc (Zn) and T_7: Farmer's Practice. The mean data of 24 farmers in Rattia and Bhattu blocks of Fatehabad district indicate that in paddy crop, the seed yield was the lowest (1980 kg ha^{-1}) in control plot (T_1) where no fertilizer was applied. Grain yield was found to be increased with the application of 150 kg N ha^{-1} or its combinations with P (60Kg/ha), K (60Kg/ha) or both. The treatment T_6 **(**recommended dose of N, P, K and Zn for crop component in the crop sequence) gave highest yield (5129 kg ha^{-1}) which shows the significant response of zinc sulphate (25 kg ha^{-1}) application. The net return of the system based on one-year study was highest in T_6 (Rs. 121992 ha^{-1}) followed by T_5 (Rs. 112392 ha^{-1}). The lowest net returns were registered in control plot (Rs. 24106 ha^{-1}). Benefit cost ratio was highest (1.93) with T_6 followed by T_5 (1.87), T_3 (1.82), T_4 (1.77), T_2 (1.75), T_7 (1.65) and the lowest with T_1 (0. 0.50).

Keywords- *Paddy, Nutrients, Yield*

IHASE-2025/20

Performance evaluation of new technology through frontline demonstrations on pigeon pea in Dang district, Gujarat

PP Javiya*, JB Dobariya, BM Vahunia, GB Padsala, SA Patel and JH Lalvani
Krishi Vigyan Kendra, Navsari Agricultural University, Waghai, Dang (Gujarat) - 394730
* E-mail: drppjaviya@nau.in

In most areas of Dang, pigeon pea is traditionally grown under rainfed conditions without the use of improved varieties or recommended cultivation practices. To address this, the Krishi Vigyan Kendra (KVK), Navsari Agricultural University, Dang, conducted 76 Front Line Demonstrations (FLDs) with the objective of showcasing the production potential of the improved pigeon pea variety GT 105 during the kharif seasons from 2022 to 2024**.** The demonstrated variety, GT 105, consistently outperformed the local farmer practices in all the years across various KVK schemes. The results of the FLDs showed that the average seed yield under improved technology was 13.54 q/ha, which was significantly higher than the 10.5 q/ha recorded under traditional farmer practices. Moreover, the FLD plots also recorded higher gross returns**,** net returns and benefit-cost ratios compared to the farmers' practice plots. On average, the technology gap**,** extension gap and technology index were calculated to be 6.46 q/ha**,** 3.04 q/ha and 32.3%**,** respectively. Notably, in each year, the extension gap was lower than the technology gap, highlighting the need for continued farmer education and support in adopting improved technologies. To further bridge the productivity gap in pigeon pea cultivation in the region, it is recommended that location-specific strategies be developed and implemented.

IHASE-2025/21

Pesticidal Potential of Malakavalactone, Sumadain A, and Calyxin H Isolated from *Alpinia malaccensis* Fruits

Sonu Kumar Mahawer[1,2*], Ravendra kumar[2], Dharmendra Singh Rawat[2]

[1]ICAR-Indian Grassland and Fodder Research Institute, Jhansi- 284003, Uttar Pradesh, India

[2]Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand 263145, India

*Email corresponding author: sonummahawer@gmail.com

Alpinia malaccensis is known for its rich secondary metabolites with diverse biological properties. The present study aimed to isolate and characterize bioactive constituents from its fruit extract and evaluate their nematicidal, phytotoxic, and insect antifeedant activities. The acetone extract of *A. malaccensis* fruits was subjected to column chromatography, yielding seven compounds identified using HRMS, FTIR, ^{1}H NMR, ^{13}C NMR, and DEPT-135 techniques. Among them, malakavalactone, Sumadain A, and calyxin H were selected for biological evaluation. Their nematicidal efficacy was tested against root knot nematode at different concentrations (250–1000 µg/mL), while phytotoxicity was assessed against chicory (*Cichorium intybus*) seeds. Insecticidal activity was evaluated against *Spodoptera litura*. The results showed that Malakavalactone exhibited the strongest nematicidal activity (100% mortality within 48 h) and complete egg hatching inhibition (100%) at 1000 µg/mL, with the lowest LC_{50} (0.008 µg/mL). Sumadain A and calyxin H also showed significant nematicidal effects (LC_{50} 1.551 and 17.200 µg/mL). In the phytotoxicity bioassay, malakavalactone inhibited seed germination (98%), root (98.82%), and shoot (96.74%) growth, matching the efficacy of pendimethalin. All three compounds showed strong insecticidal activity against *S. litura*, with malakavalactone showing 96.47% FDI. Overall, malakavalactone emerged as the most potent bioactive agent among the isolates. The findings highlight the potential of these compounds as eco-friendly leads for developing natural nematicides, bioherbicides, and insect deterrents, warranting further studies on their mechanisms of action and formulation development for field application.

Keywords: *Alpania malaccensis, isolated compounds, root knot nematode, phytotoxicity, insecticidal activity*

IHASE-2025/22

Detection of Finger Millet Blast Disease in Dang District using Artificial Intelligence

Vimal B. Patel[1], Bipin M.Vahunia[2]
[1]College of Agriculture, NAU, Waghai,
Dangs, Gujarat, India
vim_patel84@nau.in, 9558716885
[2]Krushi Vigyan Kendra, NAU, Waghai,
Dangs, Gujarat, India
bipinmv94@nau.in, 8141802632

In eastern Gujarat, the hilly, tribal-dominated Dangs district is renowned for its distinctive agro-ecological conditions and traditional organic farming methods. In Dangs, finger millet is a climate-resilient significant crop that is very crucial to the farmers. Blast is the example of fungal disease that drastically lower crop productivity and endanger local food security. This study employs an Artificial Intelligence (AI) approach to create a model for the precise and early detection of prevalent finger millet diseases through leaf images collected from diverse fields in the Dangs district. The goal of the model is to detect the blast disease using the leaf images dataset. The proposed model consists of a data collection approach, image preprocessing techniques, model development utilizing advanced Convolutional Neural Networks (CNNs) and assessment employing standard metrics (accuracy, recall, precision, and F1-score). This study focuses on the integration of AI model with Dangs natural farming philosophy to reduce crop losses and support early detection and effective disease management.

Keywords: *Artificial Intelligence, finger millet, blast, convolutional neural networks, plant disease detection*

IHASE-2025/23

Effect of dietary supplementation of mineral mixture on milk yield in milch animals in dang district of Gujarat

Dr. Sagar A. Patel, Dr. Pratik P. Javiya, Dr. Bipin M. Vahunia, Dr. J.B. Dobariya, Mr. H.A. Prajapati, Mr. G.B. Padsala and Dr. J.H. Lalwani
Krishi Vigyan Kendra, Navsari Agricultural University, Waghai, Dangs-394730
Contact details- drsagarpatel10@nau.in , 9429973242

Minerals though required in very minute quantity, hold potential to bring about remarkable changes in animal productivity. The present Frontline demonstration was aimed to study the impact of Mineral mixture supplement, on milk yield of crossbred dairy cattle in Dang district, Gujarat. A total of 30 crossbred cows in their good lactation phases were selected for the experiment in different villages under Front Line Demonstration programme of Krishi Vigyan Kendra, N.A.U., Dang. A sample size of 30 milch animals with average daily yield of 7.2 liters was selected for lying the demonstration. Result indicated that the overall average percent increase in milk production was 16.67 % after demonstration than the milk production before the demonstration during the year 2024. Result also revealed that the Average milk production (Liter) per day/animal before demonstration 7.2 liter per day/animal while after demonstration it varied from 8.4 liter per day/animal during year 2024. The mineral mixture supplementation over a period of 120 days increased milk production on an average by 1.2 (16.67 %) liters per day, fetching an additional income of 900 Indian rupees per month per animal to the farmer. It is also inferred that the demonstrated technology on use of mineral mixture in milch animal ration gave higher gross return, net return with higher additional benefit cost ratio as compared to farmer's practices (no use of mineral mixture in animal ration). The higher additional BC ratio indicated that the use of mineral mixture in animal ration technology is highly profitable. The results indicate that dietary supplementation of mineral mixture enhance the milk production of dairy animals and help in improving the socio-economic condition of the farmers to some extent.

Key words: *Mineral Mixture, Frontline demonstration, Milk yield*

IHASE-2025/24

Employing Genome Wide Association Studies for identification of genomic regions for micronutrient content in rice (*Oryza sativa* L.) germplasm lines

Madhuri M[1], Nandan Mehta[2], Abdul Fiyaz R[3*]

[1]Ph.D Scholar, Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G-492012, mmadhuri0574@gmail.com, 8555803857

[2]Principal Scientist, Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G-492012, mehta.igkv@gmail.com, 7987836041

[3*]Senior Scientist, Indian Institute of Rice Research, Hyderabad, Telangana-500030. genefiyaz@gmail.com, 9990975934

The study titled "Employing Genome Wide Association Studies for identification of genomic regions for micronutrient content in rice (*Oryza sativa* L.) germplasm lines" was conducted over four seasons of *kharif* 2021, 2022 and *rabi* 2022, 2023 at Indian Institute of Rice Research, Rajendranagar, Hyderabad. 183 genotypes were accommodated in augmented design with three replications and five checks. Iron and zinc content in hulled rice grains were estimated using ED-XRF (Energy Dispersive X-Ray Fluorescence) technique. Most of the genotypes were exhibited low to moderate amount of iron and zinc content in rice grains over four seasons. Analysis of variance revealed significant variation for both the traits with strong genetic advance and high heritability indicating selection for these traits would be effective. Genotyping of 183 germplasm accessions for identification of genomic regions related to iron and zinc content with 230 SSR markers revealed 47 significant marker trait associations. 25 polymorphic markers for 12 chromosomes were found. The markers identified throughout this investigation can be utilized in marker aided selection of individual genotypes or progeny with desired trait of interest.

Keywords: *Iron; zinc; check; genotype; trait*

IHASE-2025/25

Employing Genome Wide Association Studies for identification of genomic regions for micronutrient content in rice (*Oryza sativa* L.) germplasm lines

Madhuri M[1], Nandan Mehta[2], Abdul Fiyaz R[3*]

[1]Ph.D Scholar, Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G-492012,
mmadhuri0574@gmail.com, 8555803857

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Keywords: *Iron; zinc; check; genotype; trait*

IHASE-2025/26

Robotics and Automation in Vegetable Production

Pradip Kumar[1] and Jabborov Muzafar Pushkinovich[2]
[1-2]Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir 190025, (India).
Email: pradipverma.banda@gmail.com

Agriculture is the largest contributor in India, with an 18% gross domestic product involving approximately 57% of people in rural areas. Over the years, although India's total agronomic output has increased, the number of growers has fallen from 71.9% in 1951 to 45.1% in 2011. The Economic Survey 2018 revealed that the number of agricultural workers in the total workforce will drop to 25.7% in 2050. In rural areas, farming families gradually lose the next generation of farmers, overwhelmed by higher costs of cultivation, low per capita productivity, inadequate soil maintenance, and migrations to a non-farming or higher remunerative occupation. Presently, the world is on the verge of a digital revolution, and so it is the appropriate time to connect the agricultural landform with wireless technology, robotics to introduce and accommodate digital connectivity with farmers. A revolutionary step toward precision-based, efficient, and sustainable agriculture is the incorporation of robots and automation into the production of vegetables. To increase production and decrease reliance on manual labor, advanced robotic systems are being used more for operations including planting, weeding, irrigation, crop monitoring, and harvesting. Automation technologies coupled with artificial intelligence, machine vision, and sensor networks enable real-time decision-making and precision crop management, decreasing input waste and enhancing yield quality. Drones and autonomous field robots enable site-specific management techniques by enabling ongoing monitoring of crop health, pest occurrence, and nutritional status. Additionally, robotic harvesters are being created to precisely handle fragile crops, preserving product quality and lowering post-harvest losses. These innovations contribute to lowering production costs, optimizing resource utilization, and addressing labor shortages in the agricultural sector. However, challenges such as high implementation costs, technological adaptability to varying field conditions, and the need for farmer training remain. Continued research and development are crucial for the widespread adoption of robotics and automation in vegetable production systems.

Keywords: *Robotics, Automation, Precision Agriculture, Vegetable Production, Sustainability.*

IHASE-2025/27

Effect of Nano-urea on growth and yield attributes of tomato (*Solanum lycopersicum* L.)

Kuldeep Kumar[1], Vikram[1], Vikas[1], Davinder[1], Indu Arora[1], Prince[2], Kishor Chand Kumhar[3] and Rajender Kumar[4]

[1]Dept. of Vegetable Science, CCS Haryana Agricultural University, Hisar-125004

[2] Dept. of Horticulture, CCS Haryana Agricultural University, Hisar-125004

[3] Deendyal Upadhyay Centre of Excellence for Organic Farming, CCS HAU, Hisar-125004

[4] Dept. of Basic Engineering, COAE&T, CCS HAU, Hisar-125004

*Corresponding author: drkuldeep82@gmail.com

Mobile No.: 7988824872, 9466334091

Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable crops grown worldwide, valued for its nutritional, economic, and industrial significance. It is a rich source of vitamins A and C, minerals, antioxidants like lycopene, and is widely consumed both fresh and in processed forms. Enhancing the yield and quality of tomato while minimizing use of chemical fertilizer is essential for sustainable production. Therefore, a field experiment was conducted at Research farm of the Department of Vegetable Science, CCS HAU, Hisar (Haryana) during *rabi* season of 2024–25 to evaluate the effect of nano urea on the growth and yield of tomato cv. Hisar Arun (Selection-7). The study was laid out in a Randomized Block Design with ten treatments and three replications, sown on 15th December with a spacing of 60 cm × 45 cm. Treatments involved different nitrogen levels (100%, 75%, 50%, and 0% RDN) along with foliar applications of nano urea (4 ml/litre of water) at 30 and/or 50 days after transplanting (DAT). Results indicated that T3 (100% RDN + two sprays of nano urea at 30 and 50 DAT) recorded the maximum fruit yield (301.48 q/ha), which was statistically at par with T6 (75% RDN + two sprays of nano urea at 30 and 50 DAT), yielding 293.44 q/ha. The lowest yield (204.09 q/ha) was observed in T10 (no nitrogen). The findings suggest that the combined application of nano urea with either full or reduced nitrogen levels significantly improves tomato yield, offering a sustainable strategy for enhancing nitrogen use efficiency while reducing dependency on conventional fertilizers.

Keywords: *Tomato, Nano urea, Yield, Nitrogen use efficiency*

IHASE-2025/28

Effect of Nano-urea on growth and yield attributes of tomato (*Solanum lycopersicum* L.)

Kuldeep Kumar[1], Vikram[1], Vikas[1], Davinder[1], Indu Arora[1], Prince[2], Kishor Chand Kumhar[3] and Rajender Kumar[4]

[1]Dept. of Vegetable Science, CCS Haryana Agricultural University, Hisar-125004
[2]Dept. of Horticulture, CCS Haryana Agricultural University, Hisar-125004
[3]Deendyal Upadhyay Centre of Excellence for Organic Farming, CCS HAU, Hisar-125004
[4]Dept. of Basic Engineering, COAE&T, CCS HAU, Hisar-125004
*Corresponding author: drkuldeep82@gmail.com
Mobile No.: 7988824872, 9466334091

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Keywords: *Tomato, Nano urea, Yield, Nitrogen use efficiency*

IHASE-2025/29

Fabrication and characterization of natural textile material as an implantable medical device

Rudra Narayan Saha*, Manas Datta Roy, Subrata Ghosh
Department of Textile Technology, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, Punjab-144008
*Presenting author Email: rudrans.tt.22@nitj.ac.in/ rudenarayansaha37469@gmail.com
Phone no- 8420893207

The development of biomaterials with hydrophobic and antibacterial properties is of great importance in fields such as wound healing, implantable devices, and technical textiles. In this study, a hydrophobic silk braid with antibacterial capability was fabricated using a combination of silica sol–gel, chitosan, and hydrolysed hexadecyltrimethoxysilane (HDTMS). Silica sol was synthesized through the hydrolysis and condensation of tetraethoxysilane under alkaline conditions and applied to the silk braid surface. To impart antibacterial functionality, chitosan was coated onto the silica-modified braid prior to hydrophobization, which was achieved through the subsequent deposition of hydrolysed HDTMS. The hydrophobicity of the treated braid was evaluated by water contact angle measurements, while antibacterial activity was tested against bacterial strains using the AATCC-147 protocol. The durability of the coating was further assessed in aqueous media (7.4), simulating realistic biomedical environments. To examine the influence of surface modification on liquid transportation, the wicking behavior of both untreated and treated braids was compared. Structural and chemical changes of the modified braid were characterized using scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR). The results confirm that the modified silk braid exhibits durable hydrophobicity along with effective antibacterial properties, suggesting its potential for biomedical sutures and advanced technical textile applications.

Keywords: *Silk, hydrophobic, antibacterial, silica sol, chitosan*

IHASE-2025/30

Towards Sustainable Biocontrol: Utilizing Vanya Silkworm Eggs for *Trichogramma* Multiplication

Kritika Sharma
PhD scholar, Division of Sericulture, Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu, Chatha, India -180009
Corresponding author email: ks4722892@gmail.com

Theme 1: Horticulture and Agriculture for Sustainable Development, Precision Agriculture, Smart Farming, Sustainable Environmental Management, Food Security, Nutrition, Digital Agriculture and Agri-Tech Solutions
Subtheme: Horticultural, Sericulture, Entomology and Agricultural Practices

The success of *Trichogramma* mass rearing largely depends on the quality, availability, and physiological suitability of host eggs under varying environmental and operational conditions. This study explores the comparative suitability of eggs from the Vanya silkworm (*Philosamia ricini*) and the rice moth (*Corcyra cephalonica*) for the development and performance of *Trichogramma embryophagum* under controlled laboratory conditions. Various biological parameters, including parasitization efficiency, adult emergence, female progeny percentage, and adult longevity, were assessed across multiple egg age groups. The results revealed that while freshly laid *Corcyra* eggs supported high initial parasitism, their suitability declined sharply with egg age. In contrast, *P. ricini* eggs sustained high parasitization and emergence rates even at later stages of egg maturity, demonstrating superior host quality and prolonged usability. Furthermore, parasitoids reared on *P. ricini* exhibited enhanced female emergence, longer adult lifespan, and greater host-searching ability in subsequent generations, indicating stronger biological vigor and reproductive competence. Females emerging from *P. ricini* eggs also showed improved host discrimination and adaptability across different host species, reinforcing their potential for consistent field performance. The use of *P. ricini* eggs thus presents a sustainable and efficient alternative to traditional grain moth hosts, reducing dependence on cereal-based rearing systems. Integrating *Trichogramma* production with sericulture not only enhances the efficiency of biocontrol programs but also supports rural livelihoods by promoting eco-friendly, decentralized, and year-round production systems in sustainable agriculture.

Keywords: *Trichogramma, Philosamia ricini, biological control, sustainable sericulture, host suitability*

IHASE-2025/31

Utilization of Institutional and Avenue Waste as a Sustainable Rooting Medium for the Propagation of Select Horticultural Species

Justin R Nayagam[1]
Department of Botany, Union Christian College (Autonomous), Aluva-2, Kerala, India. 683102
Email: justinr@uccollege.edu.in Ph: +91 9446207353

This study explores the development and efficacy of a sustainable rooting medium utilizing organic waste materials for the vegetative propagation of selected ornamental horticultural species. The organic constituents included tea waste from the Union Christian College canteen, fermented coconut husk, and powdered, fermented avenue litter. These materials were combined and applied as a soil additive in the rooting and growing medium for stem cuttings of seven species: *Aralia*, *Excoecaria*, *Dracaena*, *Euphorbia myrtifolia*, Zee-Zee plant (*Zamioculcas zamiifolia*), *Sansevieria*, and *Duranta*. Cuttings measuring 15–25 cm were planted in polybags and root-trainers under controlled nursery conditions.

To evaluate the effect of rooting hormones, a 100 ppm concentration of Indole-3-butyric acid (IBA) was applied in treatment groups alongside untreated controls. The rooting performance was monitored across different seasons, with experimental trials conducted in three distinct periods: December–February, March–April, and August–September, during the years 2021 to 2025.

Results indicated that the organic waste-based rooting medium supported high rooting efficiency, ranging from 70% to 100% depending on the species and season. The highest rooting success was consistently observed during the December to February period, suggesting a significant influence of seasonal temperature and humidity conditions on root initiation and establishment. Cuttings treated with IBA generally showed improved rooting percentages and root quality compared to the control, although the organic medium itself exhibited strong baseline efficacy.

The study concludes that repurposing institutional and avenue-derived organic waste into a rooting medium presents a viable, low-cost, and eco-friendly alternative to conventional substrates. This approach holds promise for sustainable nursery practices and waste management in educational and urban settings. Further research could explore nutrient profiling, microbial composition, and long-term plant performance post-transplant.

Key Words: *Organic waste recycling, Vegetative propagation, Rooting medium, IBA (Indole-3-butyric acid) Sustainable horticulture*

IHASE-2025/32

Application of Machine Learning Techniques for Forecasting Black pepper Prices in India and Enhancing Farmers' Income

Shripad Bhat[1] & Govind V. Parab[2]
[1]ICAR-Central Coastal Agricultural Research Institute, Goa
Goa College of Agriculture, Ela, Old Goa
shripadsmail@gmail.com

Accurate price forecasting of agricultural commodities is vital for undertaking informed marketing decisions and enhancing farmers' income. To forecast the prices of black pepper, from the Cochin market, a representative market for India, monthly prices were collected from April 1997 to February 2025 spanning 335 observations. Using the *forecast* package in R, *auto.arima* function was employed to identify the best performing model automatically. The *auto.arima* function uses a step-wise algorithm for foresting minimising Akaike's Information Criterion (AIC). Among the several competing models, the Seasonal Autoregressive Integrated Moving Average (SARIMA) model with the specification ARIMA(2,0,1)(2,1,0)[12] demonstrated the best performance by effectively capturing the complex patterns in black pepper prices. The forecasts from SARIMA model indicated that a likely short-term price increase over the next six months, providing valuable insights for marketing decisions. The results of this forecasted model were disseminated to around 300 black pepper farmers of Goa in March 2025, enabling them to make informed selling decisions. The actual prices of black pepper rose from ₹640 to ₹706 per kg between March and May 2025. The adoption of forecast-based marketing strategy led to an additional income of around ₹8,50,400 for black pepper farmers. These results demonstrate the effectiveness of machine learning–driven time series models in agricultural price forecasting and highlights their potential to improve farmers' income through data-informed decision-making.

Key words: *Price Forecasting; Black Pepper; Machine Learning; SARIMA Model; Farmers' Income.*

IHASE-2025/33

Targeting the Tumor Microenvironment in Liver Cancer Using an Indole Alkaloid Isolated from *Leptadenia pyrotechnica*: Evidence from *In vitro* and *In vivo* Studies

Divya Kumari[a] and Pracheta Janmeda[a]*

Affiliation: [a]Department of Bioscience and Biotechnology, Banasthali University, Tonk 304022, Rajasthan, India.

Contact details: [a]First author' email address: divyakumari4193@gmail.com; 9135092326; [a]*Corresponding author' email address: pracheta@banasthali.in; 9352381260

Hepatocellular carcinoma (HCC) remains one of the most lethal malignancies worldwide due to its high recurrence, metastasis, and resistance to conventional therapies. The tumor microenvironment (TME), characterized by oxidative stress, chronic inflammation, and immune evasion, plays a pivotal role in liver cancer progression. Plant-derived alkaloids, with their structural diversity and multi-targeted properties, have emerged as potential anticancer agents, yet their efficacy against HCC in both cellular and animal models remain underexplored. The present study evaluated the anticancer efficacy of selected natural alkaloids against liver cancer through *in vitro* assays (MTT cell viability, DAPI nuclear staining, and Comet assay for DNA damage in HepG2 cells) and *in vivo* experiments in Swiss albino mice. *In vivo* assessments included hematological and biochemical profiling, oxidative stress biomarkers, histopathological evaluation, and immunohistochemistry of tumor tissues. *In vitro*, alkaloid treatment significantly reduced HepG2 cell viability, induced apoptosis as confirmed by DAPI staining, and triggered DNA fragmentation as demonstrated by the Comet assay. *In vivo*, alkaloid administration improved hematological and biochemical parameters, restored oxidative balance by enhancing antioxidant enzyme activities (SOD, CAT, GSH), and reduced lipid peroxidation (MDA). Histological analysis revealed decreased tumor burden and improved liver architecture, while immunohistochemistry demonstrated downregulation of pro-tumorigenic and angiogenic markers. This study provides compelling evidence that natural alkaloids exert multi-modal anticancer effects against HCC by suppressing proliferation, inducing apoptosis, modulating oxidative stress, and remodeling the tumor microenvironment. These findings support alkaloids as promising candidates for further development as adjunctive or primary therapeutic agents in liver cancer management.

Keywords: *Anticancer activity, Apoptosis, Hepatocellular carcinoma, Hepatoprotective agents, Immunohistochemistry, Indole alkaloids, Leptadenia pyrotechnica, Oxidative stress, Tumor microenvironment*

IHASE-2025/34

Solubility Enhancement Of A Poorly Water Soluble Drug By Using Solid Dispersion: Formulation Development

B.NAGARANI[*1] ,Dr Manjunath S.Y[2], Dr.G.V.RADHA[3.]

[1 & 2.]Department of Pharmaceutics,srikrupa institute of pharmaceutical sciences,velikatta,siddipet,telangana-502277.

[3.]Department of Pharmaceutics,Gitam School of Pharmacy,Visakhapatnam,Andhra Pradesh.

The main objective of the present work is to enhance the solubility for naturally isolated Mangiferin and develop the orally administering formulation. Mangiferin which is a xanthone compound present in high quantity in mango leaves and is endow to have anti diabetic activity along with other pharmacological activities. Mangiferin is a BCS class-IV drug which is having poor solubility and permeability. So it is necessary to enhance the solubility of mangiferin and develop suitable dosage form. The solubility of Mangiferin was enhanced by preparing solid dispersion by using kneading method and physical mixture method. To prepare the solid dispersion of mangiferin various excipients like cross povidone (CP),sodium starch glycolate(SSG),Beta cyclodextrin and lecithin in different ratios of Drug: carrier (1:1,1:2,1:3,1:4 and 1:5) were used. Solid dispersions were prepared by different methods like physical mixture method, Kneading method and Solvent evaporation method.

Finally the dosage formulation was developed for mangiferin,in this Osmotic drug delivery system(single layer and bilayer tablets) and sustained release matrix tablets were prepared and compared. For osmotic drug delivery system polymers like POLYOX-N-80, WSR-308, OPADRY CA and for sustained release HPMC K-100,HPMC K4M,Protanalal were used. Prepared formulations were evaluated for precompression and post compression parameters.The Mangiferin obtained from both methods was shown same properties and the yield was similar.. From the optimized batch (F2) the drug release was found maximum and to follow zero order kinetics with regression co-efficient of 0.9996. The stability study revealed that the optimized batch which was subjected to accelerated stability study shows no significant changes and confirms the stability of formulations.

Keywords: *Solubility,Mangiferin,solid dispersion,Kneading method and Osmotic drug delivery system.*

IHASE-2025/35

Differential Responses of Urease and Alkaline Phosphatase Activities across Intensive Cropping Systems of Palwal, Haryana

Preeti*, Sunita Sheoran₹ and Dhram Prakash
Department of Soil Science, CCS Haryana Agricultural University,
Hisar-125004, Haryana, India
*Email: pritisaini864@gmail.com, *Contact number: 9306097445
₹Corresponding Author E-mail: sheoransunita27@gmail.com

Soil enzymes catalyze fundamental biochemical reactions governing nutrient transformation and availability in agricultural ecosystems, serving as sensitive indicators of soil health and biological functioning. Intensive cropping systems alter microbial communities, organic matter dynamics, and substrate availability, consequently modifying enzymatic activities that regulate nitrogen and phosphorus cycles. Understanding these enzyme-cropping system relationships provides critical insights for developing sustainable nutrient management strategies in intensive agriculture. This investigation examined urease activity (UA) and alkaline phosphatase activity (APA) dynamics across five predominant cropping systems in Palwal district: cotton-wheat (CWCS), rice-wheat (RWCS), pearl millet-wheat (PMCS), pigeon pea-wheat (PWCS) and sugarcane-sugarcane (SSCS). Urease, responsible for hydrolyzing urea-containing fertilizers into CO_2 and NH_3, recorded maximum mean UA (42.71 µg NH_4^+-N g^{-1} h^{-1}) in soils under CWCS, exceeding RWCS by 26.32%, attributed to enhanced microbial decomposition of nitrogen-rich cotton residues and nitrogenous compound secretion through root exudates. Conversely, alkaline phosphatase, catalyzing organic phosphorus mineralization into plant-available forms, demonstrated significantly elevated mean APA (337.01 µg PNP g^{-1} soil h^{-1}) under RWCS compared to CWCS, exhibiting 42.62% higher activity. Superior APA in RWCS correlated with greater soil organic carbon and microbial biomass carbon accumulation, stimulating extracellular phosphatase enzyme synthesis. These contrasting enzymatic patterns reveal distinct nutrient transformation mechanisms, with CWCS favoring urease-mediated nitrogen cycling while RWCS promoted phosphatase-driven phosphorus mobilization. Results underscore the necessity for implementing crop-specific nutrient management strategies accounting for inherent enzymatic capabilities of different production systems to optimize soil biological functions, enhance nutrient use efficiency, and sustain agricultural productivity in intensive cropping landscapes.

Keywords: *Urease activity, alkaline phosphatase, soil enzymes, microbial activity, biochemical indicators*

IHASE-2025/36

Physicochemical Characterization of Smoke-Derived Microplastics and Their Differential Effects on Human Lung Adenocarcinoma and Normal Lung Cells

Nivedita Jha[1], Megha Prashanth[1], Sivachandran R[2] & Dr. Anitha T.S[1*]
[1]Department of Biochemistry and Molecular Biology, Pondicherry University, Puducherry, India
[2]Department of Zoology, RKM Vivekananda College, Mylapore, Chennai 600 004, India
[*]Corresponding Author: Assistant Professor, Department of Biochemistry and Molecular Biology, Pondicherry University (A Central University), Puducherry 605014, India
Email: tsanitha6@pondiuni.ac.in; Ph No.: 9843576675

Background: Open burning of polypropylene (PP) waste releases airborne microplastics (MPs) and toxic byproducts, posing significant inhalation exposure risks. This study investigates the physicochemical properties and tumor-promoting potential of smoke-derived MPs using A549 lung adenocarcinoma epithelial cells and WI-38 normal lung fibroblasts.
Objectives: (1) To identify and characterize MPs and associated by-products from controlled smoldering of PP pellets; (2) To evaluate the *in vitro* biological impact of smoke-derived MPs on human lung adenocarcinoma (A549) cells and normal lung fibroblast (WI-38) cells.
Methods: Smoke-derived MPs were generated by burning PP pellets with coal assistance and extracted using methanol, ethanol, and dichloromethane. MPs were characterized via FTIR, Raman spectroscopy, and Dynamic Light Scattering (DLS). Their effects on A549 cells and WI-38, at 0.02 and 2 mg/mL, were assessed using MTT, AO/EB, and DAPI assays to evaluate viability, proliferation, and morphology.
Results & Discussion: Smoke-derived MPs exhibited a broad size range and contained carcinogenic compounds such as phthalates, siloxanes, and PAHs. MTT assays showed dose-dependent proliferation in A549 cells but reduced viability in WI-38 cells, especially with ethanol extracts, indicating mitogenic effects on cancer cells and cytotoxicity on normal cells. Nuclear staining confirmed proliferation in A549 and apoptosis/necrosis in WI-38.
Conclusion: Smoke-derived polypropylene MPs contain carcinogenic organics and may promote tumorigenesis in lung epithelial cells via proliferative and inflammatory pathways. In contrast, they exert cytotoxic, non-proliferative effects on normal cells while enhancing proliferation in cancerous cells, underscoring their potential health risks and the need for further mechanistic toxicological investigation.

Keywords: *Smoke-derived Microplastics (MPs); Polypropylene combustion; Lung Cancer Cells (A549); Human Diploid Lung Fibroblast (WI-38); Cytotoxicity.*

IHASE-2025/37

Study on the Effective Use of Bio-Waste as Nano Fertilizers and Their Role in Sustainable Environmental Protection

Preeti saini[1*], Dr manjul mishra[2]

[1]Research Scholar, Chemistry Department, Apex University, Jaipur (Rajasthan)

[2]Professor, Chemistry Department, Apex University, Jaipur (Rajasthan)

Using bio-waste in agriculture is very important — not only for waste management but also for improving soil nutrition. Converting bio-waste into nano fertilizers helps plants grow better, increases productivity and reduces dependence on chemical fertilizers. It also improves soil health and supports environmental sustainability. The study focuses on testing how effective bio-waste–based nano fertilizers are and how they impact sustainable environmental protection. It also discusses the composition of bio-waste, different techniques used to make nano fertilizers and their long-term benefits. The key challenges such as cost-effectiveness, standardization, public awareness and possible environmental risks are also focussed in this study. In conclusion, bio-waste–based Nano fertilizers can become an eco-friendly and sustainable alternative in modern farming. However the successful implementation of these biowaste based on nano fertilizers needs more detailed research, clear government policies and better awareness among farmers.

Keywords; *Nano-fertilizer, Environmental sustainability, Biowaste, Waste management.*

IHASE-2025/38

Role of Spiders in Environment Management and Eco-friendly Agriculture

Major Komal Katyal
Associate Professor, Department of Zoology, MSJ Government College, Bharatpur
komalkatyalbnm@gmail.com 9414895329

Spiders, as ubiquitous arachnids in terrestrial ecosystems, play an important role in environmental management and sustainable agriculture by acting as natural predators, regulating insect populations and maintaining ecological balance. With over 45,000 identified species, they play an important role in biodiversity by serving as markers of ecological health and stability. Spiders contribute to nutrient cycling by decomposing prey, and they sustain food webs by managing herbivorous insects, limiting overgrazing and increasing vegetation diversity.

Spiders are effective biological control agents in agriculture because they feed on a variety of pests that can destroy crops, such as aphids, caterpillars, plant hoppers, and leafhoppers. This predatory behaviour decreases the need for chemical pesticides, promoting sustainable farming techniques that limit environmental contamination and protect soil health. Research shows that including spiders in integrated pest management (IPM) techniques reduces secondary outbreaks and pest resistance while increasing crop yields. In places like southern Africa, for example, conservation agriculture increases spider diversity and abundance, which naturally suppresses pests and lowers farmers' input costs.

Spider communities are influenced by farming systems; low-tillage and organic methods sustain larger spider populations than conventional methods, which frequently reduce them by disrupting their habitat. Challenges include habitat loss from monocultures and pesticide abuse, emphasising the importance of habitat corridors and reduced chemical interventions in the conservation of these arachnids. In the end, using spiders' ecosystem services supports robust agro-ecosystems, which is consistent with international objectives for biodiversity preservation and sustainable development. Agriculture can attain peace with nature and guarantee long-term productivity and environmental integrity by giving priority to spider-friendly techniques.

Keywords: *Spiders, Integrated Pest Management, Eco-friendly Agriculture, Biological Control, Environmental Sustainability*

IHASE-2025/39

Design and Development of an Infra-Red Heat Treatment Unit for Minor Millets with ANSYS-Based Structural and Thermal Analysis

Soumya C Meti [1*], Udaykumar Nidoni[1], Sharanagouda Hiregoudar[1], P F Mathad[1], Arunkumar Hosamani[2] and Saroja N. Rao[3]

[1]Department of Processing and Food Engineering, College of Agricultural Engineering, UAS Raichur-584104.

[2]Seed Unit, UAS Raichur-584104.

[3]Department of Plant Biochemistry, Pesticide Residue and Food Quality Analysis Laboratory, UAS, Raichur-584104.

*E-mail: soumyacm97@gmail.com

A rotary type continuous IR heat treatment unit was developed for minor millets. The key machine elements of the IR heat treatment unit, such as the hopper, IR heat treatment cylinder, power transmission system and supporting frame, were designed and developed following the standard procedures to achieve a processing capacity of 500 kg/h. The developed IR heat treatment unit had overall dimensions of 3462×1477×1927 mm. The power transmission required for the developed unit was obtained using 1 hp 3-phase electric motor through friction and chain drive mechanisms. The static structural analysis using ANSYS workbench confirmed that the shafts designed for power transmission in the IR heat treatment unit were structurally safe, as both deformation (1.16 mm) and stress levels (34.31 MPa.) in the shafts remained within allowable limits. The transient thermal analysis conducted using ANSYS workbench confirmed that the cylinder's outer insulation was highly effective, maintaining significantly cooler outer regions around 28.82 °C. This indicated that the IR heat treatment cylinder operated safely within its design limits.

Key words: *IR heat treatment unit, Minor Millets, ANSYS, Structural and Thermal Analysis*

IHASE-2025/40

Microstructure Analysis of Infra-Red Heat Treated Minor Millets

Soumya C Meti [1*], Udaykumar Nidoni[1], Sharanagouda Hiregoudar[1], P F Mathad[1], Arunkumar Hosamani[2] and Saroja N. Rao[3]

[1]Department of Processing and Food Engineering, College of Agricultural Engineering, UAS Raichur-584104.

[2]Seed Unit, UAS Raichur-584104.

[3]Department of Plant Biochemistry, Pesticide Residue and Food Quality Analysis Laboratory, UAS, Raichur-584104.

*E-mail: soumyacm97@gmail.com

Microstructure analysis was performed for untreated unhusked and IR heat treated unhusked little and kodo millets at optimized processing conditions of 500 kg/h feed rate and 5 kW IR power level, as well as untreated dehusked and IR heat treated at optimized conditions dehusked little and kodo millets. The analysis involved studying the surface morphology and transverse sectional structure of the grains using a scanning electron microscope (SEM). The SEM images indicated that the IR heat treatment led to notable surface structural changes in untreated little and kodo millet, which resulted in improved milling yield. While, SEM analysis of the transverse sections revealed that the IR heat treatment did not significantly alter the microstructure of either little millet or kodo millet.

Key words: *Microstructure analysis, SEM, IR heat treatment, Minor Millets*

IHASE-2025/41

An Analysis the Employment pattern of various sugarcane-based cropping system in Baghpat district of Western Uttar Pradesh

Lalit Kumar Verma[1*], and Om Prakash Maurya[2]
[1]Research Scholar, Department of Agricultural Economics, R.S.M. (P.G.) College, Dhampur, Bijnor (U.P.)
[2]Associate Professor & Incharge, Department of Agricultural Economics, R.S.M. (P.G.) College, Dhampur, Bijnor (U.P.)
*Corresponding Email: verma.lalitkumar49@gmail.com

Sugarcane plays an essential role in the economy of the country, both as a source of raw material for the sugar industry and as a means of livelihood for millions of farmers. In 2023-24, sugarcane was cultivated in 5.74 million hectares, producing 453.16 million tonnes across the country. Uttar Pradesh ranked first with 2.65 million hectares under cultivation and a production of 215.81 million tonnes (DA&FW, 2024). Within the state, Baghpat district is particularly dependent on sugarcane due to its favourable agro-climatic conditions, nearby sugar mills and jaggery processing units, which strengthen its rural economy. The present study examines the employment pattern across various sugarcane-based cropping systems in Baghpat district of western Uttar Pradesh, during the agricultural year 2024-25. Primary data were collected from 180 randomly selected farmers across two major sugarcane-growing blocks through a pre-tested schedule and personal interview. Labor employment was categorized into family and hired components, with attention to gender and seasonal variation. The findings indicate that sugarcane-based cropping systems such as CS-I (sugarcane sole), CS-II (sugarcane–wheat), and CS-III (sugarcane–mustard) exhibit higher labor absorption than monocropping, particularly during peak operations like planting and harvesting. Among these, CS-III recorded the highest employment generation per hectare, followed by CS-II and CS-I. The findings emphasize the importance of crop diversification through sugarcane-based systems in enhancing labor utilization, providing sustained rural employment, stabilizing farm income, and promoting sustainable agricultural development.

Keywords: *DA&FW, Sugarcane-based cropping system, Employment pattern and generation.*

IHASE-2025/42

Beyond beautification: Assessing the multi-functional contributions of urban floriculture and its integration into sustainable landscape

Prince[1*], Chitralekha[2], Rakesh Gehlot[1], Vikas Sharma[1], Rupali Sharma[1], Kuldeep Kumar[3], and Rajender Kumar[4]

[1]Department of Horticulture, CCS Haryana Agricultural University, Hisar-125004
[2]Cotton Research Station Sirsa, CCS Haryana Agricultural University, Hisar-125004
[3]Department of Vegetable Science, CCS Haryana Agricultural University, Hisar-125004
[4]Department of Basic Engineering, COAE&T, CCS HAU, Hisar-125004
*Corresponding author: prince@hau.ac.in

Rapid urbanization poses significant environmental, social, and aesthetic challenges, including biodiversity loss, increased urban heat island effects, and diminished human-nature connection. The strategic integration of floriculture into urban landscape design offers a powerful, multi-faceted solution to these issues, moving beyond purely ornamental functions toward sustainable and resilient cityscapes. This review synthesizes current research on the opportunities, challenges, and future trends of urban floriculture and landscape integration. The synthesis highlights the significant ecological benefits, such as enhancing urban biodiversity by creating microhabitats and pollinator corridors, promoting ecological balance, and mitigating pollution through phytoremediation. Floricultural landscapes also provide crucial environmental services, including reducing storm water runoff, moderating temperature extremes, and improving air quality. Beyond ecological functions, the review emphasizes the profound social and psychological dimensions of urban floriculture. It explores how green spaces, from community gardens to corporate green walls, improve mental well-being, reduce stress, and foster a stronger sense of community. Furthermore, the economic potential is examined, including the growth of niche markets, creation of employment opportunities in nursery management and design, and integration with local economies. The review also addresses key challenges, such as space constraints, soil contamination, water management, and high setup costs associated with intensive urban horticulture. It discusses how technological innovations, including hydroponics, aeroponics, vertical farming, and IoT-based smart systems, are essential for overcoming these hurdles and maximizing resource efficiency in compact urban environments. In conclusion, this review underscores that urban floriculture and thoughtful landscape design are critical components of sustainable urban development. It provides a comprehensive overview of the field, offering valuable insights for policymakers, urban planners, and designers seeking to leverage the full potential of floral landscapes to create healthier, more beautiful, and more resilient cities.

Keywords: *Urban floriculture, landscape design, sustainable cities, ecosystem services, social well-being, technological innovation, green infrastructure*

IHASE-2025/43

From Waste to Resource: *Musa paradisiaca* (Banana) Peel Chitin as a Novel Biosorbent for Copper and Zinc Remediation

Saswati Tripathy[1], Dr. Pravalikha G B[1*]
M.Sc (Biotechnology)
[1]Department of Life Sciences, CHRIST (Deemed To Be University),
Central Campus, Hosur Road, Bangalore, India
Email ID- sasdav14@gmail.com
Assistant Professor
[1]Department of Life Sciences, CHRIST (Deemed To Be University),
Central Campus, Hosur Road, Bangalore, India
* Corresponding Author- pravalikha.gb@christuniversity.in

Heavy metal contamination from industrial effluents, particularly copper (Cu) and zinc (Zn), poses a significant environmental threat. This study investigates the potential of chitin extracted from *Musa paradisiaca* (banana) fruit peels as a sustainable, low-cost biosorbent, specifically evaluating the comparative adsorption efficiency of chitin derived from fresh versus rotten peels.Chitin was extracted using sequential acid demineralization and alkaline deproteinization. Fourier Transform Infrared (FTIR) spectroscopy confirmed its chemical structure, identifying key amide, hydroxyl, and polysaccharide functional groups. Batch adsorption studies were conducted to analyze the effects of biosorbent concentration and solution pH (2, 5, and 8) on Cu and Zn removal, with residual metal quantified by Atomic Absorption Spectroscopy (AAS).

Results demonstrated that adsorption performance was highly dependent on fruit peel source and solution pH. Chitin from fresh peels showed superior copper adsorption, achieving a maximum capacity of 9.24 mg/g, whereas rotten peel chitin was less effective (8.48 mg/g), likely due to the degradation of active amino and hydroxyl groups. In contrast, zinc adsorption capacity was high and comparable for both fresh and rotten chitin, reaching up to 9.75 mg/g, indicating more stable binding sites. The process was strongly pH-dependent; adsorption was minimal at acidic pH 2 (Cu: 39.7%; Zn: 26.3%) but increased dramatically in alkaline conditions (pH 8), achieving 99.2% Cu and 82.4% Zn removal due to the deprotonation of active binding sites.

Banana peel-derived chitin is an effective, eco-friendly biosorbent. Fresh peels are optimal for copper remediation, while zinc removal is robust regardless of peel degradation. This study validates the valorization of agricultural waste for sustainable wastewater treatment.

Keywords - *Chitin, Biosorption, Heavy Metals, Wastewater Remediation, Banana Peel, Musa paradisiaca, Copper, Agricultural Waste*

IHASE-2025/44

Metabolic profiling of annual ryegrass toxicity resistant and susceptible annual ryegrass cultivars

Pushpendra Koli[1,2,*], Manjree Agarwal[3], David Kessell[4], Yonglin Ren[2], Simon J. McKirdy[2]

[1]ICAR-Indian Grassland and Fodder Research Institute, Jhansi UP 284003 India
[2]Murdoch University, 90 South Street, Murdoch, WA 6150, Australia
[3]Scientific Service Division, ChemCentre, Western Australia, Bentley, WA 6102, Australia
[4]Department of Primary Industries and Regional Development, WA 6150, Australia
[*]Corresponding author: kolipushpendra@gmail.com

Annul ryegrass is an important forage crop due to its excellent nutritional quality, high digestibility, palatability and productivity. It is used as pasture, hay and silage. However, a bacterium, *Rathayibacter toxicus,* infects the plant and releases neurotoxins, which are fatal poison responsible for annual ryegrass toxicity (ARGT). Millions of sheep and cattle have died and are still at risk. Therefore, it is important to understand the metabolic relationship and develop ARGT-resistant varieties. In this direction, this study focused on the exploration of untargeted metabolites associated with ARGT-resistant and susceptible ryegrass cultivars. Extract of the inflorescence of two ARGT resistant and three susceptible of annual ryegrass (*Lolium* spp.) cultivars were assessed using direct immersion solid phase microextraction (DI-SPME) coupled with gas chromatography mass spectroscopy (GC-MS) to identify differential metabolites. The principal component analysis revealed distinct clustering between ARGT-resistant and susceptible cultivars. Partial least squares-discriminant analysis identified several key metabolites associated with ARGT resistance, including ergosterol peroxide; 9,12,15-octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-; tricosyl acetate; hexacosanal; 2-chloropropionic acid, octadecyl ester; stigmastane-3,6-dione, (5α)-; octacosanoic acid, methyl ester; and methyl nomilinate. Additionally, resistant plants predominantly contained chemical groups such as esters, sterols, phenols, heterocyclic compounds, fatty acids, organofluorides, and siloxanes, while susceptible cultivars had higher proportions of alcohols, aldehydes, terpenes, and hydrocarbons. In conclusion, there was a significant difference between resistant and susceptible cultivars during the chemical profiling of inflorescence, and these distinguishing metabolites could be potential chemical markers to inform strategies to improve ARGT resistance in ryegrass.

Keywords: *annual ryegrass, ARGT, disease resistance, forage, metabolites, Rathayibacter toxicus, gas chromatography*

IHASE-2025/45

Next–Generation Pest Control And Residue Reduction Strategies For Safe Tomato Production

Chada Anu Reddy[1*], Mahesh Pathak[2], Sujan Majumder[3]
[1]National Institute of Plant Health Management, Hyderabad.
[2]College of Post Graduate Studies in Agricultural Sciences,
Central Agricultural University (Imphal),
Umiam, Meghalaya, India
[3]ICAR-Indian Institute of Vegetable Research,
Uttar Pradesh, India
*Corresponding Author Email: anureddychada@gmail.com

Tomato cultivation is constrained by severe insect pest infestation and pesticide residue concerns, demanding strategies for both productivity and food safety. The present study aimed to (i) evaluate the bio-efficacy of novel insecticides against major tomato pests and their effect on natural enemies, and (ii) assess household-level decontamination techniques for residue reduction. Field experiments were conducted at Umiam, Meghalaya, during 2023–25 using four new-generation insecticides—chlorantraniliprole, emamectin benzoate, spinosad, and indoxacarb—applied at three dose levels (1x, 1.25x and 2x) considering the real time situations in the field. Among treatments, chlorantraniliprole 18.5% SC at the recommended dose recorded the highest efficacy, reducing *Helicoverpa armigera* by 59.82% and aphids by 39.09%, with maximum yield (17.40 t/ha) and B:C ratio (2.67:1). Higher doses offered no significant benefit over the recommended rate and increased residue and environmental risks. Decontamination trials indicated that a 2% salt solution was most effective, removing over 84% of residues, followed by lukewarm water. Also, as the dosage increases the efficacy of the decontamination was found decreasing. Integrating these practices ensures sustainable pest suppression and safe tomato consumption under diverse agro-climatic conditions.

Keywords: *chlorantraniliprole, decontamination, food safety, pest management, tomato*

IHASE-2025/46

Evaluating potential of *Lactobacillus delbrueckii* 3A for developing probiotic based mango carrot blended beverage

Ananya Sharma[1], Vivek Sharma[2] Richa Salwan[1]*
[1]College of Horticulture and Forestry (Dr. YS Parmar- University of Horticulture and Forestry), Neri, Hamirpur- 177 001 (HP)
[2]Chandigarh University, Mohali, Gharuan (PB.) 143 401
*Corresponding/Presenting author: richaihbt332@gmail.com
Email ID: sharmaananya2815@gmail.com, ankvivek@gmail.com

The study reports the development of a probiotic based mango carrot blended beverage with consistent quality and health benefits. Lactic acid bacteria (LAB) isolated from homemade curd on de Man, Rogosa and Sharpe agar was purified and screened for probiotic attributes, including survival under simulated gastrointestinal conditions, bile salt tolerance, antimicrobial activity, β-galactosidase activity, and exopolysaccharide production. The isolate was identified as *Lactobacillus delbrueckii* 3A by 16S rRNA sequencing. A pre-inoculum containing 10^{11}–10^{12} CFU mL^{-1} was added to a formulation containing blend of mango and carrot (4:2 ratio), and 40 % water and incubated at 37 °C for 24 h. Optimization through central composite design–response surface methodology revealed incubation at 25 °C for 24 h with a 0.75 % inoculum yields superior flavor and nutritional quality. Under these conditions, the beverage showed improved levels of antioxidants, ascorbic acid, carotenoids, and total phenolics and achieved high sensory acceptability for taste, flavor, and color. FTIR spectra indicated functional groups such as carboxylic acids, aromatic compounds, C=O acid stretching, and C–O/C–C bonds, while GC–MS analysis detected key volatile compounds contributing to aroma. Shelf-life studies revealed stable pH, acidity, and total soluble solids, with nutritional attributes retained for up to 60 days under refrigeration in glass bottles. Viable counts of probiotics remained at ≥7 log CFU mL^{-1}, meeting FSSAI (2022) specifications, and no coliforms, yeasts, or molds were detected, confirming microbiological safety. Overall, this work highlights an indigenous *L. delbrueckii* strain for a cost-effective, nutritious probiotic beverage with potential functional food applications.

IHASE-2025/47

Comparative Antimicrobial Efficacies and Phytochemical Profiling of *Murraya koenigii*, *Ocimum tenuiflorum*, and *Colocasia esculenta* Extracts against *Pseudomonas syringae*: A Preliminary Study

Meghana Nair[1], D. Sayantan[2*]
MSc Biotechnology
[1]Department of Life Sciences, Christ University, Bengaluru – 560029,
Karnataka, India
Email ID: meghananair63@gmail.com
Assistant Professor
[2*]Department of Life Sciences, Christ University, Bengaluru – 560029,
Karnataka, India
Corresponding author: sayantan.d@christuniversity.in

Pseudomonas syringae is a widespread phytopathogen that causes leaf spots, blights, and wilts in numerous crops, leading to significant agricultural yield losses and economic impact. This study evaluated the phytochemical profile and antimicrobial effects of extracts from *Colocasia esculenta*, *Ocimum tenuiflorum*, and *Murraya koenigii* against the plant pathogen. Based on well diffusion tests and minimum inhibitory concentration (MIC) testing, *Murraya koenigii* showed the highest antimicrobial activity against *Pseudomonas syringae* with a zone of inhibition of 21.0±4.6 mm at 100 mg/mL, followed by *Ocimum* and *Colocasia*. According to phytochemical screening, *Murraya* had alkaloid and phenolic contents observed to be moderate and strong respectively, which is consistent with its effectiveness. Key bioactive substances, such as eugenol and caryophyllene, were discovered by GC – MS analysis, confirming their antibacterial properties. These compounds from plants have potential as long – term substitutes for synthetic antimicrobials by complementing sustainable agriculture methods. Further research is required to identify and characterize the active components for usage in agriculture and medicine. Thus, this study highlights the use of traditional medicinal plants to address the issues of existing antibiotic resistance and provide sustainable solutions.

Keywords: *Plant-derived antimicrobials, well diffusion, bioactive substances, GC–MS analysis, sustainable agriculture*

IHASE-2025/48

Green Synthesis of Zinc Oxide Nanoparticles using *Garcinia Pedunculata* Fruit Extract and Evaluation of its Antioxidant and Photolytic Degradation Activities : A Preliminary Study

Nairity Goswami[1], Dr. Joseph KS[1*]
[1]M.Sc (Biotechnology)
Department of Life Sciences, CHRIST (Deemed To Be University),Central Campus, Hosur Road, Bangalore, India
Email ID- goswaminairity@gmail.com
[1]Assistant Professor
Department of Life Sciences, CHRIST (Deemed To Be University),Central Campus, Hosur Road, Bangalore, India
* Corresponding Author- joseph.ks@christuniversity.in

Green nanotechnology is becoming a viable way to get around the drawbacks of traditional nanoparticle manufacturing, which frequently uses hazardous chemicals and energy-intensive techniques. In this work, we concentrate on the environmentally friendly synthesis of zinc oxide nanoparticles (ZnO NPs) utilizing the fruit extract of Garcinia pedunculata, also known as "Bor Thekera," a fruit from Northeast India that is both medicinally significant and little known. The fruit is a great option for green synthesis since it is naturally high in hydroxycitric acid, flavonoids, and phenolics, which all function as stabilizing and reducing agents. To comprehend the structural and functional characteristics of the resultant ZnO NPs, a comprehensive characterization will be conducted utilizing UV-Vis, FTIR, XRD, SEM, and DLS. Antioxidant assays will be used to assess their biological activity, and photocatalytic dye testing will be used to assess their environmental potential.

Keywords *Green synthesis, Zinc oxide nanoparticles, Garcinia pedunculata, Antioxidant assay, Photocatalytic degradation, Biogenic nanoparticles, Environmental remediation.*

IHASE-2025/49

Influence of Organic Rooting Media, Vessels, and Seasonal Variation on Rooting Efficiency of Selected Ornamental Plants under Kerala Agro-Climatic Conditions

Binoy Thomas[1] M. P and Justin R Nayagam[2]
[1&2]Department of Botany, Union Christian College (Autonomous), Aluva-2, Kerala, India. 683102
Email: btmpf02@gmail.com justinr@uccollege.edu.in Ph: +91 9446207353

A comprehensive study was conducted from 2021 to 2025 to evaluate the effects of rooting media, rooting vessels, and seasonal variation on the propagation success of three ornamental plant species—*Codiaeum variegatum* (Croton), *Agave mexicana*, and *Pandanus* sp.—under Kerala's humid tropical conditions. The experimental design incorporated three organic rooting media (coirpith, garden soil, and vermicompost) and three types of rooting vessels (root trainers 100 cc, polypots 100 cc, and polybags), assessed across three distinct seasons—summer, winter, and rainy. The use of Indole-3-butyric acid (IBA) was also tested to determine its synergistic effects on rooting.

Results revealed that rooting success varied significantly with both medium and season, ranging from 75% to 100% depending on the species. Coirpith-based media, alone or in combination with vermicompost, promoted superior root initiation and overall root system quality. Root trainers (100 cc) were found to be the most efficient propagation vessel, providing better aeration, rapid drainage, and space optimization—qualities particularly advantageous for modern nursery operations and large-scale propagation programs. Among the seasonal effects, winter recorded the highest rooting percentage and root vigor across all species, highlighting the importance of moderate temperature and humidity levels for optimal root development. Cuttings treated with IBA exhibited enhanced rooting percentages, root length, and uniformity compared to untreated controls, though the organic media alone demonstrated notable efficacy in promoting sustainable root growth.

The findings underscore the potential of organic waste-derived media and efficient propagation containers in reducing nursery costs and enhancing sustainability in ornamental horticulture. The integration of eco-friendly rooting substrates and optimized vessel systems can significantly advance vegetative propagation techniques suited to Kerala's tropical environment.

Keywords: *Vegetative propagation, Rooting medium Root trainers, Sustainable horticulture.*

IHASE-2025/50

Calibration and Validation of DSSAT Model for Wheat cultivars

***Devi Lal[1], Ramniwas**
Subject Matter Specialist Agrometeorology, Krishi Vigyan Kendra
Bhiwani CCSHAU Hisar 125004
***E-mail**: saharandevilal04@gmail.com

Crop models are effective tools to envisage crop productivity under different executive options and climatic conditions. The parameterization of CERES-Wheat (DSSAT v 4.7.5) was performed using data from first year trial during *Rabi* 2018-19. The calibrated genetic coefficients for WH 1105, HD-3086 and HD-2967 based on two year field experiment at Hisar condition were used. The model calibration gave genetic coefficient values comparable to those obtain by the other studies conducted on wheat (Hussain *et al*., 2018). Calibration of model was done to ensure the information provided by model was authentic. All four genotype have different genetic coefficients, which were adjusted as described. These coefficients were related to the time of various growth stages which were calibrated in a chronological order. The genetic coefficients were fixed and used for validation and further model application.

The model has the potential for assessing the impact of meteorological factors on wheat production. The „CERES-Wheat models" were evaluated with independent data sets which obtained from field during the 2018-19 and 2019-20 growing seasons at Hisar for different sowing dates *i.e* 1st week of November, 3rd week of November and 1st week of December which was used for calibration. Seasonal and daily variations in weather determinants crop growth and yield. Crop simulation models have capability to envisage crop growth response to weather, soils and crop management. The validation of model was carried to test model applicability under variable thermal environments of Haryana for wheat growth and yield attributes. The simulated results matched within the observed results when compared with field experiments data.

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Key words: *CERES, genetic coefficients,weather, wheat*

IHASE-2025/51

Association Studies For Oil, Protein And Various Quality Traits In Sesame (*Sesamum Indicum* L.)

K Soniya[a*], D. Padmaja[b], K. Jhansi Rani[c], Praduman Yadav[d] and N. Balram[e]

[a*]MSc Scholar, Department of Genetics and Plant Breeding, Agricultural College, Jagtial, PJTAU. kongarisonia@gmail.com , 8790484033

[b]Scientist (Plant Breeding), AICRP on Forage Crops Unit, ARI, Rajendranagar, PJTAU

[c]Dean of Agriculture, Rajendranagar, PJTAU

[d]Senior Scientist ,Department of Biochemistry, IIOR, Rajendranagar, Hyderabad

[e]Scientist (Plant Pathology), Seed Research and Technology Center, Rajendranagar, PJTAU

Sesame (*Sesamum indicum* L.) is an important oilseed crop, widely recognized for its high-quality oil, which is rich in natural antioxidants, unsaturated fatty acids such as oleic and linoleic acids, essential for maintaining heart health and reducing cholesterol levels. Hence, developing sesame varieties with enhanced oil content and desirable fatty acid composition is significant in improving both the economic and nutritional value of this crop. In this investigation eighteen crosses were generated using six lines and three testers in line × tester model during late *kharif* 2023 at RARS, Jagtial. The variation in oil content and fatty acid composition of these crosses along with parents were evaluated during summer 2024-25, following randomized block design with three replications and biochemical analysis was done at ICAR-IIOR, Hyderabad. The parents varied considerabily in their oil quantity. The oil content varied between 43.42 to 51.01 %, with average oil content of 47.14%. The highest mean oil content was recorded in the crosses JCS 3202 × JCS 4019 (51.01 %) and JCS 1020 × JCS 4019 (50.55 %). The percentage range of various fatty acids includes linoleic (38.29 - 45.60), oleic (40.81- 45.61), palmitic (8.55-10.54), stearic (4.56-7.47) and linolenic acid (0.16 - 0.73) in the seed oil. The total means of linoleic and oleic acids as unsaturated fatty acids was greater in proportion to other fatty acids which increases the suitability of the sesame oil for human consumption. Association studies among these traits showed negative correlation between oil and protein content, linoleic and linolenic acid which indicated their antagonistic nature. All the five fatty acids were correlated with each other either positively or negatively. Therefore, it is suggested that the positive association among oil content and desirable fatty acid composition can be exploited in future breeding programmes for selection of genotypes with high oil content and quality.

Keywords : *sesame, oil, fatty acids, correlation studies*

IHASE-2025/52

Enhancing fodder cowpea through conventional and modern breeding approaches for sustainable agri food systems

Pavan Kumar Sunkaraboina[1*], Padmaja Donda[2] and Sumalini Katragadda[1]
[1]College of Agriculture, PJTAU, Rajendranagar, Hyderabad, Telangana, India- 500030
[2]AICRP on Forage Crops, ARI, PJTAU, Rajendranagar, Hyderabad, Telangana, India- 500 030

Cowpea (*Vigna unguiculata* L. Walp) is one of the important legume crop cultivated in tropical and subtropical regions and valued for its multiple uses. It provides protein-rich grain for human consumption, nutritious forage for livestock, acts as soil conditioner and improves soil fertility through biological nitrogen fixation. Despite its wide adaptability, achieving consistent enhancements in high fodder yield coupled with nutritional quality poses a challenge to breeders due to the complex inheritance of traits such as high green biomass, crude protein content, and leaf-to-stem ratio and these traits are influenced by abiotic stresses like drought and heat. Traditional breeding approaches *viz.,* pre breeding, pedigree method and pure-line selection have led to the development of dual-purpose cultivars with improved biomass and disease tolerance. Previous studies indicated preponderance of additive and non-additive gene action in the inheritance of key fodder traits, implying methods such as reciprocal recurrent selection and biparental mating for incremental improvement in fodder traits. However, these conventional approaches are often slow and insufficient to meet the rising demand for climate-resilient cultivars. Recent technological advancements in cowpea, particularly the availability of reference genome and high-throughput genotyping platforms, have transformed breeding strategies. Integration of Omics approaches including genomics, transcriptomics, proteomics, and metabolomics enable a deeper understanding of the genetic determinants of fodder quality and stress tolerance. This knowledge facilitates the effective use of Marker-Assisted Selection (MAS) and Genomic Selection (GS), allowing rapid enhancement of complex traits and shorten breeding cycles. Future improvement of fodder cowpea requires an integrated breeding strategy that combines precise phenotyping with molecular tools. By efficiently identifying and deploying superior alleles, breeders can accelerate the development of high-yielding, climate-resilient cultivars, thereby strengthening livestock feed availability and supporting sustainable agricultural food systems.

Key Words: *Cowpea, Fodder, Stresses, Molecular breeding, Omics Technologies*

IHASE-2025/53

Comparative Study on Seeding Efficiency of Onion Drum Seeder at Different Drum Hole Sizes and Speeds

Kanishk Verma[1], Surinder Singh Thakur[2], Mahesh Kumar Narang[3] and Nitin Karwasra[4]

[1]Kanishk Verma, Department of Renewable and Bio- Energy Engineering, CCSHAU, Hisar

[2]Surinder Singh Thakur, Department of Farm Machinery and Power Engineering, PAU, Ludhiana

[3]Mahesh Kumar Narang, Department of Farm Machinery and Power Engineering, PAU, Ludhiana

[4]Nitin Karwasra, Department of Renewable and Bio- Energy Engineering, CCSHAU, Hisar

Email: Kanishk57@gmail.com

Contact: 9896004886

Onion can likewise be produced by direct seeding strategy which is an advancing innovation and this can likewise help in sparing work. The onion drum seeder with three different drums D1, D2 and D3 with seed dropping holes of 3mm, 3.5mm and 4mm diameter respectively were evaluated in the laboratory of Farm Machinery and Power Engineering department of Punjab Agricultural University, Ludhiana, Punjab, India at three different Speed of 1 km/hr, 1.5km/hr and 2km/hr (i.e. S1, S2 and S3). With drum D1 and D2 observed seed rate was in range of 6.3 to 7 kg per hectare. In drum D3 observed seed rate was in range of 12.5 to 13 kg per hectare. In drum D1 seed spacing was 6.63cm, 6.77cm and 8.80 at speed S1, S2 and S3. The seed spacing of 7.7cm which is nearby recommended seed spacing was found with drum D2 at Speed S2. At speed S1 and S3 it was 6.8cm and 9cm. In drum D3 Seed spacing was 3.87cm, 4.10cm and 5.20 cm at speed S1, S2 and S3. Data for missing index, multiple index and singulation was found similar for drum D1 and D2. For Drum D3 data for missing index was lesser but on the other hand multiple index was found higher than drum D1and D2. For singulation observation found was higher for Drum D1 and D2 than drum D3.

Keywords: *Onion, Drum seeder, Direct seeding, Missing index, Multiple index,*

IHASE-2025/54

Root morphology and phosphorus acquisition in Pigeonpea under natural farming

Seema Hodkashia[1], Sarvendra Kumar[1]*, Tapan Jyoti Purakayastha[1], Dibakar Mahanta[2], Rakesh Pandey[3], Rosin K.G.[4]

[1]Division of Soil Science and Agricultural Chemistry; [2]Division of Agronomy;
[3]Division of Plant Physiology;
[4]Water Technology Centre, ICAR-Indian Agricultural Research Institute,
New Delhi, India.
*Corresponding Author Email: sarv.grandee@gmail.com

Conventional farming inputs, such as synthetic fertilizers, and agrochemicals, including insecticides, fungicides, and herbicides played a pivotal role in enhancing agricultural productivity in India. However, the imbalanced and excessive use of these inputs has contributed to several long-term ecological concerns, like decline nutrient-supplying capacity of soil, decline in soil biodiversity, soil degradation. In this context, natural and/or organic input-based farming emerged as a holistic and sustainable alternative aimed at improving nutrient use efficiency in crops. To investigate this, a field experiment was conducted to characterize the morphological and architectural development of pigeonpea root systems in response to different rates of compost (0, 6, 12, 18, and 24 t ha^{-1}), inorganic fertilizers (NPK), and natural farming practices. Root system development and phosphorus (P) and potassium (K) acquisition by crop were monitored and quantified across various physiological stages. The application of compost at the rate of (12 t ha^{-1}) significantly ($p<0.05$) enhanced root length density (RLD), root surface area (RSA), root fresh weigh, dry weight, and phosphorous (P) uptake at all physiological growth stages, over compost at the rate (6 t ha^{-1}), NPK, NF plots and over doses (18 and 24 t ha^{-1}) of composts. Root growth and nutrient acquisition peak at 90 days after sowing (DAS) and then decline until 135 DAS. Root morphological traits such as root length density (RLD:1.85 and 0.79 mm cm^{-3}), root surface area (RSA: 187 and 66.4 cm^3), root fresh weight (13.2 and 1.11 g), and root dry weight (4.68 and 0.57 g) were recorded in the 0–15 cm and 15–30 cm soil layers, respectively, at 90 DAS with application of compost at the rate of (12 t ha^{-1}). The P acquisition was observed as compost (12 t ha^{-1})> compost (6 t ha^{-1})> NPK> NF> compost (18 t ha^{-1})> compost (24 t ha^{-1}). These results suggest that the pigeonpea crop at 90 DAS needs a large root system to absorb nutrients to maintain crop growth and its function. Therefore, the stimulating effect of compost at the rate (12 t ha^{-1}) on pigeonpea rhizosphere further enhances the effective root growth and nutrient acquisition.

Key words: *Root growth behaviour, Organic farming, Natural input, Circular economy, Conventional farming*

IHASE-2025/55

Unravelling the Biotechnological Basis of Phosphorus Use Efficiency in Chickpea

Sakshi Gupta[1], Ashutosh K. Srivastava[2*], Anshuman Singh[3], Maneet Rana[4], Sharwan Shukla[5], Ashutosh Singh[6]

[1,6]Department of Molecular Biology and Biotechnology, Rani Lakshmi Bai Central Agricultural University Jhansi, Uttar Pradesh

[2,5]Department of Basic Science, College of Agriculture, Rani Lakshmi Bai Central Agricultural University Jhansi, Uttar Pradesh

[3]Division of Bioinformatics, ICAR-IASRI, New Delhi

[4]Division of Crop Improvement, IGFRI, Jhansi, Uttar Pradesh

*Corresponding email- aksridu@yahoo.com

Biotechnological innovations have revolutionized trait discovery and crop improvement in chickpea (*Cicer arietinum* L.), particularly for enhancing phosphorus use efficiency (PUE) in phosphorus-deficient soils. This comprehensive review examines integrated biotechnological approaches that address phosphorus deficiency challenges limiting chickpea productivity. The investigation on phosphorus use efficiency (PUE) in chickpea (*Cicer arietinum* L.) highlights the critical role of genetic and genomic resources for trait discovery aimed at improving nutrient use efficiency in this important legume crop. Chickpea cultivation is often constrained by phosphorus deficiency, especially in marginal soils, leading to reduced yield and productivity. Exploiting genetic diversity within chickpea germplasm, including landraces, elite cultivars, and wild relatives, provides valuable genetic resources for identifying PUE-related traits. Genomic tools such as genome-wide association studies (GWAS) have uncovered key single nucleotide polymorphisms (SNPs) and candidate genes linked to phosphorus acquisition and utilization efficiency. Molecular markers developed from these genomic regions enable the precise mapping and selection of phosphorus-efficient genotypes. Phenotypic evaluations under contrasting phosphorus regimes, combined with genotyping, facilitate the identification of superior genotypes exhibiting traits such as robust root systems, efficient phosphorus uptake, and stable yield under deficiency by exploiting genes, proteins involved in architecture, metabolism and mechanism contributing to enhanced PUE. Advanced molecular characterization using polymorphic SSR markers further supports diversity assessment and facilitates marker-assisted selection. This integration of genetic diversity, molecular marker analysis, and gene expression studies forms a comprehensive genomic resource base essential for trait discovery. The identified phosphorus-efficient genotypes, molecular markers, and candidate genes constitute a valuable toolkit for breeding programs focused on developing chickpea cultivars with improved phosphorus efficiency. These genomic resources accelerate the genetic improvement process by enabling targeted selection, reducing reliance on phosphorus fertilizers, and promoting sustainable agriculture in phosphorus-deficient environments.

Keywords: *Genetics, Genomic tools, Biotechnology, PUE, Phosphorous, Chickpea*

IHASE-2025/56

Optimizing Oyster Mushroom Cultivation: Exploring Low-Cost Local Substrates for Sustainable Farmer Livelihoods in Goa.

Pankaj Mapari, Aarti S Gauns[1], Deepashree Naik[2] and Govind V. Parab
Goa College of Agriculture, Ela Farm, Old-Goa.
aarti123gauns@gmail.com[1] , deepashreenaik4@gmail.com[2]

Goa's warm and humid tropical climate provides ideal conditions for Oyster Mushroom cultivation, particularly for *Pleurotus florida*, a fast-growing and nutritious species well-suited to small-scale farming. In Goa, several agricultural residues such as sugarcane bagasse, sugarcane leaves, and cocopeat are readily available but remain largely underutilized. These lignocellulosic materials have great potential as low-cost substrates, contributing to sustainable waste recycling and income generation for farmers.

The present study (2023–24 and 2024–25) were undertaken to evaluate the efficacy of different locally available substrates and additives on the cultivation performance of *Pleurotus florida*. Substrates tested included sugarcane bagasse, sugarcane leaves, and cocopeat—both individually and in combination with paddy straw. Paddy straw substrate was maintained as the control. Additives such as besan (gram flour) and rice bran were incorporated to assess their influence on growth and production parameters. Observations were recorded for duration of spawn run, stipe length, pileus diameter, days to first harvest, biological efficiency, and cost of cultivation.

Results revealed that combinations of paddy straw with rice bran and besan significantly enhanced biological efficiency and reduced the spawn run period compared to the control. The findings highlight the potential of locally available agro-wastes as efficient, low-cost substrates for oyster mushroom cultivation, thereby promoting sustainable farmer livelihoods and resource recycling in Goa.

Keywords: *Pleurotus florida, biological efficiency, agro-waste, sugarcane bagasse, cocopeat, rice bran, besan, Goa, sustainable cultivation.*

IHASE-2025/57

Design, fabrication, and performance of ohmic heater to process whole milk

Rashmi Kumari*, Jui Lodh, and M. L. Bal
Sanjay Gandhi Institute of Dairy Technology (SGIDT), BASU, Patna, Bihar
*Corresponding author: Email- rashmisgidt08@gmail.com

Ohmic heating (OH) is an emerging and innovative thermal processing technology that utilizes the direct passage of electric current through a food matrix, resulting in internal heat generation due to its inherent electrical resistance. This method offers rapid, uniform, and energy-efficient heating, making it highly suitable for liquid, semi-solid, and particulate food systems. In this study, a lab-scale, batch-type ohmic heater was designed and fabricated to evaluate its performance for whole milk processing. The unit consisted of a rectangular stainless steel process chamber with a holding capacity of 7 liters milk, equipped with a pair of stainless-steel electrodes strategically placed to ensure uniform current distribution. The system was operated under controlled voltage and time settings to optimize the heating process.Whole milk (4.1% fat, 8.2% SNF) was processed using the fabricated ohmic heater, and the temperature was raised from 20 to 80°C under varying voltage gradients. Key performance indicators such as heating rate and changes in physicochemical properties including pH, titratable acidity, and sensory quality (overall acceptability) were assessed. Results revealed a rapid heating profile, achieving an average heating rate of approximately 5°C/min, significantly reducing overall processing time compared to conventional heating methods. Ohmic heating caused a slight increase in acidity and a marginal decrease in pH, but these changes remained within acceptable limits for safe milk consumption. Interestingly, the overall sensory acceptability of ohmic-heated milk improved, possibly due to better flavor retention and reduced thermal damage to heat-sensitive components.The study demonstrated that ohmic heating can efficiently pasteurize milk while preserving its nutritional and organoleptic quality. Minimal thermal degradation, reduced fouling, and uniform heat distribution make this technique a promising alternative to conventional thermal processing for the dairy industry.

Keyword: *Ohmic heating, whole milk, pH, titratable acidity, sensory quality*

IHASE-2025/58

Agrivoltaics: Sustainable Food and Agriculture Approach for Indian Farmers

Vinod T. Atkari*, Govind V. Parab
Assistant Professor, Goa College of Agriculture, Ela Farm,
Old Goa, Goa *Email Id: ervinodatkari@gmail.com

The Food and Agriculture Organization (FAO) states that a significant amount of the various operations in the food and agriculture supply chain (FASC) are heavily dependent on fossil fuels and contribute to about 24 % of the world's total emissions of global greenhouse gases (GHG). There are several ways to cut this GHG emissions and reduce the negative effects on environment. The replacement of fossil fuels with renewable energy sources has drawn particularly notable attention. Agrivoltaics, a fast-growing renewable technology that integrates farming and solar power generation in ways that maintain agricultural productivity, will offer great potential for India. Agrivoltaics is now involved in a variety of research and demonstration projects, and it has the potential to emerge as a significant new force in the country's renewable energy industry.

The primary goal of this research is to investigate agrivoltaics technology for Indian conditions. Agrivoltiacs has shown remarkable potential for integration into a wide variety of agricultural operations and provides a sustainable agriculture answer to present problems. The demand for electricity in modern agriculture has expanded, with automation in tillage by improved implements and electric tractors, automated irrigation, usage of agricultural robotics and on-farm post-harvest processing, representing a tremendous opportunity for the use of agrivoltaics. In India agriculture provides a livelihood for a large portion of population. However, many of them suffer difficulties as a result of utilizing untrustworthy agricultural practices. Sometimes the difficulties become so great that they commit suicide. Agriculture covers 60 % of India's land area, so agrivoltaics in India is better positioned than in most other nations to ease strain on other land and ecosystems. This article examines Agrivoltaics, or the integration of solar farming with agriculture, as a Climate-Smart Agriculture (CSA) alternative for Indian farmers. This research is further backed by an agrivoltaics Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. This article uses a SWOT analysis to show how agrivoltaics may make agriculture more sustainable and dependable. This review paper concludes with the findings that agrivoltaics have the potential to meet multiple objectives, including meeting global commitments, providing employment, economic stability, increasing clean energy production capacity, conserving natural resources, and achieving a variety of others. This paper discusses the findings, recommendations, and consequences of using agrivoltaics on a wide scale in India.

Keywords: *Agrivoltaics, Food and agriculture supply chain (FASC), Sustainable agriculture, Renewable energy, SWOT analysis, solar power, Global greenhouse gas (GHG), climate-smart agriculture (CSA)*

IHASE-2025/59

Comparative Analysis of The Treated and Untreated Vegetable Oil Mill Effluents

Durga Lal Regar[1], Poonam Jaiswal[2]

[1]Assistant Professor, Dept. of Botany, Sawer (Raj.), E-mail: regardurgalal1982@gmail.com

[2]Poonam Jaiswal, Professor, Dept. of Botany, JDB Govt. Girls Collage Kota (Raj.)

Vegetable oil mill in Bundi district cover almost 80% part of the industrial scenario of the district. There are two major oil mills that extracts and refine soybean and mustard oil. Industrial effluent related pollution has become a serious concern in recent years. Because in most of the cases effluents are discharged without treatment into nearby agricultural fields or water bodies causing serious contamination of soil and water. The treated and untreated effluent sample from oil mill were collected and analyzed for Physico-chemical parameters like Color, temperature, pH, DO, BOD, COD, TDS, TS, TSS, and Oil & grease. Untreated oil mill effluent is found to have high contents of COD, BOD, TSS, TDS, and low contents of DO. The untreated (crude) effluent samples show highly acidic conditions with pH range from 2.0-4.0 for soybean OME and 1.5-3.0 for mustard OME whereas treated OME shows a pH range of 6.85-6.95 for both the OME. Untreated OME have very high total dissolved solids (TDS) and total suspended solids (TSS) which are reduced to 120 and 140 after treatment for soybean and mustard OME respectively. Untreated OME has a very high range of Oil and greases and COD which are reduced after treatment to 100ppm and 90ppm for Oil and greases and COD to 110ppm and 98ppm for soybean and mustard OME respectively. The results reflect that the treated effluents of oil industry are not highly polluted and they satisfy the BIS Indian standards values and therefore can be used for irrigation purposes.

Keywords: *Oil mill effluent, Physico-chemical parameters, pH.*

IHASE-2025/60

Study of the Antibacterial Activity of Propolis Obtained from Local Honey Bees (Apis mellifera L.) Against Staphylococcus aureus and Escherichia coli Strains

Asilakhon Khasanova Mustaqim qizi, Abdug'aniyiva Pokiza Yo'lchi qizi, Po'latova Malika oybek qizi
E-mail: asilaxasanova@gmail.com

ABSTRACT

Propolis is a natural resinous substance collected by honey bees from plant sources and enriched with biologically active compounds. The aim of this study was to determine the antibacterial activity of propolis samples produced by local honey bees (Apis mellifera L.) against Staphylococcus aureus and Escherichia coli strains. Ethanol extracts of local propolis were prepared, and their antibacterial effects were evaluated using the disk diffusion method. The results showed that propolis extracts inhibited the growth of both bacterial strains to varying degrees, with Staphylococcus aureus showing higher sensitivity. This effect is attributed to the rich content of phenolic and flavonoid compounds in the propolis extract.

INTRODUCTION

Propolis contains more than 300 biologically active compounds, including flavonoids, aromatic acids, essential oils, and waxes. These components exhibit antimicrobial properties by disrupting bacterial cell walls, inhibiting protein synthesis, and inducing oxidative stress. Staphylococcus aureus is a Gram-positive bacterium, while Escherichia coli is Gram-negative, and their structural differences influence their sensitivity to propolis. The chemical composition of propolis produced by local honey bees varies depending on the regional flora and environmental conditions. Therefore, studying its antibacterial activity is important for evaluating its potential use in food safety and as a pharmaceutical raw material.

CONCLUSION

The results of the study indicate that propolis produced by local honey bees possesses significant antibacterial properties against bacterial pathogens. In particular, higher inhibition zones were observed against S. aureus, demonstrating that propolis is more effective against Gram-positive microorganisms. These findings suggest the potential of local propolis as a natural and eco-friendly antibacterial agent for future biotechnological and pharmaceutical applications.

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Isolation of oil-degrading bacterial strains from oil-contaminated soils in the Bukhara region of the Republic of Uzbekistan and study of their bioremediation efficiency

Po'latova M.O; Abduganiyeva P.; Hasanova A. Kadirova Z.A
E-mail: malikapolatova67@gmail.com

ABSTRACT: The presence of oil-degrading bacteria in oil-contaminated soils in the Bukhara region of the Republic of Uzbekistan is a serious problem for oil products. Because bacteria contribute to soil fertility by breaking down oil. Biotechnological solutions based on obtaining oil-degrading bacteria strains are studying their bioremediation efficiency. These approaches include characterizing the biodegradation of bacterial strains and developing formulations with high stability and efficiency.

INTRODUCTION: In Uzbekistan, oil and gas deposits are found in desert regions, on irrigated lands or in adjacent areas. Currently, more than 270 oil and gas deposits have been discovered. Oil pollution causes a shift in the soil solution environment to alkaline and salinization by the chloride type. The use of microorganisms in the reclamation of oil-contaminated soils is highly effective only in one season, that is, the used oil-degrading microorganisms act in the upper aerated layer of the soil. In the lower layer, the bioremediation process does not occur. This is a disadvantage or limitation of biological reclamation. The most economical and environmentally beneficial method for eliminating hydrocarbons from contaminated environments is microbial bioremediation. Through enzymatic pathways, hydrocarbon-degrading microorganisms, also known as hydrocarbonoclastic bacteria, use petroleum hydrocarbons as sources of carbon and energy. Anaerobic processes depend on enzymes like alkyl succinate synthase, which facilitate the addition of fumarate to hydrocarbons and integrate intermediates into bacterial core pathways. Conversely, aerobic processes are started by oxygen-dependent enzymes like monooxygenase and dioxygenase which cleave hydrocarbons by integrating oxygen into otherwise stable structures. Both degradation procedures depend on the fragmentation of hydrocarbons into smaller, usable components. Biosurfactants (BS), which emulsify hydrocarbons and reduce surface tension, are frequently used to improve these microbial processes and increase the bioavailability of hydrophobic compounds.

CONCLUSION: This study demonstrates that it is possible to successfully isolate Crude oil-(CO) CO-degrading bacteria from soils that have been artificially contaminated. Strong BE and CO degradation activity was shown by bacterial strains S4 and S5 (*Pseudomonas indica*), however, S1 (*Brevibacillus formosus*) showed a moderate rate of CO degradation. The findings show that native soil bacteria possess a range of metabolic abilities suitable for hydrocarbon breakdown and BS synthesis. In order to reduce CO pollution in

IHASE-2025/62

Composition and Changes of The Aral Sea Microflora

Malohat Abdurasulovna Nematova[1] Xilola Toirbek qizi Rajabboyeva[2]
[1,2]Jizzakh Branch, National University of Uzbekistan named after Mirzo Ulugbek
nematovamalohat5@gmail.com

This study examines changes in the Aral Sea microflora, showing reduced diversity due to lower water levels and higher salinity, with a focus on halophilic microorganisms and their biotechnological importance.

Objective: To study the changes in the Aral Sea microflora and determine the role of halophilic microorganisms formed under increased salinity.

Hypothesis. The ecological crisis of the Aral Sea is recognized not only as a regional but also as a global problem. The drying of the sea, increased salinity, and loss of biological resources have disrupted the ecosystem's balance. Studying the changes in microflora is therefore crucial, as microorganisms are key stabilizing components of ecosystems. Moreover, halophilic microorganisms represent valuable resources for biotechnology and hold practical importance in developing new bio-based products.

Materials and Methods. Several basic methods were used in this study. Water and sediment samples were collected from different parts of the Aral Sea under sterile conditions and transported to the laboratory in special containers. Sediment layers were separated for microbiological analysis. To identify microorganisms, microscopy, cultivation on nutrient media, and observation of colony morphology were performed. Colonies were described based on their color, shape, and growth rate. Chemical analyses included measuring water salinity, pH, and total mineralization using standard laboratory equipment. The content and composition of organic matter in sediments were also determined and evaluated for their influence on microflora development.

Results. Preliminary microbiological analyses revealed that the composition of microorganisms varied across different regions of the Aral Sea. Microscopy of water samples showed the presence of several unicellular algae and bacteria, but overall diversity was found to be very limited. Many phytoplankton species have disappeared due to increased salinity. Cultivation of water and sediment samples on nutrient media resulted mainly in the growth of salt-tolerant bacteria. Colonies typically displayed reddish-brown pigmentation, indicating the presence of halophilic microorganisms. Some samples exhibited slow growth, suggesting a general decline in the total number of microorganisms. Chemical measurements confirmed that the sea's salinity level is significantly elevated. The pH remained

close to neutral, but total mineralization exceeded the normal range several times over. The content of organic matter in sediments was relatively low, indicating limited nutrient availability for microorganisms. Overall, the findings show that the microflora of the Aral Sea has drastically diminished under normal conditions, with halophilic microorganisms now dominating the ecosystem.

Conclusion. As a result of the ecological crisis, the microflora of the Aral Sea has fundamentally transformed, with diverse plankton species replaced by halophilic microorganisms. Although this process disrupted the biological balance, it also opened new prospects for biotechnological applications. Therefore, an in-depth study of the Aral Sea microflora is essential for understanding ecological problems and developing practical biotechnological solutions.

Keywords: *Aral Sea, microflora, halophiles, ecological crisis, biotechnology*

IHASE-2025/63

Isolation and identification of bacterial strains (Pseudomonas spp., Bacillus spp.) from local environments that accelerate polyethylene degradation.

Abdug'aniyeva P.Y

National University of Uzbekistan named after MirzoUlugbek

E-mail: pokiza.iphone12@gmail.com

ABSTRACT: Plastic pollution, particularly from polyethylene (PE), has become one of the most persistent environmental problems worldwide due to its resistance to natural degradation. Biodegradation using microorganisms offers an eco-friendly and cost-effective alternative to conventional disposal and recycling methods. This study aims to isolate and identify local bacterial strains, specifically Pseudomonas spp. and Bacillus spp., capable of accelerating polyethylene degradation. Environmental samples such as soil, compost, and waste dumps were collected for bacterial isolation. The selected strains will be identified based on morphological, biochemical, and molecular characteristics. The most effective isolates will be evaluated for their polyethylene degradation potential under controlled laboratory conditions. The results of this study are expected to contribute to the development of sustainable biotechnological solutions for plastic waste management.

INTRODUCTION: Polyethylene (PE) is one of the most widely produced synthetic polymers globally, used in packaging, agriculture, and consumer goods. However, its high chemical stability and hydrophobic nature make it extremely resistant to natural degradation, leading to its accumulation in soil and aquatic environments. Traditional disposal methods such as landfilling and incineration contribute to soil contamination, air pollution, and greenhouse gas emissions.

Recent advances in environmental biotechnology have revealed that certain microorganisms, including species of Pseudomonas and Bacillus, possess the enzymatic capability to degrade polyethylene through oxidation and depolymerization processes. These bacteria can colonize the polymer surface, secrete oxidative enzymes, and utilize low-molecular-weight degradation products as carbon sources. Identifying and characterizing efficient local strains adapted to native environmental conditions is crucial for optimizing biodegradation efficiency and developing practical applications for waste treatment.

Thus, this study aims to isolate and identify indigenous bacterial strains with exceptional polyethylene-degrading capability. We assess the ecological and

economic value of microbial degradation and argue that it can serve as a sustainable, cost-effective strategy to reduce plastic pollution.

CONCLUSION: The isolation and identification of polyethylene-degrading bacterial strains from local environments represent a promising approach to addressing global plastic pollution. Utilizing microorganisms such as Pseudomonas spp. and Bacillus spp. offers an environmentally friendly alternative to conventional waste management practices. By understanding the metabolic and enzymatic mechanisms involved in polyethylene biodegradation, it will be possible to develop effective biotechnological applications for large-scale plastic waste treatment. This research underscores the growing importance of microbial biotechnology in achieving sustainable environmental conservation and waste reduction.

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Effect of abiotic factors on the population dynamics of major sucking pests infesting upland cotton (*Gossypium hirsutum* L.)

Chitralekha[1], A.K. Mehta[2], Sudha Bishnoi[3] And Prince[4]
[1]Department of Entomology, Cotton Research Station, Sirsa, Haryana, India
[2]Department of Agronomy, Cotton Research Station, Sirsa, Haryana, India
[3]Department of Mathematics & Statistics, Cotton Research Station, Sirsa, Haryana
[4]Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India
Corresponding author Email: barwarchitralekha@gmail.com

An Experiment was conducted at Cotton Research Farm, Sirsa, CCS Haryana Agricultural University, Hisar to understand the population fluctuation of major sucking pest in *Bt* cotton *i.e.* cotton whitefly, thrips and leafhopper along with correlation with weather factors during *Kharif* 2024. Population of whitefly, thrips and leafhopper were recorded at weekly intervals. Population of whiteflies ranged from 1.33 to 68.53 adults/3 leaves with maximum during 36th SMW followed by 35th SMW. The correlation studies of whitefly with weather parameters revealed that it had significant and positive correlation with morning relative humidity (0.496**) and evening relative humidity (0.784**). The population of thrips varied from 0.67 to 71.27 adults per three leaves during 23rd to 42nd SMW with maximum population during 28th SMW. Thrips population positively correlated with Minimum temperature (0.537*) while other parameters were non-significant. The population of leafhoppers varied from 0.67 to 10.67 adults per three leaves during 24th to 41st SMW with maximum population during 30th SMW. Leafhopper population has positive correlation (0.437*) with minimum temperature. It has non-significant correlations with rest of parameters.

Keywords: *Abiotic factor, population dynamics, whitefly, thrips, leafhopper, cotton*
* SMW- Standard Meteorological Week

IHASE-2025/65

Isolation and biocontrol potential of endophytic bacteria associated with *Glycyrrhiza glabra L.*

Sokhibjon Abdusamatov[1,2], Numonjon Sultanov[2], Ziyoda Karimova[2], Dilfuza Jabborova[1,2]

[1]Institute of Genetics and Plant Experimental Biology, 111208 Kibray, Uzbekistan
[2]National University of Uzbekistan, 100174 Tashkent, Uzbekistan;
nomonjonsultanov4@gmail.com; Ziyodakarimova2106@gmail.com;
sokhibjon.abdusamatov@gmail.com;
Corresponding author: dilfuzajabborova@yahoo.com

Glycyrrhiza (licorice) belongs to the *Fabaceae* family, characterized by a deep root system and notable tolerance to adverse conditions such as salinity and drought. Numerous clinical and experimental studies have demonstrated that licorice root possesses diverse pharmacological properties, including anti-inflammatory, antiviral, anticancer, immunomodulatory, and hepatoprotective activities, which are attributed to its wide range of bioactive compounds. Among triterpenoid saponins, glycyrrhizic acid is the most abundant and represents a key pharmacologically active constituent with anti-inflammatory, antiviral, immunoregulatory, and other biological activities. Recent investigations have further revealed that licorice flavonoids exhibit multiple pharmacological functions and are gradually becoming a focal point in pharmacological research.

Various beneficial microorganisms associated with *Glycyrrhiza glabra* play a crucial role in promoting plant growth, improving nutrient uptake, and enhancing natural defense mechanisms against pathogens. However, licorice remains vulnerable to several phytopathogens. For instance, *Phytophthora* species are responsible for root rot, while *Fusarium* species damage the vascular system, leading to wilt disease and severely inhibiting plant growth and development. As an eco-friendly approach to combat these pathogens, endophytic bacteria isolated from licorice represent a promising alternative to chemical control. In this study, the antagonistic potential of endophytic bacteria against phytopathogenic fungi was evaluated, highlighting their possible application as natural biocontrol agents to replace chemical treatments.

As a result of the conducted research, a total of 18 endophytic bacterial isolates were obtained from the leaves, stems, and roots of *Glycyrrhiza glabra* L. In vitro assays revealed that several of these isolates exhibited significant antifungal activity against *Fusarium solani*. In particular, isolates ShI-2, ShI-3, ShP-4, ShB-1, ShB-6, and especially ShB-8 demonstrated strong antagonistic activity. Among them, ShB-8, which showed the highest antifungal effect, was selected as a promising candidate for further investigation. The biological activity of these isolates confirms their potential role in maintaining plant health and contributing to the development of sustainable biological protection strategies against plant diseases.

Keywords: *Glycyrrhiza glabra L.; endophytic bacteria; phytopathogenic fungi;* Fusarium solani; Phytophthora: *antifungal effect; biocontrol*

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Effect of Agricultural Commercialization on Farmers: An Indian Approach

Dr. Mahender Pal*

*Assistant Professor (Commerce),
Department of Commerce and Management, Government College,
Bahadurgarh, Jhajjar (Haryana)

This research examines the multifaceted influence of agricultural commercialization on Indian farmers through a comprehensive mixed-methods approach. The study analyzes economic, social, environmental, and institutional dimensions of commercialization across different farm sizes, regions, and crop categories. Using primary data from 180 farmers across two states and secondary data analysis spanning two decades, the research reveals that commercialization has generated divergent outcomes. While it has enhanced productivity, market integration, and income for medium and large farmers in well-developed regions, small and marginal farmers face significant challenges including increased indebtedness, market risks, and environmental stress. The study identifies critical research gaps in understanding gender dimensions, mental health impacts, and long-term sustainability. Key findings indicate that commercialization benefits are mediated by farm size, infrastructure availability, institutional support, and market access. The research proposes a comprehensive policy framework emphasizing inclusive commercialization models, strengthened institutional mechanisms, sustainable farming practices, and targeted support for vulnerable farmer categories. This study contributes to agricultural development literature by providing empirical evidence for designing equitable commercialization strategies that balance economic growth with social equity and environmental sustainability.

Keywords: *Agricultural commercialization, Indian farmers, farm income, market integration, sustainable agriculture, agrarian distress, small farmers, rural development*

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Green Biosynthesis and Characterization of Zinc Oxide Nanoparticles Using Neem (*Azadirachta indica*) Leaf Extract and Their Antibacterial Potential

Reju J[1], Sherin J S[2], Devika Sukumaran[3] and Swaliha Fathima V N[4]
[1&3]Research department of Botany, Union Christian College (Autonomous). Aluva, Kerala
[2&4]Research department of Physics, St. Xavier's College for women (Autonomous), Aluva, Kerala

The present study focuses on the green synthesis of zinc oxide (ZnO) nanoparticles using *Azadirachta indica* (neem) leaf extract as a bioreducing and stabilizing agent, with zinc sulfate serving as the precursor. This eco-friendly, cost-effective biosynthetic method provides a sustainable alternative to conventional chemical and physical nanoparticle synthesis. The phytochemicals present in neem extract effectively mediated the reduction and stabilization of ZnO nanoparticles, producing uniform and stable crystallites. Structural characterization using X-ray Diffraction (XRD) confirmed the formation of monocrystalline ZnO nanoparticles with a hexagonal wurtzite structure, exhibiting sharp diffraction peaks at 31.88°, 34.57°, 36.39°, 47.69°, 56.71°, 62.99°, 66.48°, and 68.04°, indicative of high crystallinity and purity.

Photoluminescence (PL) analysis revealed strong near-band-edge (NBE) emissions at 324 nm and 334 nm, confirming efficient excitonic recombination and minimal defect states in the ZnO lattice. The absence of broad visible emission bands further indicated the high optical quality of the biosynthesized nanoparticles. The antibacterial activity of the ZnO nanoparticles was evaluated against *Escherichia coli* (Gram-negative) and *Staphylococcus aureus* (Gram-positive) using the agar well diffusion method. Results demonstrated a concentration-dependent inhibitory effect, with *S. aureus* exhibiting greater susceptibility (zones of inhibition: 15–18 mm) compared to *E. coli* (12–14 mm).

The antibacterial efficacy is attributed to the generation of reactive oxygen species (ROS), Zn^{2+} ion release, and direct disruption of bacterial membranes. These findings align with earlier reports and underscore the potential of biosynthesized ZnO nanoparticles as effective antibacterial agents. This study highlights the scope of plant-mediated nanoparticle synthesis as a sustainable biotechnological approach with promising applications in agriculture, medicine, and environmental protection.

Keywords: *ZnO nanoparticles, Neem extract, Green synthesis, Photoluminescence, Antibacterial activity, Sustainable biotechnology.*

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Integrating Biodiversity Restoration and Service Learning: A Post-Flood Ecological Revival Model from UCC India

Suman George[1] and Justin R Nayagam[2]
[1]Research Scholar, Department of Botany, Union Christian College (Autonomous), Aluva, Kerala
[2]Assistant Professor and Research Guide, Department of Botany, Union Christian College (Autonomous), Aluva, Kerala
Corresponding author Email: drjustinrnayagam@gmail.com sumangeorgep@gmail.com

Biodiversity loss resulting from human-induced environmental degradation poses a global challenge, with measurable effects even in localized ecosystems such as educational campuses. This study presents a seven-year biodiversity restoration and service-learning initiative undertaken at UCC India, following the 2018 Kerala floods. The 24-hectare campus, which functioned as a temporary shelter for over thirteen thousand flood-affected individuals, suffered extensive vegetation loss and ecological imbalance. In response, a collaborative program was launched involving students, faculty, and local communities to restore native flora, enhance biodiversity, and promote environmental stewardship through participatory approaches.

The project focused on the establishment of fruit tree gardens, conservation of rare and endangered plant species, and integration of traditional ethnobotanical knowledge. A multidisciplinary framework was adopted, combining classroom-based ecological education, field surveys, herbarium documentation, and reflective service-learning activities. Data collected over the study period revealed that 44.56% of recorded plant species were available year-round, while 40.22% possessed medicinal properties linked to traditional healing practices. Nearly half of the documented species were identified as underutilized or unknown to the local population, highlighting opportunities for awareness, conservation, and sustainable use.

Beyond ecological restoration, the initiative significantly enriched student learning outcomes by bridging theoretical instruction with experiential, community-based practice. It fostered environmental consciousness, social responsibility, and applied understanding of ecosystem resilience among participants. The program demonstrates how academic institutions can serve as living laboratories for biodiversity conservation while advancing the principles of sustainability education. This integrated approach to post-disaster ecological recovery aligns directly with the United Nations Sustainable Development Goal 15 (Life on Land), underscoring the role of higher education in promoting biodiversity restoration, sustainable land use, and community engagement.

Keywords: *Biodiversity restoration, Service learning, Ecological resilience, Ethnobotany, Sustainable education, Kerala floods, SDG 15.*

IHASE-2025/69

Shifting cultivation: An old age agriculture practice in forests, and measures to improve its productive and protective functions

Rajesh Kumar
Assistant Professor, Department of Forest Products and Utilization,
Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya,
Durg (Chhattisgarh), India
Email: rajesh.dewangan0506@gmail.com

Shifting cultivation, also known as slash-and-burn or swidden agriculture, is an ancient farming method still practiced in various parts of the world, including India. This traditional practice involves clearing forested land, burning vegetation, and cultivating crops for a few years before moving to a new location. Despite its long history, shifting cultivation has significant environmental and social implications, including deforestation, soil erosion, and loss of biodiversity. In India, shifting cultivation is prevalent in the northeastern states, where it is a primary source of income for over 5 lakh tribal families. However, the practice has led to the degradation of 22% of the topsoil in jhum-dominated areas, resulting in soil fertility loss and decreased crop yields. To address these concerns, strategies such as agroforestry, soil conservation, and participatory land use planning have been proposed. The incorporation of new technologies, such as contour trenches, vegetative bunds, and organic mulch, can help reduce soil erosion and improve soil fertility. Furthermore, the adoption of sustainable land use systems, such as alder-based shifting cultivation, can provide an alternative to traditional practices. This study aims to explore the social and environmental aspects of shifting cultivation, its history, and the various strategies being implemented to improve its productivity and sustainability. By examining the complex relationships between shifting cultivation, environment, and society, this research seeks to contribute to the development of more effective policies and practices for managing this ancient yet problematic practice.

Keywords: *Shifting cultivation, deforestation, tribal community, ecology, sustainable agriculture.*

IHASE-2025/70

Effect of Different Levels and Combinations of Panchgavya and Jeevamrit on Growth Parameters of Mango (*Mangifera indica* L.) under Organic Production System at SKUAST-J, Chatha

Ankush, Shalini Devi
Division of Fruit Science, Centre for Organic and Natural Farming, SKUAST-J, Chatha, Jammu and Kashmir, India, 180009
Ankushjallandhra77@gmail.com, 7784877800, Shalinicham112@gmail.com, 7831037556
Corresponding Author- Ankush (Ankushjallandhra77@gmail.com)

The present study will be conducted on eight-year-old mango plants maintained under the organic system at the Centre for Organic and Natural Farming, SKUAST-J, Chatha, Jammu, to evaluate the effect of different levels and combinations of *Panchgavya* and *Jeevamrit* on growth parameters. The experiment will include three levels each of *Panchgavya* (P1: 0%, P2: 3%, P3: 5%) and *Jeevamrit* (J1: 0%, J2: 3%, J3: 5%), along with their respective combinations (J1P1, J1P2, J1P3, J2P1, J2P2, J2P3, J3P1, J3P2, and J3P3). The parameters to be recorded include plant height (cm), plant spread (cm), stem girth (cm), average leaf area (cm^2), and relative growth rate (cm cm^{-1} per month). The results are expected to show significant variation among treatments. The combined application of *Panchgavya* and *Jeevamrit* is anticipated to exhibit a synergistic effect on plant growth compared to their individual application. Among all the treatments, J3P3 (5% *Jeevamrit* + 5% *Panchgavya*) is expected to record the highest values for all growth parameters, while the minimum performance is expected in J1P1 (control). The superior performance under J3P3 may be attributed to enhanced microbial activity, improved nutrient availability, and hormonal stimulation. The study aims to conclude that the integrated use of *Jeevamrit* and *Panchgavya* at 5% concentration each is the most effective combination for improving growth performance of mango under organic production systems, thereby promoting sustainable and eco-friendly farming.

Keywords*: Panchgavya, Jeevamrit, Mango, Organic farming, Growth parameters, Sustainable agriculture*

IHASE-2025/71

Precision Agriculture: Role of Sensor Technology in Crop Monitoring and Sustainable Farm Management

Abhijit Singh[1], Shalini Devi[2]
[1]Department Agribusiness Management, College of Basic Science, Punjab Agriculture University, Punjab [2]Division of Fruit Science, Centre for Organic and Natural Farming, SKUAST-J, Chatha, Jammu and Kashmir, India, 180009
Contact details: Abhijitsingh0230@gmail.com, 9878590021, Shalinicham112@gmail.com, 7831037556
Corresponding Author- Abhijit (Abhijitsingh0230@gmail.com)

Precision agriculture represents a modern farming approach that utilizes advanced technologies to enhance productivity, resource efficiency, and environmental sustainability. Among these technologies, sensor-based systems play a pivotal role in the continuous and accurate monitoring of crops and their growing environments. Sensor technology enables the collection of real-time data on crucial parameters such as soil moisture, temperature, nutrient content, crop canopy status, and microclimatic conditions. This data-driven approach allows farmers to make informed decisions related to irrigation, fertilization, pest management, and harvesting, thereby optimizing input use and improving overall farm efficiency. Various types of sensors such as soil sensors, plant sensors, environmental sensors, and remote sensing devices integrated with GPS and GIS help detect spatial and temporal variability within fields. The integration of these sensors with Internet of Things (IoT) platforms and data analytics systems further facilitates automation and precision in crop management. Drone-mounted and satellite-based sensors have also expanded the scope of large-scale crop monitoring and yield prediction. The adoption of sensor technology in precision agriculture not only reduces input wastage and environmental impact but also enhances yield quality and farm profitability. However, challenges such as high installation costs, technical expertise requirements, and data management limitations still constrain its wider application. Overall, sensor technology-based precision agriculture holds immense potential for transforming traditional farming into a sustainable, efficient, and intelligent production system.

Keywords*: Precision agriculture, Sensor technology, Crop monitoring, Soil sensors, IoT, Remote sensing, GIS, Smart farming*

IHASE-2025/72

Effect of Iron and Sulphur on Ascorbic acid, Phenolic, and Glutathione Content in Different Stages of Contrasting Varieties of Pearl millet Under NFT System

Sunil[1*] and Vinod Kumar[2]
[1]Department of Biochemistry, CCS HAU, Hisar, Haryana, India
[2]Division of Biochemistry, FBSc, SKUAST-Jammu,
Main Campus Chatha, J&K, India
Corresponding Author Email: suniltaak23@gmail.com,
Contact No. 9996550425

This study aimed to investigate the Effect of Iron and Sulphur on Ascorbic acid, phenolic, and glutathione content in different stages of contrasting varieties of pearl millet under the NFT System. The genotypes, i.e., HHB-67 Improved and HHB-299, were used in this study. Plants were grown through a modified nutrient film technique (NFT). Nutrient deficiencies were applied from the five-leaf stage to maturity. Four treatments of combinations of iron and sulphur, Control (-Fe -S), T1 (+Fe -S), T2 (-Fe +S), T3 (+Fe +S), were used. Seedlings were grown up to maturity in the NFT system, and samples for ascorbic acid, phenolic, and glutathione content analysis were collected at the panicle initiation stage, boot stage, and maturity stage. The ascorbic acid content showed an increase from the panicle initiation stage to the maturity stage in both genotypes. Total glutathione levels were higher under iron-and sulphur-deficient conditions and lower when Fe and S were supplied at various growth stages. In both genotypes, glutathione content increased progressively from the panicle initiation to the maturity stage due to nutrient deficiency. The hybrid consistently exhibited significantly higher total glutathione content than HHB-67(I) under comparable growth stages and treatments. Similarly, total phenolic content increased from the panicle initiation to the maturity stage in the shoots of both genotypes. Among the treatments, phenolic compounds, ascorbic acid, and glutathione levels were highest under nutrient-deficient conditions (T0) and declined with nutrient supplementation (T1, T2, and T3). Overall, HHB-299 demonstrated superior performance across growth stages, reflecting better adaptability and stress tolerance.

IHASE-2025/73

Comparative Extraction of Sulphated Polysaccharides from Red Algae and Biomedical Evaluation of a Sulphated Polysaccharide Hydrogel from *Gracilaria corticata*

Rithika. R
Research Scholar, Department of Biotechnology,
Christ (Deemed To Be University), Bengaluru

Marine red algae are being considered to be a suitable source of bioactive sulfated polysaccharides (SPs) with diverse applications in medicine. The present study deals with an extraction and characterization of sulphated polysaccharides from *Gracilaria corticata* and *Porphyra indica*, followed by testing the property of sulphated polysaccharide hydrogel from *G. corticata* for potential biomedical applications. For extraction, these SPs are separated using ethanol precipitation. The carbohydrate and sulphate contents of the SPs were determined, and further analysis was performed via FTIR characterization which showed that functional hydroxyl, sulphate, glycosidic, and carboxylate groups were present. *Gracilaria corticata* had the highest amount of polysaccharide (43.25 µg/mL) and sulphate (100.20 ppm) compared to *P. indica* (14.81 µg/mL and 97.61 ppm respectively), thus semi prepared for hydrogel formulation along with chitosan.

Most astonishingly, the gel had a pronounced antibacterial activity against *E. coli* (25.67 mm inhibition zone) and *S. aureus* (19.67 mm). DPPH assay confirmed concentration-dependent antioxidant activity (R^2 = 0.961). Cytotoxicity studies through the MTT assay have illustrated excellent biocompatibility with greater than 85% fibroblast cell viability and have shown significant wound healing potential as demonstrated in the scratch assay with 92.6% closure within 48 hours.

Gracilaria corticata therefore stands established as a marine resource of bioactive sulphated polysaccharides which might be sustainably available in the future. Hydrogel serves as a natural and biodegradable biomaterial for wound healing and other biomedical applications in the future possessing antioxidant, antibacterial, and cytocompatibility properties.

Keywords: *Sulphated Polysaccharides, Gracilaria corticata, Red Algae Hydrogel, Wound Healing, Antioxidant Activity, Antimicrobial Activity, MTT Assay, Scratch Assay, Marine Biomaterials, Natural Wound Dressing.*

IHASE-2025/74

Innovations in Emerging Bioplastics and their Future Prospects

Nisha Rana
**orcid Id: 0000-0001-9896-8674
Email: nisharana.zoology@gmail.com
Research and Development Cell
Swami Vivekanand Subharti University,
Meerut U.P., India, 250005

The present study is focused on the innovation and impact of eco-friendly plastics. Conventional plastics, which are mostly made from fossil fuels, have long been linked to serious environmental problems, such as ongoing pollution, widespread landfill usage, and a large carbon footprint. The hunt for substitute materials that can offer comparable functionality while causing less environmental damage has been sparked by growing awareness of these problems. Biodegradable polymers, bio-based plastics made from renewable resources, and advanced recyclable materials are examples of eco-friendly plastics that show promise in addressing these issues. The environmental effects of using eco-friendly plastics are thoroughly examined, with special attention paid to how they may lessen the buildup of plastic waste, cut down on greenhouse gas emissions, and preserve limited natural resources. This paper focuses on the technological advancements that facilitate the production of eco-friendly plastics. Innovations in biopolymer synthesis, recycling technologies, and waste management techniques are highlighted.

These developments help create a circular economy and aid in the pursuit of a more resilient and sustainable future by lessening the environmental impact of plastic manufacture and disposal. The conclusion highlights the necessity of more study and funding for environmentally friendly polymers in order to secure their long-term viability and incorporation into commonplace uses.

Keywords- *Biodegradable polymers, renewable resources, plastic waste, environmental impact, biopolymer synthesis.*

IHASE-2025/75

Impact of Arbuscular Mycorrhizal (AM) Inoculation on Establishment and Shoot Growth Performance of Potted Litchi *(Litchi chinensis* Sonn.) Plants

Shalini Devi
Division of Fruit Science, SKUAST-J, Chatha, Jammu and Kashmir, India, 180009
Shalinicham113@gmail.com, 7831037556
Corresponding Author- Shalini Devi

The present investigation was conducted to evaluate the impact of arbuscular mycorrhizal (AM) inoculation on the establishment and growth performance of potted litchi (*Litchi chinensis* Sonn.) plants propagated through air layering. Six treatments were formulated to assess the effect of AM under varying growth media combinations. The treatments included AM inoculated (+A) and uninoculated (-A) plants grown in media composed of Soil + Sand + FYM (1:1:1), Litchi orchard soil + Vermicompost (1:1), and Soil + AM. The experiment focused on key shoot growth parameters, namely increase in shoot length, length of longest shoot, increase in shoot diameter, and number of shoots per plant. Results revealed significant variation among treatments with respect to growth response. Treatment T_3 (AM inoculated air layered plants grown in Litchi orchard soil + Vermicompost in 1:1 ratio) recorded the highest performance in all shoot growth parameters, indicating better plant Vigor, enhanced nutrient uptake, and improved establishment. In contrast, the lowest growth response was observed in T_2 (AM uninoculated plants grown in Soil + Sand + FYM in 1:1:1 ratio), suggesting that absence of AM symbiosis restricted nutrient acquisition and root development. The findings confirm that AM inoculation, particularly in combination with nutrient-rich organic substrates like vermicompost, plays a pivotal role in enhancing the establishment and early growth of litchi plants under potted conditions. The study highlights the potential of AM as a sustainable bio-inoculant for improving nursery performance in litchi propagation.

Keywords*: Arbuscular mycorrhiza, Air layering, Vermicompost, Shoot growth, Bio-inoculant*

IHASE-2025/76

Accumulation of Heavy Metals in the Soil-Plant System and Associated Risk Assessment of Forages Irrigated by Sewage Water

Mahendra Prasad[1]*, Sonu Kumar Mahawer[1], M.M. Das[1], M. Vassanda Coumar [2], J.K. Saha[2]

[1]Crop Production Division, ICAR-Indian Grassland and Fodder Research Institute, Jhansi (UP), India

[2]Environmental Soil Science Division, ICAR-Indian Institute of Soil Science, Bhopal (M.P.), India

Email: mahendra.meena18@gmail.com

Sewage water (SW) irrigation is commonly practiced in developing countries, especially in arid and semi-arid regions, due to its cost-effectiveness and nutrient-rich nature. However, it also introduces heavy metals (HMs) into the soil–plant system, posing ecological and health hazards. This study evaluated the effects of blending SW with groundwater (GW) at different ratios—T1 (GW alone), T2 (25% SW + 75% GW), T3 (50% SW + 50% GW), T4 (75% SW + 25% GW), and T5 (SW alone) on fodder yield, heavy metal accumulation, and associated risks to livestock over three years. Results showed that SW application enhanced soil fertility and fodder productivity but significantly increased HM concentrations. Among the tested crops, oat accumulated the least HMs, whereas cowpea, maize, and berseem showed higher uptake, with Pb levels in SW treatments exceeding permissible limits. The T2 treatment exhibited the lowest metal accumulation, while pollution indices classified all crops except oat as “severely” to “heavily polluted.” Ecological risk indices were low for T1–T3 and moderate for T4 and T5, with Cd contributing most to ecological risk. Transfer factors (TF) for Cr, Ni, and Cd were below 1, while Pb exceeded 1 in all crops. The health risk index (HRI) for Pb was above 1, indicating potential health hazards for livestock consuming fodder grown with SW irrigation. Therefore, using a 1:3 SW: GW blend combined with low metal-accumulating fodder species is recommended to enhance productivity while minimizing ecological and health risks, depending on water quality composition.

Keywords: *Sewage water, Fodder crops, Heavy metals, Risk Assessment*

IHASE-2025/77

Sustainable Use of Shrimp Waste to Improve Pigmentation and Growth in Three-Spot Gourami *Trichopodus trichopterus*

Krina Patel[*1], Rajkumar Dabhi[2]

[*1]Department of Aquaculture, Kamdhenu University, Veraval, Gujarat, 362266.

[2]Fisheries Research Station, Kamdhenu University, Sikka, (361 140), Gujarat, India

The present study evaluated the effect of shrimp waste powder on pigmentation, growth, survival, and whole-body composition of the three-spot gourami (*Trichopodus trichopterus*). Four isonitrogenous diets (30% protein) were prepared: a control diet (T0) without shrimp waste powder supplementation and three diets containing shrimp waste powder at 5% (T1), 10% (T2) and 15% (T3). Each treatment was conducted in triplicate. Total carotenoid content and pigmentation intensity increased with the level of shrimp waste inclusion, with the highest values recorded in T3. Growth performance, expressed as weight gain (%) and specific growth rate (SGR), was significantly higher in T3, which also showed the lowest feed conversion ratio (FCR). Whole-body proximate composition improved with increasing shrimp waste levels, with the highest crude protein and lipid content observed in T3. No significant difference was found in survival rate among treatments. Overall, 15% shrimp waste powder proved most effective for enhancing colouration and growth of *T. trichopterus*.

Keywords: *Shrimp waste powder, Pigmentation, Growth, Whole-body composition*

IHASE-2025/78

Evaluation and optimizing the effectiveness of water harvesting structures to ensure water security through groundwater recharge for the Kanari River's revival

Ayushi Trivedi[1*], MK Awasthi[2] and Nirjharnee Nandeha[3]

[1*]Department of Natural Resource Management, Mahatma Gandhi University of Horticulture and Forestry, Sankara, Patan, Durg, 491111, Chhattisgarh

[2]Department of Soil and Water Engineering, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004,Madhya Pradesh

[3]Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492001, Chhattisgarh

Another way to raise surface and groundwater levels and provide a steady supply of water to areas that require it to ensure the water security of an expanding population is through artificial recharge. In order to assess groundwater potential zones and identify appropriate zones and sites for groundwater recharge for river revival, the current study's scope makes use of geospatial and multi-criteria decision analysis (MCDA) approaches. This study recommended the pragmatic methodology for the installation of water harvesting systems. Satellite and conventional datasets were systematically processed with field judgments to yield the many theme data of the research region. For each individual feature, the analytical hierarchical process (AHP) in a geographic information system (GIS) was used to calculate the geometric mean and the normalized weight. Potential groundwater zones were also discovered. Using a GIS platform, satellite-derived multiple thematic maps were integrated to identify the groundwater recharge zone and the sites of artificial recharge facilities within the Kanari river system. In order to ensure water availability, the water budgeting process finally evaluated the water demand for households, agricultural, pumping, and livestock. The study's findings led to the conclusion that the Kanari River watershed's water demand was assessed to be 731.83 MCM. With this in mind, the Kanari River watershed's pumping overdraft was calculated and found to be 423.192 MCM. The proposed additional recharge through the planned conservation structure is 858.8 MCM. It is easy to conclude that if overdrafting through pumping is also taken into account, this additional recharge can meet the requirement, maintain the river's flow, and guarantee water availability and security.

Keywords *Water Security, Artificial recharge, Groundwater recharge, Spatial data, MCDA, Water harvesting structures*

IHASE-2025/79

Effect of Biodynamic Preparations and Organic Inputs on Growth Dynamics, Yield Attributes, and Economics of Different Wheat Varieties

Nirjharnee Nandeha[1*] and Ayushi Trivedi[2]

[1*]Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492001, Chhattisgarh

[2]Department of Natural Resource Management, Mahatma Gandhi University of Horticulture and Forestry, Sankara, Patan, Durg, 491111, Chhattisgarh

The effects of biodynamic preparations were investigated in the setting of contrasting conventional, organic, and biodynamic systems as well as a variety of varietal systems. Four distinct wheat varieties were used as the subplot treatments, each of which was repeated three times, while seven BD (bio-organic preparations) were used as the main plot treatments in the experiment's split plot design. At 30, 60, 90, and harvest, observations were made based on crop growth studies and plant population (i.e., plant height, plant population, number of tillers, and plant weight (dry) of wheat). At 30, 60, and 90 DAS, data on LAI and chlorophyll concentration were also documented. The net assimilation rate (NAR), crop growth rate (CGR), and relative growth rate (RGR) were calculated at 30-60 and 60-90 day intervals, respectively. At harvest, the variables that contributed to the yield—ear head length, number of effective tillers per meter square, number of grains per ear head, weight of grains per ear head, test weight, and, lastly, grain and straw yield—were noted. On the basis of benefit-cost BC ratio, cost cultivation, net monetary returns, and gross monetary returns per hectare, the economic feasibility of the treatments was finally assessed. The results are interpreted using data related to the several parameters that were statistically analyzed. Compared to applying BD500, BD501, and P separately with VC, the combination application of BD500+BD501+ P+VC, followed by P+VC and BD500+BD501 + VC, resulted in a significant increase in wheat grain yield of 22.29, 18.26, and 6.38%. yields of grain (2462.18 kg per ha) and straw (3149.88 kg per ha), including harvest index (HI) (43.73), that are noticeably higher. BD500+BD501+P+VC outperformed BD500+BD501+VC and P+VC in terms of profitability. In addition, it was seen that the employment of BD-500+BD-501 or P+VC in JW-3020 and HW-2004, as well as BD500+BD-01+P or P+VC in C-306 and Sujata, stood out as more profitable.

Keywords *Bio-dynamic preparations, vermi compost, Panchgavya, Sharbati wheat, organic nutrient management*

IHASE-2025/80

Exploring the Green Niche: Consumer Insights into the Exotic Vegetable Market of South Gujarat

Swati Sharma[1*]
ASPEE Agribusiness Management Institute
Navsari Agricultural University Navsari
Email: swatisharma_abm@yahoo.co.in
Contact No.: 9662913378

The demand for exotic vegetables has emerged as a rapidly expanding niche within the global agri-food system, reflecting shifting consumer preferences toward dietary diversity, wellness, and nutritional enrichment. Exotic vegetables typically comprising non-native, high-value, or specialty crops have gained prominence in urban markets as consumers increasingly explore novel culinary options and health-oriented lifestyles. The present study analyzes consumer preferences and determinants influencing the purchase of exotic vegetables in selected urban centers of South Gujarat. Primary data were gathered from 300 respondents using a structured and pre-tested questionnaire. Statistical tools, including descriptive and inferential analyses, were applied to identify key factors shaping consumer purchasing behavior. The findings revealed that coloured capsicum, broccoli, Lollo Rosso, and cucumber were among the most preferred exotic vegetables. Major determinants influencing consumer choice included nutritional benefits, affordability, product quality, quantity, and hygiene standards. Conversely, issues such as short shelf life, lack of traceability, perceived inconsistency in quality, and limited acceptance among family members were identified as major constraints. The study emphasizes the importance of enhancing consumer awareness, ensuring the continuous supply of preferred varieties, and strengthening supply chain efficiency to promote sustained demand. Addressing these factors can improve consumer satisfaction, reduce market inefficiencies, and foster the sustainable growth of the exotic vegetable sector in South Gujarat.

Keywords: *Consumer behaviour, Exotic vegetables, Purchase determinants, Market constraints, South Gujarat*

IHASE-2025/81

Determination of Marketed Surplus of Farm Production

Dr. Ravi Singh Chouhan
Cost of Cultivation Scheme, Deptt. of Agril. Econ. & F. M.
JNKVV, Jabalpur (M.P.)

Marketed surplus is a portion of production, which actually sold in market after deduction of quantity of retained from home consumption, seed, payment of in-kind to labours and losses in post harvest activities. The farmers on road side village dispose of more percentage of marketed surplus than farmers of interior village, the same has been found to be true for the villages connected with bridges. The quantum of marketed surplus increases with size of farms and had negative response to price. An increase in income resulting from an increase in price results in a large demand for increased consumption of the food staple than the accompanying negative substitution effect on consumption and positive output supply effect. The elasticity of marketable surplus will be positive if the elasticity of supply is greater than price elasticity of home consumption. Commercial crops marketed through official channels indicate a tendency for supply response to be positive and rational in these crops nearly more than 80 percent output was marketed while, in food crops around 50 per cent of output was found to be marketed in these channels. Farmers need to encourage opting for farm level storage through helping in creation of efficient storage structure at farm level and taking serious and effective steps for promotion of use of warehouse receipt programme among the farmers. Marketers need to design creative solutions like e-marketing to overcome challenges typical of the rural environment such as physical distribution, channel management promotion and communication. The “anytime-anywhere” advantage of e-marketing leads to efficient price discovery, offers economy of transaction for trading and more transparent and competitive setting.

Key word: *Determination, Marketed Surplus, Farm Production*

IHASE-2025/82

Development, Characterization and Evaluation of cubosomes nanoparticles (CUBNPs) for co-delivery of 5- Fluorouracil (5-FU) and 4-MTBlTC (Er), A synergistic approach

Sharabjit Singh[a*], Prabhjot Kaur[a],Shivani Attri[a], Saroj Arora[a*]

[a] Department of Botanical and Environmental Sciences, Guru Nanak Dev University, Amritsar 143005, India

Combination therapy is based on the valuable properties of pharmacodynamic interaction (synergistic or additive) between combined drugs or substances. Although significant progresses in cancer therapy, chemotherapeutic agents are still the main forms of drugs used to treat cancer patients. 5-Fluorouracil (5-FU) is the first-line treatment in numerous kind of human cancers, however, sustained release and high doses toxicity are the important barrier to attain efficient response in cancer patients. The use of cubosomes nanoparticles (CUBNPs) for tumor targeted delivery of 5-FU in combination with additional potent anticancer agent is considered an important strategy to enhance the therapeutic efficacy of 5-FU. In this study, we planned to use CUBNPs to co-encapsulate 5-FU and 4-MTBITC (ERUClN), a natural compound, known to enhance the therapeutic efficacy of chemotherapy. CUBNPs were prepared by using solvent evaporation technique by two-factors and three-level central composite design and characterized for size and drug encapsulation efficacy. The cell growth inhibitory effect of prepared CUBNPs was assessed by MTT assay on Ehrlich ascites carcinoma (EAC) colon cancer cell line. The analysis of CUBNPs by dynamic light scattering showed that the developed CUBNPs have average size of 5-FU CUBNPs, 4-MTBITC CUBNPS and 5-FU&4-MTBITC loaded CUBNPs were 23nm, 26nm and 88nm. The encapsulation efficiency of CUBNPs was 42.24±0.058% and 99.38±0.037% for 5-FU and 4-MTBITC, respectively. FTIR evaluation revealed successful encapsulation of 5-FU and 4-MTBITC in the Cubosome. TEM images showed that cubic nanoparticles were irregular or non-spherical in structure. Furthermore, the CUBNPs showed a remarkable antioxidant and cellular uptake in EAC cells as compare to pure form. CUBNPs loaded individually or with both 5-FU and 4-MTBITC (5-FU&4-MTBITC loaded CUBNPs) were found to have significantly higher growth inhibitory effects as compared with CUBNPs loaded with each drug alone in CUBNPs as well as pure drug in EAC cell line.

Keywords: *4-MTBlTC, 5-Fluorouracil, Central composite design, Cubosomes Nanoparticles, Ehrlich ascites carcinoma.*

IHASE-2025/83

Satellite-Based Spatiotemporal Crop Health and Stress Analysis: A Case Study of Ludhiana District, Punjab

Devansh Negi
Symbiosis Institute of Geoinformatics, Symbiosis International University, India **Email:** [devnegi8192@gmail.com] | **Phone:** [+91-8791792496]

Abstract: It is vital to monitor the health of crops effectively and in a timely manner in order to optimise agricultural productivity and sustainability. This research will address a prototype satellite approach to assess the response of crops in Ludhiana District, Punjab with respect to crop strength and crop stress throughout the 2024 growing season. We generated vegetation and stress related indices from a great number of Sentinel-2 images using two major studies (1) Time-Series Phenology Monitoring, and (2) Stress Detection Mapping. The Normalized Difference Vegetation Index (NDVI) time series had a good performance at different phenological stages of the crop life cycle, with respect to differences of Vigor, as well as peak growth and senescence. The Normalized Difference Moisture Index (NDMI) and Normalized Difference Red Edge Index (NDRE) were used to indicate water stress and a deficit of nutrients or chlorophyll respectively. A composite Decision Map was developed from all indices to classify fields into non-vegetated, water-stressed, nutrient-stressed and healthy zones. Overall, results confirm that remote sensing can monitor crops in a variety of ways, which enables early detection of physiological stress reliably. Such a tool opens doors to precision agriculture and sustainable resource management, especially in areas where very limited or no data is available.

Keywords: *Remote Sensing, Crop Health, Indices, Phenology, Precision Agriculture*

IHASE-2025/84

Optimizing Floral Productivity in *Ixora* Loose Flower Cultivation through Precision Foliar Application of Secondary and Micronutrients

Reshma R[1], Ganga M[2], Visalakshi M[3], Irene Vethamoni P[4] and Chitdeshwari T[5]

[1,2]Department of Floriculture and Landscape Architecture, TNAU, Coimbatore [3]Department of Medicinal and Aromatic Crops, TNAU, Coimbatore

[4]Department of Horticulture, TNAU, Coimbatore

[5]Department of Soil Science and Agricultural Chemistry, TNAU, Coimbatore

Correspondence Email: reshurv1998@gmail.com

Theme 1: Horticulture and Agriculture for Sustainable Development
Subtheme: Horticultural, Sericulture, Entomology and Agricultural Practices

A field experiment was conducted during the academic year 2022–2023 at Tamil Nadu Agricultural University, Coimbatore, to investigate the influence of foliar-applied secondary and micronutrients on the floral parameters of various *Ixora* genotypes. The study utilized a Factorial Randomized Block Design (FRBD) with two replications, assessing the effects of different combinations of $CaCl_2$ $CaNO_3$, $FeSO_4$, $ZnSO_4$ and Boric acid across four *Ixora* genotypes viz., Red (*I. casei*), Pink (*I. chinensis*), Orange (*I. coccinea*) and Yellow (*I. chinensis*). Nutrients were administered as monthly foliar sprays. The results confirmed the significant role of secondary and micronutrients in boosting floral parameters. Specifically, the combination of NPK + $FeSO_4$ (0.5%), $ZnSO_4$ (0.5%), Boric acid (0.2%) and $CaCl_2$ (1%) proved to be the most effective treatment when combined with the Pink genotype (*I. chinensis*), this formulation achieved the highest values for key yield parameters, including the maximum number of flower cymes per plant (17.50), highest flower cyme weight (10.05) and maximum hundred florets weight (17.96). The study successfully identified an optimal nutrient regime and superior genotype, demonstrating a practical strategy for enhancing the commercial productivity of *Ixora* as a loose flower crop.

Keywords: *Ixora, Micronutrients, Foliar Spray, Flower Yield, Genotypes*

IHASE-2025/85

Ethnopharmacology and therapeutic potential of macrolichens of Kilbury region, Nainital

Neha Pantola*, Balwant Kumar and Prachi Joshi
Department of Botany, S.S.J.U. Campus (Almora) 263601, Uttarakhand
Department of Botany, SSJDWSSS Govt. P.G. College,
Ranikhet (Almora) 263645, Uttarakhand
Corresponding Email: pantola.neha123@gmail.com
Contact no: 9917932023

The Indian Himalayan region, particularly Kumaun Himalaya, provides diverse forest stands ranging from tropical to alpine regions, that offers wide range of habitats for numerous kinds of lichens. The India, represents maximum count of lichens with around 1614 taxa. Particularly, Uttarakhand solely holds majority number of lichens with 777 taxa. Lichen is a microecosystem where several microorganisms such as algae, fungi, bacteria, and viruses exist altogether in a close relationship. The master-slave dynamics of lichen where the fungal partner dominates, possibly at the expense of the algal partner depicts the "Helotism" nature of these miniature organisms. The present study collates and discusses the available knowledge on phyto-pharmacological activities of macrolichens. A total of 28 macrolichens belonging to 19 genera along with 6 families, foliose (22), dimorphic (2) and fruticose (4) have been reported from Kilbury region of Nainital. The total 28 macrolichens were reported that possess pharmacological uses. Of which 18 macrolichens were identified and utilized as antioxidant, 17 lichen species were utilized in traditional medicine, 15 macrolichens possess antibacterial and anticancerous property either in India or elsewhere, 11 species of macrolichens have been tested positive for antimicrobial and antifungal about 9 species are screened for inhibitory and anti-inflammatory activity. The aim of this study is to succinctly elaborate upon and summarize a legacy of research in lichen ethnopharmacological dynamics in a precise manner and to fill the research gap in the field of lichenological research.

Keywords: *Forest types, lichens, medicinal properties, therapeutic uses.*

IHASE-2025/86

Softwood Grafting: A Progressive Approach to Enhance Tamarind (*Tamarindus indica* L.) Propagation and Sustainability

J. Uma Devi[1], M. Madhavi[2], E. Padma[3] and P. Subbaramamma[4]
Dr. Y.S.R. Horticultural university, Andhra Pradesh. jampaumadevi17@gmail.com

Tamarind is a multipurpose perennial tree valued for its fruit, timber, and medicinal uses, but its conventional propagation through seeds results in genetic variability and prolonged juvenile periods. To overcome these limitations, softwood grafting has been recognized as an efficient and reliable technique for producing true-to-type and early-bearing plants. The present investigation entitled *"*Studies on Effect of Precuring and Time of Grafting on Success of Softwood Grafting in Tamarind, was conducted at the College of Horticulture, Venkataramannagudem, during 2020. The experiment comprised 16 treatment combinations with two factors—precuring of scion sticks at two levels (unprecured and precured 10 days prior to grafting) and time of grafting at eight levels (fortnight intervals from 15th March to 30th June) with two replications. Observations were recorded at 60, 90, 120, and 150 days after grafting (DAG). Results revealed that grafting performed on 15th March with precured scions exhibited superior growth performance across all parameters. The maximum scion shoot length (33.60, 36.85, and 40.80 cm at 90, 120, and 150 DAG respectively), scion diameter (0.60, 0.70, 0.83, and 1.09 cm at 60, 90, 120, and 150 DAG), and number of leaves per graft (51.70, 54.10, 57.70, and 59.70) were recorded in this treatment, whereas the lowest values were observed in grafting performed on 30th June with unprecured scions.

Keywords: *Tamarind, softwood grafting, Precured, unprecured scions*

IHASE-2025/87

Elucidation of Genetic Diversity of Mulberry Germplasm through Microsatellite Markers

Yawer A. Dar, Shabir A. Wani and Sadaf Rashid Malik
College of Temperate Sericulture, Mirgund S.K. University of Agricultural Sciences and Technology, Srinagar (J & K) India -191121
Corresponding author email: yawerdar2001@gmail.com

Genetic diversity forms the basis for adaptation, breeding and trait improvement in crops like mulberry. To assess diversity at the DNA level, molecular markers provide a reliable and accurate tool. Simple Sequence Repeats (SSRs) being particularly effective due to their abundance, high polymorphism, co-dominant inheritance and reproducibility. In the present investigation, SSR markers were employed to analyze the genetic diversity of temperate mulberry genotypes. The Polymorphism Information Content (PIC) values ranged from 0.00 (MESTSSR113) to 0.59 (MESTSSR67), with an average of 0.43, indicating moderate polymorphism among genotypes. Jaccard's dissimilarity coefficient ranged from 0 to 10, with the highest dissimilarity observed between Kanva-2 and Chatalul Mirgund and complete similarity between TR-10 and China White/Robeshsernel. Cluster analysis grouped the genotypes into three major clusters a large core cluster (V-1, Kanva-2, Sujanpur, Kairiyoroso, KNG, China White, Kokuso-20, Kokuso-21, Tomeiso, France, Enshutakasuki, Ichi, Zust, Cherry, Robeshsernal, Serpentina, Mandaliya, Goshoerami and Obawase), a small intermediate cluster (TR-10) and a divergent group (Botatul, Chatatul Mirgund).PCA revealed that Botatul and Chatatul Mirgund were genetically divergent and clearly separated from the main cluster. Goshoerami occupied a somewhat distinct position in the lower right quadrant, while TR-10 grouped closely with other genotypes, indicating intermediate genetic status. The results reveal considerable genetic variation within the germplasm, suggesting that genetically distinct genotypes can serve as valuable resources for future breeding for development of new genotypes with maximum improved traits.

Keywords: *Genetic diversity, Polymorphism, SSR markers, Co-dominant*

IHASE-2025/88

Climate-smart Agriculture and Carbon farming as an adaptation strategy

Anita Kerketta[1], Ayusha Gupta[2], Suresh Kumar Wakre[2], Richa Sao[1], Amit Dixit[3]

[1]Assistant Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.

[2]Ph.D. Scholar, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.

[3]Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.

Correspondence: anitakerketta@mguvv.ac.in

Climate-smart Agriculture (CSA) is a set of agricultural practices and technologies which simultaneously boost productivity enhance resilience and reduce greenhouse gases emissions. CSA encloses a wide range of practices and technologies that are targeted to specific agro-ecological conditions and socio-economic conditions including adoption of climate-resilient crop varieties, conservation agriculture techniques, agroforestry, precision farming, water management strategies, and improved livestock management. Approaches like laser-land leveling and AWD in rice cultivation showed reduced water use and improved soil health. Carbon farming is a system of agricultural management that helps the land accumulate and store more greenhouse gases instead of releasing those gases into the atmosphere. It transforms agriculture from being a net emitter of CO_2 to a net sequester of CO_2. Core carbon farming practices involves reduced fertilizer application, grassland conservation, reduces tillage, crop rotation, improved residue management, cover crops, 4Rs approach of nutrient management (right time, right rate, right source, and right place of nutrients application) etc. Carbon farming can be a game changing revolution in present climate changing scenario. CSA and carbon farming constitute essential methodologies in the endeavor to alleviate climate change while simultaneously bolstering agricultural sustainability. Despite its potential, carbon farming faces challenges such as high initial costs, regulatory barriers, and market complexities. The future direction on CSA and carbon farming practices involves a comprehensive, multifaceted approach that combines sustainable agricultural practices with innovative technologies. This transition is critical for combating climate change and also for ensuring long-term food security, improving livelihoods, and maintaining healthy ecosystem.

Key words: *Carbon farming, Climate change, Food security, Transition.*

IHASE-2025/89

Nutraceuticals and functional foods, a new health needs

Ayusha Gupta[1], Anita Kerketta[2] and Amit Dixit[3]
[1]Ph.D. Scholar, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
[2]Assistant Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
[3]Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
Correspondence author: anitakerketta@mguvv.ac.in

Nutraceuticals described as food or part of a food that provides health benefits and are used for prevention or treatment of a disease whereas functional foods described as food products that are used in the standard diet to provide beneficial health effects in addition to the traditional nutritional effects. A diet containing high levels of fruits and vegetables has been associated with a lower risk of chronic disease therefore encompassing the importance of nutraceuticals and functional foods in our daily diet. Nutraceuticals are one of the secondary metabolites that are being produced by diverse group of plants including the horticultural crops. The secondary metabolites expressed in horticultural crops such as phenolic compounds, flavonoids, alkaloids, polyphenols, terpenoids exhibit number of health benefits such as anti-inflammatory, anti-diabetic, anticancer response. For example, tomato polyphenols are hydroxycinnamic acids, flavanones, naringenin chalcone anthocyanins and flavonol glycosides like rutin and kaempferol-3-rutinoside reported vital health benefits. Knowledge of the biosynthetic pathways will enhance its production. For example, citrus fruits are defensive against a variety of human cancers, dark green leafy vegetables contain lutein having ability to neutralize free radicals reducing chances of age-related macular degeneration. Extensive research work is being done to enhance our understanding of functional foods to improve the quality of life. Horticultural crops produce tremendous number of secondary metabolites that holds the nutraceutical value beneficial for our health. The use of nutraceuticals and functional food are helpful to promote the human health and reduce the disease risk.

Keywords : *Functional foods, Nutraceuticals, Polyphenols, Secondary metabolites.*

IHASE-2025/90

Identification of potential landraces of rice (*Oryza sativa* L.) with high yield and Nutritional traits.

Mayuri Megha. T[1,2], Neeraja C.N[2] Suman. K[2], Vaidurya P. Sahi[1]
mayuritaidalwar@gmail.com
Sumankarre1@gmail.com
vpsahi@shiats.edu.in
Corresponding author: Neeraja C.N[2]*
cnneeraja@gmail.com
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Uttar Pradesh-211008, India[1]
ICAR- Indian Institute of Rice Research, Rajendranagar, Hyderabad, Telangana-500030, India[2].

Rice is the staple food for millions of people globally and contains many important nutrients. Out of all the nutrients, zinc and iron are cruical for several growth metabolisms in plants and humans. Thus, the deficiency of these nutrients causes hidden hunger. Therefore, understanding the genetic variability of rice landraces is needed for enhancement of grain yield, yield contributing and nutritional characters. The current investigation was conducted to study the variability, heritability, genetic advance as percent mean in rice-landraces. The present study was carried out with 76 rice landraces in a randomized block design at experimental farm of ICAR-Indian Institute of Rice Research located at ICRISAT, Hyderabad, India. Analysis of variance showed significant differences among the landraces for all the traits. Grain yield, Iron, Zinc, Protein showed high mean values in landraces Katarangi (28.7267), Sathi (15.65), White rice (32.8) and C.G. Dev bhog (25.6267). The analysis recorded high for grain yield i.e., GCV (31.4755), PCV (32.1355), heritability (95.93), Genetic advance as percent mean (63.5082) followed by biological yield (29.7309), (29.8119), (99.46), (61.0789), thus indicating further improvement of these traits in zinc and iron enriched rice landraces.

Keywords*: Genetic variability, Heritability, Genetic advance, Rice Landraces, Iron, Zinc, Protein.*

IHASE-2025/91

In-Vitro Micropropagation of *Senegalia* (*Acacia*) *catechu* (L.f.) Mature Seeds.

Ratnamala Ghosal*, Chitra Kashyap*, Aditya Raj*, Kalpana Chaurasia
[1]Research Scholar;
Banasthali Vidhyapith Tonk Rajasthan.
[2]Assistant Professor;
Modi Institute of Management and Technology Kota, Rajasthan
[3]Student; Department of Science,
Modi Institute of Management and Technology Kota, Rajasthan
[4]Associate Professor, Department of Science,
Modi Institute of Management and Technology Kota, Rajasthan
Email- 1) mouprit16@gmail.com 2) chitrakashyap53@gmail.com 3) adityarajsighjhala5@gmail.com
Corresponding Author: 4) m.chourasiya@gmail.com

Acacia catechu, a tree species known for its ecological and economic importance, offers a promising method for mass propagation and conservation. This study investigates the optimal conditions for the germination of *A. catechu* seeds and subsequent micro-propagation using tissue culture techniques on immature seeds. Seed sterilization was achieved using a combination of 70% ethanol and 1% sodium hypochlorite, respectively, followed by incubation on Murashige and Skoog (MS) medium supplemented with various concentrations of plant growth regulators (PGRs). The effects of different PGR combinations on shoot initiation, elongation, and rooting were assessed. Results indicated that a specific ratio of 6-benzylaminopurine (BAP) and 2,4-Dichlorophenoxyacetic acid (2,4-D) significantly enhanced shoot proliferation and root formation. The successful acclimatization of in vitro regenerated plants was also evaluated, demonstrating high survival rates when transferred to soil. This study provides a reliable protocol for the rapid propagation of *Acacia catechu*, contributing to its conservation and sustainable utilization in agro forestry systems.

IHASE-2025/92

Public–Private Partnerships in Delivering Digital Extension Services

P. Akhila*, P. Lakshmi Priya, Dubasi Abhigna
*M.Sc. scholar, Dairy Extension Division, ICAR – National Dairy Research Institute
*Corresponding author: akhilapapishetty04@gmail.com

Agriculture is not an exception to the growing global accessibility of digital services and facilities. Farming is no longer restricted to isolated rural areas and conventional practices in the current digital revolution. The use of digital technology is accelerating the evolution of agricultural extension systems by improving the distribution of market, advisory, and knowledge information to farmers. Public-private partnerships, or PPPs, have grown in popularity in agriculture and rural development as a way to solve multiple challenges and encourage sustainable growth. PPPs in agriculture can help farmers make better decisions about crop management, weather readiness, pest and disease control, and market accessibility by combining the advantages of the public and private sectors. They can also strengthen infrastructure, facilitate technology transfer, increase input availability, and improve farmers' access to markets by providing timely, location-specific, and tailored information. Successful models like mKisan Portal, Digital Green, and e-Choupal demonstrate that PPPs have the potential to increase the effectiveness, inclusivity, and sustainability of extension services (FAO, 2019; World Bank, 2017). PPPs provide a workable framework for advancing resilient, knowledge-based rural development and modernising agricultural extension, notwithstanding a number of obstacles such as the digital divide, literacy challenges, disinformation, institutional coordination, and data privacy (Swanson & Rajalahti, 2010).

Keywords: *Public–Private Partnerships, Digital Extension, ICT, Agriculture, Rural Development*

IHASE-2025/93

Algorithm-Fortified Biofuel Robust for Next-Gen Climate-Intelligent Agriculture

T. Porchelvan[1*] and P. Sudhakar[2*]
[1]Ph.D. Scholar, [2]Associate Professor, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar - 608 002 (T.N.), India.
*Correspondence email- porchelvanporz@gmail.com; sudha.au.in@gmail.com

Climate change represents the defining crisis of our era, with global temperature rising 1.2°C above pre-industrial levels and atmospheric CO_2 concentrations exceeding 420 ppm levels unprecedented in human history. The primary catalyst of this environmental catastrophe is unequivocally fossil fuel combustion, contributing 89% of global CO_2 emissions and driving increasingly severe droughts, floods, and unpredictable weather patterns that devastate agricultural systems worldwide. While conventional agronomic practices offer marginal mitigation benefits, they fundamentally fail to address the root cause: our civilization's addiction to carbon-intensive energy sources. The agriculture sector itself paradoxically suffers as both victim and contributor, consuming 30% of global energy while remaining dependent on petroleum-based inputs for mechanization, fertilizers, and transportation.

This review presents a transformative solution at the nexus of renewable energy and intelligent agriculture: algorithm-fortified biofuel production systems that simultaneously decarbonize energy supply chains and enhance agricultural climate resilience. By leveraging IoT, artificial intelligence, machine learning, and advanced optimization algorithms, we demonstrate how biofuel crop cultivation can be elevated from a sustainability aspiration to an economically viable, environmentally regenerative reality. This integrated framework employs predictive modeling to optimize feedstock selection, yield maximization, and conversion efficiency while ensuring zero competition with food security. Through precision cultivation powered by IoT sensor networks and AI-driven resource management, biofuel crops including major field crops like maize (corn), sugarcane, and sweet sorghum, as well as dedicated fodder crops such as Cumbu Napier and Sudan grass, which are used for producing ethanol, biodiesel, and biogas achieve remarkable productivity gains of 35-48% while sequestering atmospheric CO_2 during growth cycles. The future of climate-resilient agriculture lies not in incremental improvements to conventional practices, but in fundamentally reimagining farmland as dual-purpose ecosystems that nourish both humanity and the planet through intelligent, renewable energy production.

Keywords: *Artificial intelligence; Biofuel; Climate mitigation; Renewable energy*

IHASE-2025/94

Cyprinus Carpio in catch of Gobind Sagar Reservoir during two years

Krishan Lal
Department of Zoology, NSCBM Govt. College Hamirpur (H. P.) India
(E mail: krishanlaldaroch@gmail.com)

Gobind Sagar reservoir is located in Himachal Pradesh. It has been created by damming Sutlej River at village Bhakra, in 1963. *Catla catla, Labeo rohita, Labeo calbasu, Sperata seenghala, Tor putitora, Cirrhinus mrigala, Ctenopharyngodon idella, Cyprinus carpio* and *Hypophthalmichthys molitrix* are some of common fishes in the catch of this reservoir. *Cyprinus carpio* is one of the fish species dominating the catch in Gobind Sagar Reservoir. It is a bottom feeder. Other exotic carps in Gobind Sagar reservoir are *Hypophthalmichthys molitrix* (Silver carp) and *Ctenopharyngodon idella* (Grass carp). *H. molitrix and Cyprinus carpio* (common carp) are dominating the catch. Fishermen have organized themselves into fisheries co-operative societies. *C. carpio* was in Himachal Pradesh at at Nahan on 18 April 1955 and provided to other places of the state also. During year 2016-17, out of 753.54 tons of total catch from Gobind Sagar reservoir 122.83 tons was *C. carpio*. During year 2017-18 total fish catch from this reservoir was 471.8 tons. Total contribution of *C. carpio* in this catch was 108.57 tons. No fish was caught for two months from 15 June to 15 August each year. This was done for conservation reasons and this period was observed as close season. Only licensed fishermen were allowed the fishing. Gillnets were operated for fishing. Seed stocking was done regularly. Maximum catch was observed after the close season. Minimum harvestable size of *C. carpio* has been fixed at 30 cm. Recently seed stocking of Hungarian strain of common carp (Amur carp) is being done.

Keywords: *gillnets, fisheries co-operatives, seed stocking, harvestable size.*

IHASE-2025/95

Biopesticides As A Sustainable Alternative For Aphid Management In Mustard

Pawar Shubham Tarasing
Ph.D. Entomology, SKUAST-K, Shalimar, Srinagar
Pawarstv879@gmail.com

A field experiment was conducted to evaluate the efficacy of different biopesticides against the mustard aphid (*Lipaphis erysimi* Kalt) on mustard. The study included seven treatments: neem leaf extract, neem oil, *Bacillus thuringiensis, Beauveria bassiana, Metarhizium anisopliae, Lecanicillium lecanii,* and an untreated control, arranged in a randomized block design. All biopesticides significantly reduced aphid populations compared to the untreated control.

The overall effect on Aphid population after 3, 7, and 10 days of first and second spraying revealed that the plot treated with *Beauveria bassiana* had the lowest (21.32 aphids per 5 cm apical twig/plant). In order to control aphids, the most effective biopesticides were *Beauveria bassiana* > neem leaf extract > neem oil > *Metarhizium anisopliae* > *Bacillus thuringiensis* > *Lecanicillium lecanii* > control.

The findings suggest that *Beauveria bassiana* is the most effective and environmentally sustainable option for the management of mustard aphid and can be effectively integrated into organic and integrated pest management strategies for mustard cultivation.

Key words: *Biopesticide, Beauveria bassiana, Aphid, neem leaf extract, neem oil*

IHASE-2025/96

Accessing the feasibility of growing strawberry in Vertical farming using PVC pipes

L.Shruthi Reddy[a], M.Rajasekhar[b]

[a.]Ph.D (Horticulture), Horticulture Officer, Government of Telangana.
Mail: lattupallishruthireddy@gmail.com , Phn: 9963370844

[b.]Professor (Horticulture), SKLTGHU, Mulugu, Siddipet, Telangana.

At present, 55% of the world population is living in urban areas and it is projected to increase over 68% by the year 2050. This increase in urbanization is leading to reduction of cultivable land, which is a major concern all over the world. In this context, Vertical farming has been developed as an innovative technology for providing food security to the growing population and food demand. The food consumption patterns has been changed after Covid-19 Pandemic, focusing mostly on Vitamin C rich fruits. Strawberry is one of the fruits that falls into this category. The root system of Strawberry is shallow and that extends only 20 to 30 cm, thus can be grown vertically in a small area, which can assist in fulfilling the growing demand of strawberries in urban households. In this experiment, PVC pipes (Towers) are used for vertical farming for accessing the performance of four strawberry varieties (Nabila, Flaminia, Murano, Vivara) in four different potting media. Each PVC pipe consists of 24 plants accommodating in one sq.mt area. All the four varieties have exhibited a significant growth in PVC towers, however, everbearing varieties (Murano, Vivara) has shown higher yield per tower than short day varieties (Nabila, Flaminia). The varieties exhibited higher yield in potting media having Cocopeat + Vermicompost (4.79 Kg). Therefore, by this experiment, it can be concluded that, strawberry can be grown conveniently in vertical farming by utilizing PVC towers in the urban households that are having restricted or limited space.

Key words: *Vertical Towers, Urban farming, Pandemic, Vitamin C*

IHASE-2025/97

Comparative Evaluation of Growth, Biometric Parameters, and Survival of the Indian Pearl Oyster, *Pinctada fucata* (Gould, 1850) Under Onshore and Natural Rearing Systems

Rajkumar Dabhi[1], Hitesh Kardani[1*], Piyush Vadher[1], Ajay Ram[1], Sunil Shekh[1] and Pinak Bamaniya[1]

[1]Fisheries Research Station, Kamdhenu University, Sikka, (361140), Gujarat, India.

Email: hiteshkardani@gmail.com **Mobile No.:** +919825932198

The present study comparatively evaluated the growth performance, biometric parameters and survival of the Indian pearl oyster, *Pinctada fucata* (Gould, 1850), reared under onshore and natural systems. Hatchery-produced three-month-old spats were categorized into two size classes (L1: 7.0-7.5 mm; L2: 8.0-8.5 mm) for onshore rearing and corresponding natural rearing groups (N1, N2). Each treatment was maintained in triplicate, with ten spats per replica packed in fine mosquito net pouches. Onshore rearing was conducted in FRP tanks with controlled water quality and microalgal feeding (*Chaetoceros* spp., *Isochrysis* spp. and *Nannochloropsis* spp.), while natural rearing involved deployment in netted cages at open-sea sites. Growth was monitored through dorso-ventral measurement (DVM), antero-posterior measurement (APM), hinge length (HL), and total weight (TW) at 15-day intervals for 120 days, along with environmental parameter assessments. Statistical analysis (one-way ANOVA and DMRT, $p < 0.05$) revealed significantly higher growth in natural systems compared to onshore tanks. Results revealed that oysters reared under natural conditions exhibited a higher growth rate in terms of DVM, APM, Hinge Length and Total Weight compared to those in the onshore system. However, survival was significantly greater in the onshore system, indicating better environmental control and reduced stress. Water quality showed no significant influence on oysters in the onshore system and natural rearing system. The findings highlight that onshore rearing offers a stable and controlled environment with improved survival, whereas natural systems promote faster growth under variable environmental conditions.

Keywords: *Pinctada fucata, onshore rearing, growth performance, biometric relationship, water quality.*

IHASE-2025/98

Medicinal Plants in Cancer Therapy: Mechanisms, Efficacy and Future Prospects

Sahil Ahmad Dar
SKUAST-K, Shalimar, Srinagar, 190025
tlokkit786@gmail.com

Cancer remains one of the leading causes of mortality worldwide and despite advances in chemotherapy, radiotherapy and targeted therapies, the search for safer and more effective treatments continues. Medicinal plants have long been recognized as a valuable source of bioactive compounds with anticancer potential. This paper highlights key medicinal plants and their phytoconstituents that exhibit promising anticancer activities through diverse molecular mechanisms. *Catharanthus roseus* (vincristine, vinblastine), *Taxus brevifolia* (paclitaxel), *Camptotheca acuminata* (camptothecin), *Curcuma longa* (curcumin) and *Withania somnifera* (withaferin A) are notable examples. These chemicals reveal mechanisms such as inhibition of microtubule dynamics, activation of apoptosis, suppression of angiogenesis and modification of oxidative stress and inflammatory pathways. Additionally, new research indicates that plant-derived chemicals and traditional chemotherapeutic drugs may work in concert to increase efficacy while lowering toxicity. Even though several of these phytochemicals have reached the stage of clinical evaluation, more investigation is necessary to clarify their safety profiles, pharmacokinetics, and bioavailability. This study supports the ongoing investigation of phytochemicals as models for the development of new anticancer drugs and highlights the therapeutic potential of medicinal plants in the treatment of cancer.

Keywords*: Cancer, medicinal plants, bioactive compounds, Catharanthus roseus, Taxus brevifolia*

IHASE-2025/99

Influence of ohmic heating on physico-chemical and rheological properties of whole milk

Rashmi Kumari*, Jui Lodh, Diwakar Mishra, M. L. Bal and Sanjeev Kumar
Sanjay Gandhi Institute of Dairy Technology (SGIDT), BASU, Patna, Bihar
*Corresponding author: Email- rashmisgidt08@gmail.com

Ohmic heating (OH) is an emerging and innovative thermal processing technology that employs the direct passage of electric current through a food matrix, generating internal heat due to the material's inherent electrical resistance. This technique enables rapid, uniform, and energy-efficient heating, making it particularly suitable for liquid, semi-solid, and particulate food systems. In this study, a lab-scale ohmic heater was designed and fabricated using a stainless steel rectangular process chamber with an 8 liter holding capacity, equipped with a pair of stainless steel electrodes and an agitator. Whole milk (4.1% fat, 8.2% SNF) was processed using ohmic heating at a constant voltage of 200 V, with the temperature raised from 10°C to 90°C. The ohmic-heated milk samples were analyzed for viscosity and pH and compared with conventionally heated whole milk. Significant differences ($p<0.05$) were observed in pH, titratable acidity, and viscosity among all samples. The pH of ohmic-heated milk decreased slightly compared to conventionally heated milk, while the apparent viscosity increased significantly ($p<0.05$) with longer processing times. The observed increase in viscosity was well correlated with the total solids content. The overall sensory acceptability of ohmic-heated milk was found to be superior, which may be attributed to enhanced flavor retention and reduced thermal damage to heat sensitive constituents. The findings indicate that ohmic heating can effectively achieve milk pasteurization while maintaining its nutritional and organoleptic properties. Owing to its minimal thermal degradation, reduced fouling tendency, and uniform heat distribution, ohmic heating emerges as a promising alternative to conventional thermal processing methods in the dairy industry.

Keyword: *Ohmic heating, whole milk, pH, viscosity, sensory quality*

IHASE-2025/100

Effect of Gamma Radiation on Floral Characters of Commercial Cultivars of Dahlia (*Dahlia Variabilis* L.)

Bharti Sao* and Amit Dixit[1]

[*]Assistant Professor, College of Horticulture and Research Station, MGUVV, Durg C.G.

[1]Professor, College of Horticulture and Research Station, MGUVV, Durg C. G

Corresponding Author: bhartipink62@gmail.com

In this study, rooted cuttings of three dahlia cultivars Kenya Blue, Kenya Yellow, and Kenya Original were subjected to gamma radiation treatments at doses of 0, 10, 15, and 20 Gy, using a 60Co source. These cuttings were subsequently planted under open field conditions, employing a Complete Randomized Design (CRD) with a factorial approach. The effect of gamma irradiation on various floral characteristics of the treated plants was also studied. The findings indicated that gamma radiation treatments had significant detrimental effects on the days taken for first bud appearance, number of days taken for flower opening, number of days taken for full bloom, longevity of flower, and duration of flowering. Plants treated with higher doses (15 and 20 Gy) showed deleterious effects of ionizing radiation, although at the lowest dose (10 Gy), plants were not significantly affected. The days taken for the first bud appearance were significantly earlier than those in untreated plants and were delayed at the highest dose. Radiation treatment at higher doses caused a delay in the number of days taken for flower opening and full bloom. Longevity of flower and duration of flower was significantly longer in untreated plants and subsequent delayed with increased dose of gamma radiations. However, at lower doses, a diminishing effect of gamma irradiation was observed in vM1.

Keywords: *Dahlia, treatment, irradiation, ionizing, longevity, radiation, CRD*

IHASE-2025/101

Chemical and Microbial Assessment of Industrial Effluents in Pali, Rajasthan: A Comparative Review

Deepshikha Khangarot
Research Scholar, Department of Zoology Madhav University Abu Road (Rajasthan)

Industrial effluents pose a significant environmental challenge due to their intricate mixture of chemical and biological pollutants. This review-based study assesses the characteristics and magnitude of pollution generated by the textile and dyeing industries in the Pali district of Rajasthan, emphasising comparative analyses between treated and untreated effluents. The analysis consolidates results from recent studies on physicochemical parameters—including pH, total dissolved solids, biochemical oxygen demand, and heavy metals (Cr, Cd, Pb, Ni, Zn)—as well as microbial indicators like E. coli and total coliforms. Results from various studies indicate that despite partial treatment, effluents often exceed permissible limits set by the CPCB, posing risks to surface and groundwater quality as well as soil health. The review also talks about how well current treatment technologies work and stresses the need for combined chemical and microbiological monitoring systems. In general, the paper stresses how important it is to have long-term plans for managing industrial wastewater in the Pali industrial cluster to protect the health of the environment in the area.

IHASE-2025/102

Advancing Sustainability in the Flower Industry with Biodegradable Floral Foams

Syed Ayesha[1], Dr. T. Suseela[2], Dr. A.V.D Dorajee Rao[3]
[1]PhD Scholar, Department of Floriculture and Landscaping
[2]Professor and Head, Department of Floriculture and Landscaping
[3]Associate Dean, Dr YSRHU – COH, Venkataramannagudem
Dr YSR Horticultural University, COH, Venkataramannagudem, Andhra Pradesh
(Corresponding author: ayeshasyed936@gmail.com)

Floral foam is an amazing product that is very convenient in flower arrangement. In addition to supporting a flower or foliage stem in the proper position and conducting water into the stem, it can withstand up to 50 times its weight in water. Traditional floral foams like are non-biodegradable, petroleum-based and microplastic generating, so researchers and industries are actively exploring alternatives. In the last few years, more ecologically friendly floral foams and foam substitutes have been created as a substitute for conventional floral foams made of phenol-formaldehyde polymers. If phenol-formaldehyde foam is not disposed of appropriately, it decomposes into microplastics that wind up in soils, landfills, and rivers, including the world's oceans. Biodegradable foams derived from cellulose, starch, and lignocellulosic materials have drawn interest as environmentally friendly substitutes for synthetic foams. A combination of coconut coir and polyurethane can be used to create an eco-friendly floral sponge. While polyurethane can be utilized as a binding agent to improve structural integrity, coconut coir, a natural resource, can be used for its biodegradability and water retention qualities. In addition to being inexpensive, renewable, non-toxic, abundant in nature, and having the lowest bulk density and thermal conductivity, the study found that coir fiber's high lignin content makes it more resilient than other natural fibers. Additionally, natural resources like basalt minerals are also used to make eco-friendly foam substitutes.

Key words*: Floral foam, coconut coir, microplastics, biodegradable and natural fibers.*

IHASE-2025/103

Assessment of Industrial Air Pollution in Riico Industrial Area-Kukas Jaipur and its impact on local vegetation via APTI Tool

Pawan Kumar Chaudhary[1*], Dr.Manjul Mishra[2]

[1*]Research Scholar, Chemistry Department, Apex University, Jaipur (Rajasthan), India

[2]Professor, Chemistry Department, Apex University, Jaipur (Rajasthan), India

*Corresponding Author

[1]pawanchoudhary7259@gmail.com,[2]manjulmishra7@gmail.com

Industrialization plays a vital role in economic development, but it also contributes significantly to environmental pollution, particularly air pollution. The present study focuses on assessing the impact of Industrial air pollution in the RIICO industrial area, Kukas, Jaipur and its effect on local vegetation using the Air Pollution Tolerance Index (APTI) tool. The APTI method evaluates the tolerance level of various plant species against air pollutants by analyzing four biochemical parameters- leaf Ph, relative water content (RWC), Ascorbic acid content (AA) and total chlorophyll (TChl).Plant samples collected from selected sample sites around the industrial area and compared with samples, collected from less polluted zones. The results revealed a significant variation in biochemical parameters among different plant species, indicating differential tolerance capacities. Some species showed higher APTI values, suggesting their potential as bio-indicators and tolerant species for green belt development while others exhibited low APTI values reflecting their sensitivity to air pollutants. This study highlights the importance of vegetation as a natural indicator of air quality and provides useful data for selecting appropriate plant species for air pollution mitigation and urban green planning in industrial regions like Kukas Jaipur.

Keywords *- Air Pollution Tolerance Index (APTI), Relative water content (RWC), Ascorbic acid content (AA), Total chlorophyll (TChl), Bio-indicators.*

IHASE-2025/104

Optimizing Rearing and Reproductive Conditions of Common Carp (*Cyprinus carpio*) in Semi-Intensive Farming System

Ajmair Singh Sodhi[1], Romisa Gull[2]

[1,2]Department of Industrial Fish and Fisheries, Govt. Degree College Baramulla, J&K, 193101

Corresponding author – Ajmair Singh Sodhi, sodhifishery@gmail.com, 9419956655

Common carp (*Cyprinus carpio*) is a hardy and resilient freshwater fish capable of surviving in a wide range of environmental conditions. It tolerates variations in temperature, dissolved oxygen, and water quality better than most cultured species. This adaptability allows it to thrive in ponds, lakes, reservoirs, and even moderately polluted waters. The present study was conducted in fish pond of Govt. Degree College, Baramulla to investigate the optimization of rearing and reproductive conditions of *Cyprinus carpio* (common carp) under a semi-intensive farming system. The research aimed to assess the growth performance, and breeding efficiency through balanced pond management, feed optimization, and controlled water quality. Experimental trials were conducted in a pond with a semi-concrete pond with earthen bottom and concrete sidewalls over a twelve-month culture cycle. Water temperature, dissolved oxygen, and nutrient load were monitored regularly. Broodfish were conditioned using formulated diets with 30% crude protein, and natural breeding was carried out by designing a suitable breeding facility and maintaining optimum environmental conditions to promote natural spawning of *Cyprinus carpio* in captivity. Results revealed that optimum growth and reproductive performance occurred in well maintained semi-intensive system.

Keywords: *Cyprinus carpio, Semi-intensive system, Water quality, Broodstock management*

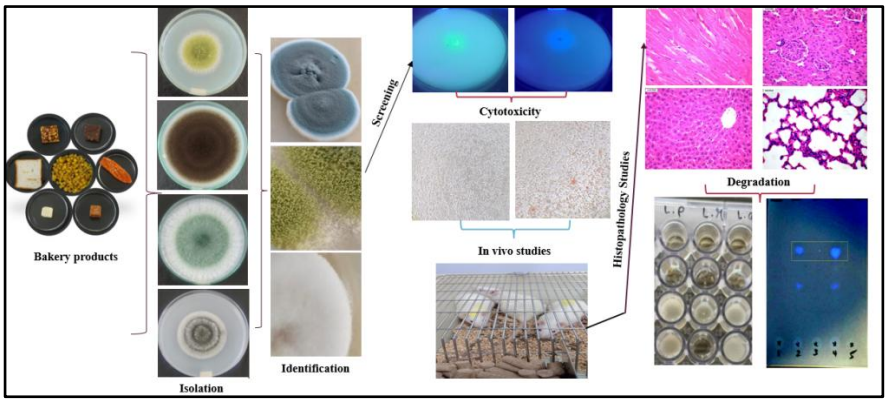
IHASE-2025/105

Toxicological Evaluation of Mycotoxins Contaminating Cereal-Based Foods: Experimental Assessment of Aflatoxin B_1 Induced Biochemical, Hematological, and Histopathological Alterations in Rats

Dr. Sowmya K.L[1] & Dr. Ramalingappa. B[*]

[1]Research Scholar, Department of Microbiology, Davangere University, Davangere-577007, Karnataka, India. E-mail: swomyakl456@gmail.com

[*]Senior Professor, Department of Microbiology, Davangere University, Davangere-577007, Karnataka, India. E-mail: ramalingappa.88@gmail.com



Graphical representation of abstract

Cereal-based foods form a major component of the human and animal diet, they are frequently contaminated by mycotoxins, and these are secondary metabolites produced by filamentous fungi such as *Aspergillus*, *Fusarium*, and *Penicillium* species. Among these, aflatoxins, ochratoxins, fumonisins, and trichothecenes are of major concern due to their potent toxic, carcinogenic, and teratogenic effects. The present study aims to evaluate the toxicological impact of mycotoxins contaminating cereal based foods with particular emphasis on aflatoxin B_1 (AFB_1), a highly hepatotoxic compound commonly detected in grains based foods. Experimental assessment was conducted using animal models to determine the clinical signs of toxicity, alterations in hematological and biochemical parameters, changes in organ weights, and histopathological lesions induced by AFB_1 exposure.

Results revealed dose-dependent adverse effects, including hepatic and renal dysfunction, oxidative stress, and disruption of normal hematological profiles. Histopathological examination showed marked degeneration and necrosis in liver

and kidney tissues, confirming the cytotoxic potential of AFB_1. The study further highlights the significance of early biomarkers of mycotoxin exposure and the role of antioxidant defense mechanisms in mitigating toxicity.

This research provides valuable insight into the mechanisms underlying mycotoxin-induced organ damage and contributes to the broader understanding of foodborne toxicants in cereal-based diets. The findings emphasize the necessity for regular monitoring, improved storage practices, and implementation of mycotoxin control strategies to safeguard food quality, animal productivity, and public health.

Key words: *Mycotoxins, AFB1, Detoxification, Animal model, Penicillium Species, Aspergillus species, LCMS, HPLC*

IHASE-2025/106

Antimicrobial Resistance and the Role of *Allium sativum* (Garlic) in Combating Carbapenem-Resistant *Escherichia coli.*

Sandhya
Department of Microbiology, Faculty of Science, Swami Vivekanand Subharti University, NH-58, Subhartipuram, Meerut-250005, India.
Contact No: 9953692600
E-mail: sandhyasingh0710@gmail.com

The rapid emergence of antimicrobial resistance (AMR) poses one of the most significant threats to global public health in the 21st century. Within the wide range of resistant pathogens, *Escherichia coli* has become a critical issue because of its capacity to obtain and spread numerous resistance genes. The emergence of carbapenem-resistant *Escherichia coli* (CRE), which shows resistance to carbapenems—the last line of defence among β-lactam antibiotics-is especially concerning, as it significantly reduces the number of treatment options. Increased death rates, longer hospital stays, and more treatment failures have been led due to an increasing rate of CRE infection. There is an urgent need to investigate new, safe, and effective natural antibiotic substitutes as synthetic ones become less effective.

Garlic (*Allium sativum*), which has been known for its healing and medicinal benefits for a long time, has attracted significant scientific attention as a possible antimicrobial agent. The active compounds found in garlic, especially allicin, ajoene, diallyl sulfides, and various organosulfur compounds, are recognised for their extensive antibacterial properties. These components demonstrate their antimicrobial properties through various mechanisms, such as disrupting the synthesis of bacterial cell walls, inhibiting crucial enzymes, interfering with the synthesis of DNA and RNA, and dampening quorum sensing, which is essential for bacterial communication and virulence. In contrast to traditional antibiotics that focus on particular bacterial mechanisms, garlic's diverse methods of action reduce the chances of developing resistance in microbial communities. *Allium sativum* (garlic) may improve the effectiveness of current antimicrobial drugs against resistant bacterial strains. The possible application of garlic as a natural, cost-effective, and eco-friendly antimicrobial substance. The use of plant-derived antimicrobials and other medications is gaining traction in medical practice as conventional antibiotics, which are derived from microbes or artificial components, become less effective and struggle to address new diseases.

Keywords: *Antimicrobial Resistance (AMR), Allium sativum (Garlic), Carbapenem-resistant Escherichia coli (CRE).*

IHASE-2025/107

Nature's Pharmacy within Endophytic Fungi of Medicinal Plants as a Source of Anti-Obesity Pancreatic Lipase Inhibitors

Mohammed Asif Killedar[1] & Ramalingappa B*

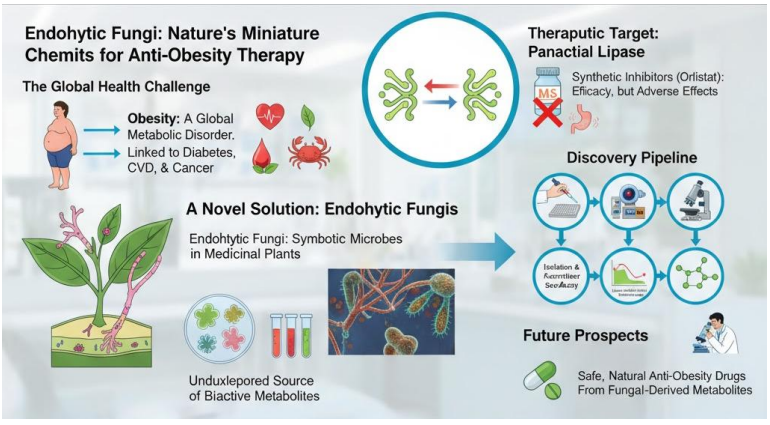
[1]Research Scholar, Department of Microbiology, Davangere University, Shivagangotri, Davangere-577007, Karnataka. India. E-mail: mdasifkilledar1999@gmail.com

*Senior Professor, Department of Microbiology, Davangere University, Shivagangotri, Davangere-577007, Karnataka. India. E-mail: ramalingappa.88@gmail.com

Obesity, a global metabolic disorder, is closely linked to diseases such as diabetes, cardiovascular complications, and certain cancers. One of the key therapeutic targets for obesity management is pancreatic lipase-the principal enzyme responsible for dietary triglyceride hydrolysis. Synthetic inhibitors like Orlistat have shown efficacy but are often associated with adverse effects, emphasizing the need for safer, natural alternatives. Endophytic fungi symbiotic microorganisms residing within plant tissues without causing harm, represent an underexplored source of bioactive metabolites with pharmacological potential. This review explores the diversity, isolation, screening, and characterization of endophytic fungi from medicinal plants as a promising source of pancreatic lipase inhibitors. Advanced analytical, biochemical, and molecular techniques involved in the discovery pipeline are discussed, along with future prospects for drug development from fungal-derived secondary metabolites.

Keywords: *Endophytic fungi, Medicinal plants, Pancreatic lipase inhibitors, Anti-obesity agents, Bioactive metabolites, Natural products.*

Graphical presentation of Abstract:



IHASE-2025/108

Study of Biotic Homogenisation of Birds in Rapidly Urbanizing Kota City (Rajasthan, India)

Gajanan Charpe[1] and Meenakshi Mayanger[2]
[1.]Associate Professor Zoology, Government College Kota
[2.]Professor Zoology, Government College Kota

Increasing industrialisation and technological advancement has developed a trend a human to settle in cities leading to urbanisation. Urbanisation is invasive in terms of loss of natural landscapes. Urbanization is a strong driver of biotic homogenisation that causes progressive replacement of locally specialized species by widespread, generalist species hence greatly affecting ecosystem functioning. We studied patterns of avian taxonomic and functional composition across an urban–rural gradient in Kota city, Rajasthan, combining published checklists and recent campus and green-space surveys with targeted field sampling and analytical methods designed to detect homogenisation (Sidemo-Holm W., et al 2022). Kota has experienced rapid urban expansion in recent decades which reduced green spaces and reduced wetlands. Using species-occurrence data, community similarity metrics, and trait-based analyses (diet, foraging stratum, body size, and nesting strategy), we tested whether (1) species richness declines with urban intensity, (2) communities become more similar (taxonomic homogenisation) in highly urbanised sites, and (3) functional diversity is reduced in urban sites (functional homogenisation). We found evidence consistent with partial homogenisation: urban cores were dominated by cosmopolitan generalists (pigeons, collared doves, red vented bulbuls), while wetlands and peri-urban green spaces retained more specialist and migratory species. Functional analyses indicated loss of some guilds (large insectivores, ground-foraging specialists) in the most built-up areas. We discuss mechanisms (habitat simplification, exotic plantings, food subsidies, disturbance) and conservation actions (protecting wetlands, expanding native-plant green corridors, monitoring), and propose a long-term monitoring framework for Kota.

Keywords *Biotic homogenisation, specialists and generalist birds, feeding guilds, functional diversity, community similarity*

IHASE-2025/109

Modulatory Effects of Gibberellic Acid Concentrations and Culture Media on Root Morphogenesis in Jamun (*Syzygium cumini* L. Skeels)

P. Lepakshi[1], Dr. P. Vinaya Kumar Reddy[2]
[1]Ph. D. Scholar, Dr. YSR Horticultural University
[2]Associate Professor Dr. YSR Horticultural University
email.id lepakshipydi9999@gmail.com, 8978412373.

The investigation entitled "Modulatory Effects of Gibberellic Acid Concentrations and Culture Media on Root Morphogenesis in Jamun (*Syzygium cumini* L. Skeels) was conducted at the College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari District, Andhra Pradesh. The experiment comprised four media compositions -Soil**,** Soil + Cocopeat (1:1)**,** Soil + Vermicompost (1:1) and Soil + Cocopeat + Vermicompost (1:1:1) and four concentrations of GA_3 **-** Control (0 ppm)**,** 100 ppm**,** 200 ppm and 300 ppm-forming sixteen treatment combinations, each replicated thrice. Seeds were pre-soaked for 24 hours in the respective GA_3 solutions before being sown in the designated media. Results revealed that seeds treated with GA_3 at 300 ppm and sown in the Soil + Cocopeat + Vermicompost (1:1:1) medium exhibited the longest primary root (31.53 cm)**,** the highest number of secondary roots per seedling (43.83) and the maximum root fresh and dry weights (29.43 g and 7.35 g, respectively)**,** significantly outperforming the control treatment. The synergistic effect of the nutrient-enriched medium and optimal GA_3 concentration evidently promoted enhanced root elongation, secondary root proliferation and overall root system development, thereby establishing a strong foundation for vigorous seedling growth and subsequent field performance. In summary, the study underscores the pivotal role of both growing media composition and plant growth regulator concentration in determining the root development potential of Jamun seedlings, offering valuable insights for optimizing nursery practices and ensuring the production of robust planting material for large-scale horticultural propagation.

Keywords: *Cocopeat, GA_3, Jamun, Root proliferation, Vermicompost*

IHASE-2025/110

Study of Biotic Homogenisation of Birds in Rapidly Urbanizing Kota City (Rajasthan, India)

Gajanan Charpe[1] and Meenakshi Mayanger[2]
[1.]Associate Professor Zoology, Government College Kota
[2.]Professor Zoology, Government College Kota

Increasing industrialisation and technological advancement has developed a trend a human to settle in cities leading to urbanisation. Urbanisation is invasive in terms of loss of natural landscapes. Urbanization is a strong driver of biotic homogenisation that causes progressive replacement of locally specialized species by widespread, generalist species hence greatly affecting ecosystem functioning. We studied patterns of avian taxonomic and functional composition across an urban–rural gradient in Kota city, Rajasthan, combining published checklists and recent campus and green-space surveys with targeted field sampling and analytical methods designed to detect homogenisation (Sidemo-Holm W., et al 2022). Kota has experienced rapid urban expansion in recent decades which reduced green spaces and reduced wetlands. Using species-occurrence data, community similarity metrics, and trait-based analyses (diet, foraging stratum, body size, and nesting strategy), we tested whether (1) species richness declines with urban intensity, (2) communities become more similar (taxonomic homogenisation) in highly urbanised sites, and (3) functional diversity is reduced in urban sites (functional homogenisation). We found evidence consistent with partial homogenisation: urban cores were dominated by cosmopolitan generalists (pigeons, collared doves, red vented bulbuls), while wetlands and peri-urban green spaces retained more specialist and migratory species. Functional analyses indicated loss of some guilds (large insectivores, ground-foraging specialists) in the most built-up areas. We discuss mechanisms (habitat simplification, exotic plantings, food subsidies, disturbance) and conservation actions (protecting wetlands, expanding native-plant green corridors, monitoring), and propose a long-term monitoring framework for Kota.

Keywords *Biotic homogenisation, specialists and generalist birds, feeding guilds, functional diversity, community similarity*

IHASE-2025/111

Pseudocyclic Podand-Based Liquid Membranes for Environmental and Metallurgical Ion Purification

Rekha Vijay[1,2], Poonam Hariyani[1*] and Barkha Shrivastava[2]
[1]Department of Chemistry, JECRC University, Jaipur (Rajasthan), INDIA
[2]Department of Chemistry, JECRC College, Jaipur (Rajasthan), INDIA
[*]poonamgck.09@gmail.com; rekhavijay.chem@jecrc.ac.in

Flexible pseudocyclic cavity of podand has attracted much attention of researchers in separation technology of metal and anions from the feed phase to the receiving phase using a stripping agent using transport phenomenon *via* liquid membranes. The synthesis process entailed a meticulous multi-step procedure, with spectroscopic and elemental studies validating the successful production of the target molecule. The unique structural features of the carrier enable the formation of transient cavities that are suitable for holding specific metal ions and anions within its cavity, based on size and coordination chemistry. Selective binding, which is made possible by concentration gradients or electrical potentials, is an efficient way to extract and transport target ions. This technology has multiple applications, including the purification of metals in metallurgy and mining, the removal of harmful ions in environmental remediation, and analytical functions in ion-selective electrodes. This technique may result in further developments in membrane and ion transport technologies, enhancements in industrial separation processes, environmental protection efforts, and analytical methodologies.

Keywords: *Carrier, Transport, Membrane, Remediation.*

IHASE-2025/112

Analysis of Physico- Chemical Parameters of Chambal River Water Around Kota Industrial Area, Rajasthan, India.

Dr. Bhartiy Sharma,[1] Nikita Vijay[2]
[1.]Principal (Lzebra College), [2.]Research scholar
Department of Chemistry, University of Kota, Kota (Raj.), India
Email ID: 1). Bharatisharma14@gmail.com (9413442185)
2). nikitavijay131@gmail.com (9468961231)

Water is essential for the life of humans, animals and plants. The Chambal River flows around Kota city in Rajasthan, India. Because of nearby factories, sewage, and other human activities, the water quality of the river in this area is under pressure. A study was done to check many physical properties of the river water (such as dissolved oxygen and BOD) at sampling points around the industrial zone. The results show that at some sites the river water meets acceptable quality levels, but at other sites the values of some parameters are above safe limits or show signs of pollution. Also, seasonal changes (such as monsoon v/s dry season) affect the water quality. The study concludes that the water quality of the Chambal River in the Kota industrial region is moderately polluted and needs regular monitoring and better management to prevent further deterioration and to ensure the river remains safe for drinking, irrigation and ecological health.

Keywords*: Chambal River, water quality, physico-chemical parameters, industrial pollution, BOD.*

IHASE-2025/113

Impact of Organic and Inorganic Nutrient Management on Yield Performance of Cluster Bean (*Cyamopsis tetragonoloba* L.) var. Pusa Navbahar under Chhattisgarh Plains

Anamika Jain Badkul and Ritu Chandrawanshi

An investigation entitled *"Impact of Organic and Inorganic Nutrient Management on Yield Performance of Cluster Bean (Cyamopsis tetragonoloba L.) var. Pusa Navbahar under Chhattisgarh Plains"* was carried out during the summer season of 2024–25 at the Research Farm, Village Khudmudi, under the College of Horticulture and Research Station, Mahatma Gandhi University of Horticulture and Forestry, Durg (C.G.). The experiment aimed to assess the effect of integrated nutrient management (INM) involving farmyard manure (FYM), Vermicompost, and *Rhizobium* inoculation in different combinations on the growth and yield of cluster bean. The study was conducted in a Randomized Block Design (RBD) with three replications and eleven treatments. Results revealed that the application of 75% Recommended Dose of Fertilizer (RDF) + FYM (25 t/ha) + Vermicompost (5 t/ha) + *Rhizobium* (2 kg/ha) recorded the highest performance in all major yield attributes, including number of clusters per plant (6.15), pods per cluster (5.50), pods per plant (33.29), average pod weight (2.35 g), pod length (14.1 cm), and total yield (70.43 q/ha). The combined application of organic and inorganic sources significantly improved soil fertility and nutrient availability, leading to enhanced plant growth and productivity. Therefore, it may be concluded that the integrated nutrient management treatment comprising 75% RDF + FYM (25 t/ha) + Vermicompost (5 t/ha) + *Rhizobium* (2 kg/ha) is most effective and suitable for achieving higher yield and sustainable commercial cultivation of vegetable cluster bean under the agro-climatic conditions of the Chhattisgarh plain regions.

Keywords: *Cluster bean, INM, farmyard manure, vermicompost, rhizobium*

IHASE-2025/114

Effect of venom extraction on hygienic and defensive behaviour of honey bees, *Apis cerana* (Hymenoptera: Apidae)

Mousumi Bharali[1], M.K. Deka[2] and Partha P.G. Das[3]
Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam
[1]M.Sc. Scholar, Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam
[2]Principal Scientist, Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam
[3]Scientist, Department of Entomology, Assam Agricultural University, Jorhat-785013, Assam
Corresponding address: Mail id- mousumi.bharali25@gmail.com | Phone no. - 8721025788

Honey bee venom is a valuable biological product with diverse pharmaceutical potential, while also serving vital roles in colony defense and communication that sustain collective health and behavioural harmony within the hive. Hygienic and defensive behaviour are key adaptations that ensure colony health and survival. The present study, conducted at Assam Agricultural University, Jorhat, from March 2024 to February 2025, evaluated the effect of venom extraction on the hygienic and defensive behaviour of *Apis cerana*. Colonies were subjected to three venom extraction durations - 20 min (T1), 30 min (T2) and 40 min (T3). Hygienic and defensive behaviour were assessed using the pin-prick method and black leather ball patch assay, respectively. Hygienic behaviour increased progressively with exposure duration, with the highest and most consistent improvement recorded under T3, particularly during spring (March – May, 2024) and winter (December, 2024 – February, 2025). Similarly, defensive behaviour intensified with longer extraction durations, showing peak sting frequencies under T_3 during May 2024 (2.67 ± 0.60 stings/colony/min), followed by February 2025 (2.11 ± 0.45 stings/colony/min). Further, worker mortality was also evaluated which showed no significant effect of treatment or season, though the highest (0.824 ± 0.112 workers/colony) occurred at 40 min, mainly due to accidental entrapment during electrical stimulation, indicating that the extraction method was largely safe. These findings demonstrate the potential of venom harvesting as a sustainable practice that enhances both behavioural vitality and colony health in *Apis cerana*.

Key words: *Apis cerana, Venom, Hygienic behaviour, Defensive behaviour, Mortality*

IHASE-2025/115

Overview of Soil Fertility Management: Approaches and Strategies in Nepal

Shree Prasad Vista
Chief, National Soil Science Research Centre, Nepal Agricultural Research Council

Soil fertility management is crucial for sustaining agricultural productivity in Nepal, where nutrient depletion, erosion, soil acidity and fertilizer shortage, etc. are major concerns. Diverse agro-ecological zones require site-specific approaches combining traditional and modern practices. Integrated Nutrient Management (INM), which blends organic manures, biofertilizers, and chemical fertilizers, is widely promoted to improve soil health and crop yield. Government and research institutions are strengthening soil testing services, promoting green manuring, crop rotation, and farmer training programs. NARC has developed and launched digital soil map and every two years; it is updated. The use of the DSM is quite encouraging but due to limited technology adoption, poor access to quality inputs, and lack of irrigation, it hinders progress. Thus, sustainable soil fertility management in Nepal thus requires coordinated efforts among farmers, researchers, and policymakers to ensure long-term soil productivity and food security.

Keywords: *Soil fertility management, integrated nutrient management, sustainable agriculture, Nepal*

IHASE-2025/116

Phosphate and Zinc Solubilization Activity of Endophytic Bacteria Isolated from *Plantago lanceolata* L.

Sokhibjon Abdusamatov[1,2*], Numonjon Sultanov[2], Dilfuza Jabborova[1,2]
[1]Institute of Genetics and Plant Experimental Biology, 111208 Kibray, Uzbekistan
[2]National University of Uzbekistan, 100174 Tashkent, Uzbekistan;
nomonjonsultanov4@gmail.com; dilfuzajabborova@yahoo.com
Corresponding author: sokhibjon.abdusamatov@gmail.com

Soil phosphorus (P) and zinc (Zn) are among the most essential nutrients required for optimal plant growth and productivity. However, a large portion of these elements exists in insoluble forms that are not readily available for plant uptake. Phosphate-solubilizing microorganisms (PSMs), particularly endophytic bacteria, play a crucial role in converting insoluble inorganic and organic phosphorus compounds into soluble forms that can be absorbed by plants.

Endophytic bacteria associated with medicinal plants have recently gained significant attention due to their dual role in promoting plant growth and protecting against pathogens. Among such plants, *Plantago lanceolata* has been reported to harbor diverse endophytic bacterial communities with remarkable biochemical activity. These microorganisms enhance nutrient availability and stimulate plant growth by secreting various organic acids—such as citric, oxalic, gluconic, and lactic acids—that chemically dissolve insoluble phosphate compounds, releasing soluble orthophosphate ions ($H_2PO_4^-$, HPO_4^{2-}). Additionally, the enzymes phosphatase and phytase produced by these bacteria hydrolyze organic phosphorus compounds into plant-accessible forms.

Several studies have demonstrated that bacterial genera such as *Bacillus*, *Pseudomonas*, and *Brevibacillus* are among the most effective phosphate-solubilizing endophytes. In addition to phosphorus, the solubilization of zinc minerals (e.g., ZnO, $ZnCO_3$, $Zn_3(PO_4)_2$) by bacterial metabolites is another important mechanism contributing to improved micronutrient availability in soils. Organic acids secreted by these endophytes dissolve insoluble zinc compounds, producing soluble Zn^{2+} ions that are more easily assimilated by plants.

In the present study, endophytic bacteria isolated from *Plantago lanceolata* were evaluated for their ability to solubilize phosphate and zinc compounds. The results revealed that *Bacillus velezensis* exhibited the highest phosphate solubilization index, indicating its strong potential as a plant growth-promoting bacterium. *Bacillus cereus* and *Bacillus paramycoides* demonstrated moderate solubilization activity, while *Brevibacillus brevis* and *Brevibacillus formosus*

showed relatively lower efficiency. *Pseudomonas moraviensis* displayed the weakest phosphate solubilizing capability.

A similar trend was observed for zinc solubilization, where *Bacillus* and *Brevibacillus* species showed high efficiency in dissolving zinc minerals, with *Bacillus velezensis* being the most effective isolate. In contrast, *Pseudomonas moraviensis* exhibited the lowest solubilization activity.

Overall, the findings demonstrate that the solubilization efficiency of phosphate and zinc compounds varies significantly among different bacterial isolates. These results highlight the important ecological role of endophytic bacteria in phosphorus and zinc cycling within the soil–plant system and suggest that *Bacillus velezensis* possesses high potential as a promising bioinoculant for enhancing plant nutrient uptake and growth.

Keywords: *Plantago lanceolata ; endophytic bacteria; phosphorus (P); zinc (Zn); phosphate-solubilizing microorganisms (PSMs); zinc solubilization*

IHASE-2025/117

Hydrogen Cyanide Production Activity of Endophytic Bacteria Isolated from *Plantago lanceolata* L.

Sokhibjon Abdusamatov[1,2*], Numonjon Sultanov[2], Dilfuza Jabborova[1,2]
[1]Institute of Genetics and Plant Experimental Biology, 111208 Kibray, Uzbekistan
[2]National University of Uzbekistan, 100174 Tashkent, Uzbekistan;
nomonjonsultanov4@gmail.com; dilfuzajabborova@yahoo.com
Corresponding author: sokhibjon.abdusamatov@gmail.com

Although there are numerous species of medicinal plants, one of the most widespread and therapeutically valuable among them is *Plantago lanceolata*, which holds particular significance in scientific research. In traditional medicine, *Plantago lanceolata* has long been used for the treatment of wounds, while modern studies have confirmed its anti-inflammatory, analgesic, tonic, antihistaminic, and other healing properties.

The aerial parts of *Plantago lanceolata* have been found to possess several important pharmacological effects. Specifically, the organs of this plant are known to accelerate wound healing, exhibit antibacterial activity, display diuretic effects, and have potential applications in the treatment of asthma.

In recent years, the medicinal properties of *Plantago lanceolata* have attracted increasing scientific interest. Consequently, attention has been directed not only to the plant itself but also to the microorganisms that live in symbiotic association with it. In studies conducted by Krimi and co-authors, five endophytic bacterial strains were isolated from the roots of this plant, which were identified mainly as belonging to the genera *Bacillus* and *Pseudomonas*.

These bacterial isolates exhibited strong biocontrol activity and were evaluated as effective agents against phytopathogens such as *Agrobacterium* spp. and *Pectobacterium* spp., as well as growth-promoting agents for tomato plants. Considering these beneficial characteristics, we aimed to investigate the properties of endophytic bacteria isolated from *Plantago lanceolata*. Endophytic bacteria were isolated from long-leaved plantain (*Plantago lanceolata* L.) collected from the territory of the State Forestry of the Surxondaryo Region, Republic of Uzbekistan, and their hydrogen cyanide (HCN) production activity was studied.

HCN production by endophytes was assessed using King's B broth supplemented with glycine (4.4 g/L). Each bacterial and fungal suspension was inoculated into the medium, and all experiments were performed in triplicate. Non-inoculated flasks served as controls. Sterile filter paper strips were soaked in an alkaline picrate solution (0.5% picric acid and 2% Na_2CO_3) and fixed to the neck of

each flask (one per flask). The flasks were sealed with parafilm and incubated at 28 °C for 4 days with shaking at 140 rpm.

The production of HCN was indicated by a color change of the sodium picrate paper strips to a reddish hue proportional to the amount of HCN produced. Each used filter paper strip was then placed into a test tube containing 10 mL of deionized water to elute the color, and absorbance was measured spectrophotometrically (SHIMADZU, model UV1800) at 625 nm. Before measurement, the absorbance at 625 nm was zeroed using distilled water.

The qualitative and quantitative capacities of the bacterial endophytes to produce HCN were evaluated. According to the results, *Bacillus cereus* exhibited strong (+++) HCN production, with a quantitative value of 0.041 ± 0.002 OD. *Bacillus paramycoides* showed moderate (++) production with a value of 0.034 ± 0.002 OD.

The highest HCN production was observed in *Bacillus velezensis*, which demonstrated very strong (++++) activity, recording a value of 0.073 ± 0.003 OD. In addition, *Brevibacillus brevis* (0.024 ± 0.002 OD) and *Brevibacillus formosus* (0.033 ± 0.002 OD) exhibited moderate (++) levels of production.
Pseudomonas moraviensis, on the other hand, showed the lowest HCN production ability, displaying only weak (+) activity, with a quantitative value of 0.013 ± 0.003 OD.

Overall, the results indicate that there are significant differences in HCN production among the bacterial endophytes. In particular, *Bacillus velezensis* stood out with the highest production capacity, while *Pseudomonas moraviensis* exhibited the lowest level of activity.

Keywords: *Plantago lanceolata; endophytic bacteria; HCN production*

IHASE-2025/118

Factors Influencing Test-Day Milk Yield in Jsersey Crossbred Cattle

V. V. Potdar* , Syed Meraj Ahmed Ismail, Shivarudrappa B, Sachin Joshi and Jayant Khadse

Central Research Station, BAIF Development Research Foundation, Urulikanchan, Pune, India.

*Corresponding author: E-mail: vinod.potdar@baif.org.in

The present study aimed to evaluate the factors influencing test-day milk yield in Jsersey crossbred cattle using least squares means (LSM) analysis under the BAIF Enhance Genetics Project. Test-day milk yield data were analyzed considering the fixed effects of calving year, district (zone), and lactation number to understand variation across management and environmental conditions. The effect of calving year indicated a marginal decline in milk yield from 2021 to 2024, followed by a slight rebound in 2025. Peak yield was observed between the first and third test-days, gradually decreasing in later test-days, representing the characteristic lactation curve pattern described by Wood (1967) and Ali & Schaeffer (1987). The improvement noted in 2025 reflects enhanced herd management, feed practices, and climate adaptation under project interventions. District-wise analysis revealed significant regional differences, with cattle from the Tarai and Central Plain zones recording higher milk yields than those from the Eastern Plain zone, which experienced greater climatic stress and mastitis incidence . These findings align with Sahoo et al. (2023), who reported strong agroclimatic effects on milk production under Indian smallholder conditions. Lactation number significantly affected milk yield, with a gradual decline observed from 11.17 ± 0.08 kg in the first lactation to 10.31 ± 0.08 kg in the sixth lactation at Test-Day 2. Early lactation peaks and reduced persistency in older cows correspond with findings by Sharma et al. (2019, 2022) and Singh et al. (2020).Overall, the study confirms that calving year, agroclimatic region, and lactation number significantly influence test-day milk yield, underscoring the importance of management and environmental adaptation for sustained productivity in crossbred cattle.

Keywords: *Test-day milk yield, Crossbred cattle, Least squares means, Lactation curve, Agroclimatic zones*

IHASE-2025/119

Effect of abiotic factors on the population dynamics of major sucking pests infesting upland cotton (*Gossypium hirsutum* L.)

Chitralekha[1], A.K. Mehta[2], Sudha Bishnoi[3] And Prince[4]
[1]Department of Entomology, Cotton Research Station, Sirsa, Haryana, India
[2]Department of Agronomy, Cotton Research Station, Sirsa, Haryana, India
[3]Department of Mathematics & Statistics, Cotton Research Station, Sirsa, Haryana
[4]Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India
Corresponding author Email: barwarchitralekha@gmail.com

An Experiment was conducted at Cotton Research Farm, Sirsa, CCS Haryana Agricultural University, Hisar to understand the population fluctuation of major sucking pest in *Bt* cotton *i.e.* cotton whitefly, thrips and leafhopper along with correlation with weather factors during *Kharif* 2024. Population of whitefly, thrips and leafhopper were recorded at weekly intervals. Population of whiteflies ranged from 1.33 to 68.53 adults/3 leaves with maximum during 36th SMW followed by 35th SMW. The correlation studies of whitefly with weather parameters revealed that it had significant and positive correlation with morning relative humidity (0.496**) and evening relative humidity (0.784**). The population of thrips varied from 0.67 to 71.27 adults per three leaves during 23rd to 42nd SMW with maximum population during 28th SMW. Thrips population positively correlated with Minimum temperature (0.537*) while other parameters were non-significant. The population of leafhoppers varied from 0.67 to 10.67 adults per three leaves during 24th to 41st SMW with maximum population during 30th SMW. Leafhopper population has positive correlation (0.437*) with minimum temperature. It has non-significant correlations with rest of parameters.

Keywords: *Abiotic factor, population dynamics, whitefly, thrips, leafhopper, cotton*
* SMW- Standard Meteorological Week

IHASE-2025/120

Microbiological Study and Contaminant Analysis on Sambhar Lake of Jaipur, Rajasthan to Evaluate the Toxicity Risk for Birds, Aquatic Life and Humans

Prakriti Pareek[1*], Dr. Manjul Mishra[2]
[1]Research Scholar, Chemistry Department, Apex University, Jaipur (Rajasthan)
[2]Professor, Chemistry Department, Apex University, Jaipur (Rajasthan)
manjulmishra7@gmail.com prakritiparrek@gmail.com

Sambhar Lake, the largest inland saline wetland in India, near Jaipur, Rajasthan, is ecologically vital yet threatened by pollution. This study analyzes the microbiological and chemical contaminants of the lake to assess toxicity risks for birds, aquatic life and humans. Water samples were collected seasonally and analyzed for physico-chemical parameters, heavy metals, and microbial indicators. Elevated concentrations of lead, cadmium and copper were detected at several sites. High levels of total and fecal coliforms indicated organic and sewage contamination. The combined presence of heavy metals and pathogens suggests multiple stress factors affecting aquatic organisms. Avian mortality reports align with deteriorating water quality and potential toxin exposure. Human health risk arises through contaminated groundwater and local salt production. Findings highlight the urgent need for integrated monitoring and pollution control strategies. Conservation of Sambhar Lake is critical to protect biodiversity and community health.

Keywords: *Sambhar Lake, microbiological contamination, heavy metals, aquatic toxicity, avian risk, saline wetland.*

IHASE-2025/121

Unlocking the Economic Potential of Orchid Flowers through Drying and Value Addition

Neelima Khunte*, Dr. Rajeshwari Sahu, Dr. Toran Lal Sahu, Suvigya Gautam
Department of Horticulture, Floriculture and Landscaping
Mahatma Gandhi University of Horticulture and Forestry,
Sankara (491111) Patan, Durg (Chhattisgarh).
Corresponding author Email Id**:** nilukhunte09@gmail.com

Value addition in floriculture significantly enhances both the economic worth and market appeal of floral commodities. Among these, orchids represent one of the most diverse and economically important groups of ornamental plants. Indigenous species such as *Aerides*, *Bulbophyllum*, *Calanthe*, *Coelogyne*, *Cymbidium*, *Paphiopedilum*, *Rhynchostylis*, *Renanthera*, and *Vanda* are utilized in breeding programs due to their wide adaptability and aesthetic diversity. Orchids can be cultivated organically on various substrates including rocks and logs, making them suitable for sustainable and eco-friendly production systems. Value addition in orchids can be achieved through drying, processing, and utilization of plant parts for multiple purposes. Various drying techniques—such as air, sun, press, embedded, microwave, freeze, and cryo-drying—help preserve color and fragrance, enhancing the ornamental and commercial value of flowers. Fragrant orchids like *Aerides multiflora*, *Cattleya maxima*, and *Dendrobium chrysotoxum* are popular for indoor and outdoor décor. Additionally, several species contribute to nutrition and traditional medicine, as their leaves, pseudobulbs, and tubers are rich in phytochemicals and edible compounds. *Vanilla planifolia*, a major source of vanillin, exemplifies the industrial significance of orchids in value-added products.
Through innovative processing and diversification, orchid value addition offers immense potential for rural entrepreneurship, sustainable livelihood, and environmental conservation—thereby strengthening the floriculture sector's contribution to the green economy.

Keywords: *drying, economic value, orchid, value addition*

IHASE-2025/122

Horizontal and Vertical Growth Dynamics of Natural Farming in Andhra Pradesh: A Pathway towards Sustainable and Climate-Resilient Agriculture

K. Gurava Reddy[1] and B. S.S .Siddartha Naik[2]
Affiliation : Acharya N G Ranga Agricultural University
Corresponding mail id : reddy.gurava@angrau.ac.in

Natural farming is an ecologically integrated approach that works harmoniously with natural processes while eliminating synthetic fertilisers, pesticides, and chemical inputs to promote soil health, biodiversity and sustainable livelihoods. It focuses on lowering cultivation costs, improving soil fertility, conserving natural resources, and ensuring food safety through eco-friendly practices. In India, the Andhra Pradesh Community-Managed Natural Farming (APCNF) programme represents one of the largest and most structured efforts toward nature-based agriculture. Initiated in 2015 and piloted in 704 villages in 2016, the programme has expanded through strong institutional support, community participation, and government commitment. By 2021-22, APCNF practices had reached 2.88 lakh ha (7.13 lakh acres) involving 6.3 lakh farmers. The average operational holding of participating farmers is about 1.1 acres, reflecting the predominance of small and marginal farmers in the initiative. Vertical growth is defined by the depth and quality of adoption, where farmers integrate key ecological principles such as continuous living roots, crop and tree diversity, minimal soil disturbance, the use of indigenous seeds, on-farm bio-inputs, and botanical pest management. Despite these achievements, challenges remain in ensuring consistent adoption, developing strong market linkages for naturally produced commodities and providing transition support to farmers shifting from conventional systems. A replicable pathway for transforming Indian agriculture toward ecological balance, economic viability, and climate-resilient rural prosperity is of the need of the hour.

Keywords: *Natural farming, Climate resilient agriculture, horizontal growth and vertical growth.*

IHASE-2025/123

Amelioration of heat stress in broilers via dietary electrolytes and herbal supplements (*P. emblica)*.

Dr. Vipin Maurya[1], Dr. Utkarsh Kumar Tripathi[1], and Dr. Santosh Marandi[2]

[1]Department of Livestock Production Management, Faculty of Veterinary & Animal Sciences, I.Ag.Sc., RGSC-Banaras Hindu University, Barkachha, Mirzapur, Uttar Pradesh, India. 231001.

[2]In-charge, Livestock Farm Complex, Faculty of Veterinary & Animal Sciences, I.Ag.Sc., RGSC-Banaras Hindu University, Barkachha, Mirzapur, Uttar Pradesh, India. 231001.

Heat stress (HS) is a major constraint to broiler productivity, particularly in tropical and subtropical climates such as North India, where summer temperatures often exceed 34 ± 1.6 °C with relative humidity levels of 68–70%. Chronic HS disrupts acid–base equilibrium, elevates body temperature, impairs feed efficiency, and alters neuroendocrine and hematological profiles. This 42-day experiment conducted at the Livestock Farm Complex, RGSC-BHU, evaluated the effects of dietary sodium bicarbonate ($NaHCO_3$), vinegar, and Phyllanthus emblica (Amla) extract on mitigating HS impacts in 240 VenCobb broilers (n = 60 per group). The treatments included T_1 (basal control diet), T_2 (2% vinegar), T_3 (2% $NaHCO_3$), and T_4 (P. emblica at 1 g/kg feed). Control birds (T_1) exhibited classical HS symptoms, including elevated rectal temperature (RT: 42.1 ± 0.2 °C), reduced body weight gain (BWG: 1,976 ± 42 g), high feed conversion ratio (FCR: 2.05 ± 0.08), and elevated corticosterone levels (5.8 ± 0.4 ng/mL), along with high heterophil-to-lymphocyte (H/L) ratio (0.61 ± 0.04) accompanied by low hemoglobin (9.2 ± 0.3 g/dL). Vinegar supplementation (T_2) marginally improved appetite and thermoregulation (RT: 41.8 ± 0.2 °C; BWG: 2,050 ± 38 g; FCR: 1.98 ± 0.07; corticosterone: 5.3 ± 0.3 ng/mL; H/L: 0.53 ± 0.03), indicating limited stress alleviation. $NaHCO_3$ supplementation (T_3) effectively improved acid–base homeostasis by reducing systemic alkalosis and supporting thermoregulation (RT: 41.5 ± 0.2 °C; $p < 0.01$). This group exhibited significantly enhanced BWG (2,320 ± 35 g), reduced FCR (1.80 ± 0.05), and moderate stress reduction (corticosterone: 4.6 ± 0.2 ng/mL; H/L: 0.45 ± 0.03; Hb: 10.1 ± 0.3 g/dL), confirming improved physiological stability. The Amla-supplemented group (T_4) demonstrated the most comprehensive benefits across all parameters, showing superior BWG (2,410 ± 30 g), optimal FCR (1.75 ± 0.04), and lowest corticosterone levels (3.9 ± 0.2 ng/mL), coupled with a balanced H/L ratio

(0.39 ± 0.02), higher hemoglobin (10.5 ± 0.3 g/dL), and packed cell volume (34.5 ± 1.0%). Overall, $NaHCO_3$ effectively stabilized acid–base balance, while P. emblica offers potent systemic protection against heat-induced physiological and endocrine disruptions. Vinegar provides buffering and appetite enhancement. Integrated use of electrolytes and herbal antioxidants can therefore enhance broiler welfare, thermotolerance, and productivity under heat-stressed environments.

Keywords: *Antioxidant, Broiler chicken, Feed conversion ratio, Heat stress, Phyllanthus emblica, Physiological adaptation, Sodium bicarbonate, Thermoregulation.*

IHASE-2025/124

Ethical Animal Production: Merging Welfare, Sustainability, and Productivity

Dr. Nikita Mangal
Assistant Professor, Department of Geography
Government College, Deoli (Tonk) Rajasthan
Email-nikitamangal1983@gmail.com
Contact Number- 9461752511

Ethical animal production represents a modern and responsible approach to livestock farming that connects animal welfare, environmental care, and sustainable productivity. As the global demand for animal-based food increases, it has become essential to balance efficiency with compassion. Ethical farming ensures that animals are treated humanely, with proper housing, nutrition, health care, and freedom to express natural behaviours, while still maintaining good production outcomes.

Sustainable and welfare-friendly practices—such as improved housing systems, responsible feed use, waste management, and reduced antibiotic dependence—help protect both animals and the environment. These approaches not only enhance animal well-being but also support long-term farm productivity and profitability. Additionally, consumer awareness and supportive policies are encouraging farmers to adopt production systems that value transparency, animal ethics, and environmental protection.

By merging welfare, sustainability, and productivity, ethical animal production creates a win-win scenario for animals, farmers, and society. It builds trust among consumers, promotes sustainable food systems, and ensures that agricultural progress aligns with moral and ecological responsibility. This approach paves the way for a more humane and resilient future in animal agriculture.

Keywords: *Ethical farming, animal welfare, sustainable livestock production, environmental sustainability, responsible farming practices.*

IHASE-2025/125

Identification and comparison of mirror repeats in mRNA isoform of the muscular dystrophy gene: The largest human gene

Priya*, Namrata Dangi**
* Phd Research Scholar Baba Mastnath University (Rohtak), Haryana
** Co-author and guide

Duchenne muscular dystrophy (DMD) is the most prevalent and severe form of X-linked muscular dystrophy, caused by mutations in the dystrophin gene, one of the most significant genes in the human genome. The absence of dystrophin destabilizes the sarcolemma, leading to progressive degeneration of muscle fibers, necrosis, and eventual replacement by adipose and fibrotic tissue. Clinically, DMD manifests in early childhood with gait abnormalities, frequent falls, calf contractures, and loss of ambulation before adolescence, culminating in life-limiting cardiac and respiratory complications. Although dystrophin primarily functions in muscle stability, its isoforms are also expressed in the brain, where altered expression may contribute to the mild cognitive deficits observed in a subset of patients. The large size and complexity of the dystrophin gene make it highly susceptible to diverse mutations, including de novo events, and it produces multiple tissue-specific isoforms through the use of alternative promoters and splicing. Emerging evidence suggests that repetitive DNA and RNA motifs can influence gene regulation, transcript stability, and disease severity in neuromuscular disorders. In this study, we focus on **mirror repeats** within dystrophin mRNA isoforms, with the objectives of (i) identifying these repeats across different isoforms and (ii) analyzing their distribution by comparing essential isoforms. Characterizing such repeat elements may provide new insights into transcript structure and function, and highlight potential modifiers of disease pathogenesis in DMD.

Keywords: *Muscular dystrophy, mirror repeats, isoforms.*

IHASE-2025/126

effect of fertigation and nano formulated nutrients on the soil nutrient status of pole bean (*Phaseolus Vulgaris* L.)

Bandi Leeshini Indira*, Dr. Raveendra S. Jawadagi, Mr. H. P. Hadimani, Yashvantha Kumar K.H and Sanjeevareddi G. reddy
Ph. D. Scholar, Department of Vegetable science,
Dr. YSR Horticultural University,
Andhra Pradesh, India
E-mail: leeshiniindira1948@gmail.com

An experiment was conducted during 2023–24 in the Department of Vegetable Science, College of Horticulture, University of Horticultural Sciences, Bagalkot, to evaluate the "Effect of fertigation and nano formulated nutrients on the soil nutrient status of pole bean (*Phaseolus vulgaris* L.)". The investigation comprised sixteen treatment combinations replicated twice, involving different fertigation levels and nano nutrient formulations. Among the fertigation treatments, F_3 (100% of N, P, K @ 75:100:75 kg/ha as recommended dose of fertilizers through fertigation) recorded significantly higher availability of nitrogen, phosphorus and potassium in the soil compared to other levels. Between the two nano diammonium phosphate (DAP) concentrations, foliar spray at 4 ml/l (N_2) proved more effective in increasing soil nutrient status. The combined treatment of 100% RDF of N, P, K (75:100:75 kg/ha) through fertigation along with foliar application of nano DAP @ 4 ml/l at 30, 60 and 90 days after sowing (DAS) recorded maximum soil nitrogen (244.86 kg/ha), phosphorus (32.92 kg/ha) and potassium (267.45 kg/ha) availability. The improved soil nutrient status could be attributed to the continuous and uniform nutrient supply through fertigation, coupled with the enhanced absorption and translocation efficiency of nano DAP. The distribution and availability of nutrients were primarily influenced by soil moisture dynamics, solubility characteristics of applied nutrients and efficient nutrient mobility in the rhizosphere, ultimately promoting better nutrient utilization by pole bean plants.

Keywords*: Pole bean, fertigation, nano DAP, soil nutrient status and nutrient availability*

IHASE-2025/127

Effect of some Macro-nutrients and Micro-nutrients in nutritive value of germinating wheat

Archana Singh
Professor, Department of Botany
M.S.J. Government Post-graduate College, Bharatpur (Raj)-321001

A small plant of Wheat is calling 'Jwara' or wheat grass or wheat germ. It consists of approximate 70% to 75% chlorophyll. This is significant because chlorophyll has a close structure as haemoglobin. It plays a vital role to carry oxygen to the different parts of our body; due to the similar structure of chlorophyll as haemoglobin it is often known as "the blood of plant life" and as the high levels of chlorophyll found in wheat grass it can be easily absorbed by human bodies and used to restructured the blood. The present studies were carried to explore the effect of different concentrations of important nutrients on the germination and growth of germinated wheat (jwara). Effect of Magnesium, Phosphorus, Boron, Sulfur, Nitrogen and potash in growth of the germinating Wheat were observed in the present experiments. The excellent results were observed in the treatment of Magnesium, sulphur, phosphorus followed by nitrogen and potash in varieties selected for the studies are Raj 3765, Raj 3077, GW 173.

Key Words: *Germinating wheat, macro-nutrients, micro-nutrients, wheat varieties.*

IHASE-2025/128

Spectrum of mirror repeats in gustatory receptor gene Gr37 of yellow fever mosquito: *Aedes aegypti* (Linn.)

Deepti[1], Vikash Bhardwaj[2*] and Kavita Saini[3]

[1]Ph.D. Scholar and [2*]Associate Professor, Department of Zoology, Baba Mastnath University, Asthal Bohar, Rohtak-124021, Haryana, India

[3]Department of Zoology, Government College for Women, Gohana, Sonipat - 131301, Haryana, India

*Corresponding author Email: vikashbhardwaj@gmail.com

Mirror repeats (MRs), the repetitive DNA sequences, known to accumulate variations in the gene or genome, are important tools for evolutionary, taxonomic, phylogenetic, and vector ecological studies. Present study is first of its kind to identify MRs in the pheromone detecting gustatory receptor gene, Gr37 of yellow fever mosquito, *Aedes aegypti* (Linn.) (Diptera: Culicidae). In total, 39 mirror repeats were retrieved from the complete gene sequence (1454 bp) using nucleotide BLAST (BLASTn). Of these, 8 MRs were categorized as Perfect Mirror Repeat (PMR), 6 as Imperfect Mirror Repeat (IMR) and remaining (25 MRs) as Perfect Mirror Repeat with Single Spacer (PMR-SS). Exon-1 (842 bp) and exon-2 (461 bp) possessed 24 and 7 MRs, respectively. The exonic region thus comprised of 31 MRs. Of these, 5 MRs were categorized as PMR, 6 as IMR and remaining (20 MRs) as PMR-SS. The only intron (151 bp) possessed 8 MRs; 3 MRs were categorized as PMR and 5 MRs as PMR-SS. Overall, 31 MRs were reported in the mRNA (1326 bp). Of these, 5 MRs were categorized as PMR, 6 as IMR and remaining (20 MRs) as PMR-SS. The coding DNA sequence (CDS) (945 bp) comprised of 26 MRs. Of these, 4 MRs were categorized as PMR, 4 as IMR and remaining (18 MRs) as PMR-SS. Two MRs viz., AAAGAAA and TTCACTT had frequency of 2, while rest of the MRs were found only once in the complete gene sequence. Distribution studies using megaBLAST revealed the presence of three MRs viz., TTTAATATAATTT, ATAGTGTGATA and TTTCACCCACATT within the genome of most of the mosquito species namely *A. aegypti*, *Aedes albopictus* (Skuse), *Anopheles stephensi* Liston, *Culex pipiens* Linn. and *Culex quinquefasciatus* Say, except *Anopheles culicifacies* Giles. The study concludes that the identified MRs are limited not only to *A. aegypti* but also present in other mosquito species.

Keywords*: Aedes aegypti, Culicidae, Pheromone, Mirror repeat, Gustatory gene Gr37, BLASTn*

IHASE-2025/129

Nutraceuticals and functional foods, a new health needs

Ayusha Gupta[1], Anita Kerketta[2] and Amit Dixit[3],
[1]Ph.D. Scholar, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
[2]Assistant Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
[3]Professor, Vegetable science, MGUVV, Durg, Chhattisgarh, 491111.
Correspondence author: anitakerketta@mguvv.ac.in

Nutraceuticals described as food or part of a food that provides health benefits and are used for prevention or treatment of a disease whereas functional foods described as food products that are used in the standard diet to provide beneficial health effects in addition to the traditional nutritional effects. A diet containing high levels of fruits and vegetables has been associated with a lower risk of chronic disease therefore encompassing the importance of nutraceuticals and functional foods in our daily diet. Nutraceuticals are one of the secondary metabolites that are being produced by diverse group of plants including the horticultural crops. The secondary metabolites expressed in horticultural crops such as phenolic compounds, flavonoids, alkaloids, polyphenols, terpenoids exhibit number of health benefits such as anti-inflammatory, anti-diabetic, anticancer response. For example, tomato polyphenols are hydroxycinnamic acids, flavanones, naringenin chalcone anthocyanins and flavonol glycosides like rutin and kaempferol-3-rutinoside reported vital health benefits. Knowledge of the biosynthetic pathways will enhance its production. For example, citrus fruits are defensive against a variety of human cancers, dark green leafy vegetables contain lutein having ability to neutralize free radicals reducing chances of age-related macular degeneration. Extensive research work is being done to enhance our understanding of functional foods to improve the quality of life. Horticultural crops produce tremendous number of secondary metabolites that holds the nutraceutical value beneficial for our health. The use of nutraceuticals and functional food are helpful to promote the human health and reduce the disease risk.

Keywords *: Functional foods, Nutraceuticals, Polyphenols, Secondary metabolites.*

IHASE-2025/130

Genetic Modification and Gene Editing Approaches in Bioremediation: Innovations for Sustainable Agriculture and Environmental Health

Dr Hardik Pathak
Centre of Research in Environmental Sustainability,
Jecrc University, Jaipur Rajasthan, India
Email Id: hardikaeshu@gmail.com
Contact Number : 9602453825

Coupling bioremediation with genetic modification and gene editing technologies opens an advanced frontier toward environmental sustainability and agricultural resilience. Conventional bioremediation relies on microorganisms in the wild to degrade harmful pollutants; however, applications of molecular biology have made it possible to develop genetically modified and CRISPR-edited microbial strains with enhanced degradative potential, metabolic efficiency, and environmental adaptability. Engineered bacteria and fungi can degrade complex pollutants such as pesticides, heavy metals, and microplastics more efficiently, thus offering eco-friendly approaches to conventional remediation. In agriculture, gene-edited plants and rhizobacteria are being developed with capabilities for improving soil health, restoring fertility, and detoxifying ecosystems to support sustainable food production systems. Coupling gene editing with omics further accelerates the discovery of novel degradation pathways and enzymes for targeted bioremediation. This paper highlights recent advances in genetic engineering-driven bioremediation and its applications across agricultural, environmental, and industrial sectors, with emphasis on its critical role in achieving sustainable development and a cleaner, healthy planet.

Keywords: *Genetic engineering, Gene editing, CRISPR-Cas9, Bioremediation, Environmental sustainability, Microbial biotechnology, Soil health, Pollution mitigation*

IHASE-2025/131

Nanotechnology in Medicine: Challenges and Opportunities for Sustainable Healthcare Solutions

Dr Saurabh Dave
Department of Chemistry, Jecrc University, Jaipur Rajasthan, India
Mail Id: Saurabhchem76@gmail.com
Contact Number 9414605268

Nanotechnology has indeed brought a revolution in the biomedical and agricultural sciences, offering novel tools for precision diagnostics, targeted therapeutics, and sustainable health solutions. In the medical domain, several nanoscale materials, including liposomes, polymeric nanoparticles, gold nanoparticles, and quantum dots, have shown immense potential in targeted drug delivery, gene therapy, bioimaging, and regenerative medicine. These nanostructures enhance the efficacy of therapeutic agents and reduce unwanted side effects to a minimum while simultaneously allowing for real-time monitoring of the disease states-a prerequisite for precision and personalized healthcare. Besides, the merging of nanotechnology with biotechnology and environmental science supports the development of a green product and biocompatibility for sustainable applications. The emerging concept of "nano-enabled agriculture" also interlinks human and environmental health through the reduction of chemical residues and enhancement of food safety, thus relating medical nanoscience to global sustainability goals. This review discusses the many applications of nanotechnology in medicine by accentuating its contribution to achieving sustainable development through the development of novel, effective, and environmentally benign healthcare solutions.

Keywords: *Nanotechnology, Drug delivery, Diagnostics, Biomedical innovation, Sustainable healthcare, Nano-biotechnology, Precision medicine*

IHASE-2025/132

Effect of Heavy metal- induced Oxidative Stress on Growth and Chlorophyll content of freshwater algae Chlorella vulgaris

Bhaswati Chakraborty[1], Dr. Joel Jose[1*]
[1]M.Sc. Biotechnology
Department of Life Sciences, CHRIST (Deemed to be University), Bengaluru Central Campus, Hosur Road, Bangalore, Karnataka, India
Email ID- bhaswati.chakraborty@mbty.christuniversity.in
[1]Assistant Professor
Department of Life Sciences, CHRIST (Deemed to be University), Bengaluru Central Campus, Hosur Road, Bangalore, Karnataka, India
*Corresponding Author- joel.jose@christuniversity.in

The persistent occurrence of heavy metal pollutants and its subsequent primary impact on aquatic ecosystem have been ever concerning. Such pollutants often exhibit a complex interplay of toxicity with other metals and can sustain in the nature for prolonged duration. Microalgae serves as a valuable bioindicator to study the effect of such pollutants to successfully predict and assess the potential impact of such pollutants on higher organisms. This study focuses on the growth and stress physiology of Chlorella vulgaris, a unicellular photosynthetic alga, by exposing it to different concentrations of Lead and Arsenic, both in single and combination. The algae were grown in BBM media with different concentrations of Arsenic (0.05. 0.5, 5, 15 mg/L), Lead (0.05, 0.5, 2, 6 mg/L) and in Combinations (0.05 As + Pb, 0.5 As + Pb, 5 As + 2 Pb, 15 As + 6 Pb mg/L respectively). Antioxidant enzymes like Catalase (CAT) and Ascorbic Peroxidase (APX) were also evaluated, which showed a steep increase in the enzyme activity with increasing concentration of heavy metal treatment. Photosynthetic pigments like chlorophyll a, chlorophyll b and carotenoids showed gradual decrease, with slight stimulation at the initial stages. The lead treated culture showed overall higher photosynthetic productivity in comparison to arsenic and combination treated cultures, indicating the lesser toxicity of lead over other two scenarios, indicating antagonistic effects of these pollutants in the environment.

Keywords *Antioxidant enzymes, arsenic, bioindicator, chlorophyll, freshwater algae, lead, oxidative stress, phytotoxicity.*

IHASE-2025/133

Effect of different chemical preservatives on keeping quality and vase life of Gerbera cv. Livia

Richa[1], Manisha Kashyap[2], Sushil kashyap[2]

[1]M.Sc. Scholar, Department of Floriculture and Landscaping, College of Horticulture and Research Station, MGUVV, Durg, Chhattisgarh. 491111

[2]Assistant Professor, Department of Floriculture and Landscape Architecture, College of Horticulture and Research Station Saja, Bemetara, MGUVV, Durg, Chhattisgarh. 491111

*Corresponding Author- manisha.fla2024@gmail.com

Gerbera (*Gerbera jamesonii*), commonly known as the Transvaal daisy, is one of the most important cut flowers in global floriculture. However, its vase life is often limited due to microbial contamination, stem bending, and early senescence. The present investigation, titled "Effect of chemical preservatives on keeping quality and vase life of Gerbera (*Gerbera jamesonii*) cv. Livia", was conducted at the College of Horticulture and Research Station, Saja, Bemetara, during April 2025. The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments involving different concentrations of citric acid, 8-hydroxyquinoline sulfate (8-HQS), and salicylic acid, each combined with 4% sugar. Among all treatments, 8-HQS at 200 ppm + 4% sugar (T_5) proved most effective in enhancing postharvest quality and vase life. This treatment resulted in the longest vase life (12.1 days), highest solution uptake (60.8 ml), maximum flower diameter (9.89 cm), and delayed petal discoloration, shriveling, and drop compared to the control (distilled water). The superior performance of T_5 is attributed to the antimicrobial and chelating properties of 8-HQS, which maintained xylem conductivity and water absorption, along with sugar providing an energy source to sustain freshness. Overall, the study concludes that the use of 8-HQS (200 ppm) with 4% sugar is an effective preservative solution for improving the vase life, appearance, and commercial value of gerbera cut flower.

Keywords: *Gerbera jamesonii, vase life, postharvest quality, 8-hydroxyquinoline sulfate (8-HQS), floral preservatives.*

IHASE-2025/134

Echoes of the Wild: Morphological and Ethnobotanical Exploration of Orchids in Chhattisgarh for Sustainable Floriculture and Conservation

Suvigya Gautam*, Dr. Rajeshwari Sahu, Dr. Toran Lal Sahu, Neelima Khunte
Department of Horticulture, Floriculture and Landscaping
Mahatma Gandhi University of Horticulture and Forestry,
Sankara (491111) Patan, Durg (Chhattisgarh).
Corresponding author Email Id**:** suvigyagautamedge50@gmail.com

Orchids, one of the most diverse and evolutionarily advanced families of flowering plants, hold immense ecological, ornamental, and medicinal importance. The present study explores the morphological diversity and ethnobotanical relevance of wild orchids in Chhattisgarh, a biodiversity-rich yet under-documented region of Central India. The research aimed to document species diversity, assess morphological traits following DUS (Distinctness, Uniformity and Stability) guidelines, and record traditional knowledge related to their uses. Extensive field surveys were conducted across forest divisions representing varied altitudinal and microclimatic zones. Morphological data were recorded visually and photographically, while ethnobotanical information was obtained through interviews with local communities and traditional healers. The study revealed notable diversity among epiphytic and terrestrial orchids, primarily belonging to *Dendrobium*, *Aerides*, *Vanda*, *Rhyncostylis*, and *Bulbophyllum*. Distinct variations in floral color, inflorescence structure, and pseudobulb morphology were observed. Several species exhibited significant ethnomedicinal value, being traditionally used for treating wounds, respiratory ailments, and fevers.

Selected ornamental orchids were evaluated for dry flower value addition, showing potential for eco-friendly decorative use and livelihood improvement. Integrating morphological and ethnobotanical insights emphasizes the need for in-situ and ex-situ conservation and sustainable utilization of native orchid diversity for biodiversity conservation and floricultural advancement.

Keywords: *conservation, ethnobotany, morphological diversity, wild orchids*

IHASE-2025/135

Detecting Adulteration in Ghee: A Synthesis of Classical Constants, Rapid Screens, and Modern Instrumental Methods

Tanmay Hazra[1], Rohit Sindhav[1] and Anamika Das[2]
[1]College of Dairy Science, Kamdhenu University, Amreli
[2]Sanjay Gandhi Institute of Dairy Technology, Bihar Animal Sciences University, Patna

Ghee is a major dairy fat for cooking and nutrition, yet rising demand and price have encouraged adulteration with cheaper vegetable oils and animal body fats. Authenticity assurance requires sensitive, validated and scalable laboratory and field methods today. The available detection strategies are explained in a practical, tiered framework. First, statutory fat constant assays: Reichert–Meissl, Polenske, iodine and saponification values and butyro refractometer readings offer inexpensive screening aligned with FSSAI, but sensitivity is limited and tailored blends can avoid detection. Second, simple physical tests such as Bomer value, opacity time, complete liquefaction time and apparent solidification time have field utility but poor reproducibility. Third, rapid chromogenic reactions (Baudouin and Halphen tests, ferricyanide or ferric chloride systems and DPPH) enable rapid detection for specific adulterants, provided cross reactivity and storage effects are controlled. Finally, instrument based platforms deliver robust confirmation: gas chromatography of fatty acids and triglycerides with chemometrics; reverse phase TLC or HPLC targeting unsaponifiable sterols (βsitosterol as a vegetable oil marker); mid and near infrared spectroscopy with multivariate models; and species specific PCR to verify animal fat substitution. No single test is sufficient across matrices and adulteration levels. Best practice is orthogonal testing-pairing a rapid screen with a confirmatory chromatographic or spectroscopic method, benchmarked to nationally harmonized limits and validated with reference materials. Priorities include harmonizing cut offs across species and seasons, deploying portable spectroscopic workflows for field enforcement, and strengthening proficiency testing. Together, these steps protect consumers, support fair trade and preserve the economic and cultural value of genuine/pure ghee today.

Keywords: *Ghee; Adulteration; fat constants (RM, BR, Polenske); chromogenic tests; gas chromatography; FSSAI standards.*

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Effect of Dietary Supplementation of *Kappaphycus Alvarezii* (Marine Macroalgae) Vis-A-Vis Bacitracin Methylene Disalicylate on Blood Profile, Oxidative Stress Indices and Immune Response in Commercial Broiler Chickens

S.Navaneetha Krishnan[1*], Anchal Keshri[2], A.K. Patil[3], Naresh Kurechiya [4], Joycee Jogi[5] and Kurukuti Sailesh Sai[6]

[1.] Animal Nutritionist, Dindigul District, Tamilnadu

[2.] Assistant Professor, Department of Animal Nutrition, COVSc ,Mhow.

[3.] Associate Professor, Department of Animal Nutrition, COVSc ,Mhow.

[4.] Assistant Professor, Department of Animal Nutrition, COVSc ,Mhow.

[5.] Associate Professor, Department of Veterinary Microbiology, COVSc, Mhow

[6.] PhD Scholar, NIANP, Bangalore.

* Email – krishnaveen721@gmail.com. Mob – 8778917642.

The present study evaluated the effect of dietary supplementation of *Kappaphycus alvarezii* on the production performance of broiler chickens. A total of 240 day-old VenCobb 400 broiler chicks were randomly assigned to four treatment groups: T0 (corn-soya-based basal diet), T1 (basal diet with BMD at 50 mg/kg), T2 (basal diet with 1% *Kappaphycus alvarezii*), and T3 (basal diet with 2% *Kappaphycus alvarezii*), with six replicates of 10 birds per group for 35 days. Haematological parameters, including Hb and PCV, were similar across all treatments. Biochemical parameters such as total protein, globulin, A:G ratio, total cholesterol, SGOT and SGPT differed significantly ($p \leq 0.05$) among treatments, with the 2% *Kappaphycus alvarezii* group showing the most favorable values. Supplementation with *Kappaphycus alvarezii* also enhanced antioxidant enzyme activities, reflected by higher levels of reduced glutathione (GSH), superoxide dismutase (SOD) and catalase (CAT) in the 2% inclusion group. Broilers supplemented with *Kappaphycus alvarezii* showed significant improvements in humoral immunity, particularly in Newcastle disease (ND) antibody titers. In conclusion, supplementation of *Kappaphycus alvarezii* up to 2% significantly improved blood biochemical parameters, antioxidant enzyme activities and immune response, indicating its potential as a natural substitute for antibiotic growth promoters.

Keywords*: Kappaphycus alvarezii, broiler, biochemical parameters, antioxidant enzyme, immunity.*

IHASE-2025/137

Studies on Pollen Morphology of *Bougainvillea* Cultivars: A Popular Ornamental Plant of Hyderabad District, Telangana State, India

Dr.Chaya Pallati*
Applied Palynology Research Lab, Department of Botany, University College of Science, Saifabad, Osmania University Hyderabad, Telangana State-500004.
Email: pallati.chaya@gmail.com

Bougainvillea native to South America, is a very popular ornamental plant due to its colorful, papery bracts that come in shades of Magenta, pink, purple, orange, and white etc. It is used in horticulture and is often grown in gardens, on patios, fences and along road-sides. This study investigates the pollen morphology of six cultivars of *Bougainvillea* species (family Nyctaginaceae), widely grown along the road sides of Hyderabad district of Telangana, India. The cultivars analyzed include Magenta, Pink, Yellow, Orange, White, and Purple. Pollen grains were prepared using the Erdtman acetolysis technique and examined under a light microscope (LM).

The morphological characteristics of the pollen grains were generally similar across the cultivars, with some minor variations. Pollen size ranged from 22 µm to 28 µm, and the shape was typically spheroidal to rounded triangular with a sub-prolate form. All cultivars exhibited a tricolporate apertural pattern, with the aperture outlined as lolangate. Exine thickness ranged between 3 µm and 4 µm, and the exine ornamentation was coarsely reticulate, with polygonal lumina and free piloid elements. Notably, the lumina of the Magenta and Purple cultivars were larger than those of the Pink, Yellow, Orange, and White cultivars. These pollen morphological characteristics provide valuable insights for cultivar identification and may assist in future breeding programs for *Bougainvillea*.

Keywords: *Horticulture, Ornamentals, Bougainvillea cultivars, Pollen morphology, Hyderabad, Telangana state, India.*

IHASE-2025/138

Unraveling Mirror Repeats and Transcript Diversity in the Human PAH Gene

Laxita Singh
Baba Mastnath University, Asthal Bohar, Rohtak, Haryana
Email: laxitasingh95@gmail.com

Repetitive DNA elements are integral to genomic organization and regulation, yet several subclasses remain poorly characterized. Among these, mirror repeats (MRs) constitute a unique category of palindromic motifs capable of forming non-B DNA conformations such as triplex and H-DNA, which are associated with transcriptional interference, replication stress, and genome instability. The present study provides a comprehensive **in silico analysis** of mirror repeats within the *Homo sapiens* phenylalanine hydroxylase (*PAH*) gene, mutations in which cause phenylketonuria (PKU). A systematic bioinformatic workflow combining NCBI sequence retrieval, segmentation, reverse complement generation, and BLAST-based alignment under the FPCB (Fast Pairwise Comparison) framework was employed to examine two transcript variants—NM_000277.3 (canonical) and NM_001354304.2 (alternative). Across the complete *PAH* sequence, 2,822 mirror repeats were identified, including 63 within exonic regions of the canonical transcript, suggesting possible regulatory influence on transcription and translation. Despite encoding the same 452-amino acid enzyme, the canonical and alternative transcripts differ structurally, containing 13 and 14 exons respectively, with extended untranslated regions in the latter. These variations likely contribute to transcript-specific expression and regulatory control. The findings present the first comprehensive mirror repeat landscape of the *PAH* gene, highlighting the role of sequence symmetry in transcript diversity, gene regulation, and genomic stability.

Keywords: *Mirror repeats, PAH gene transcript variants, Non-B DNA, Genomic instability, Phenylketonuria, In silico genomics*

IHASE-2025/139

Length-Weight Relationship and Growth Pattern Analysis of Channa punctatus from the Ganga River, Bijnor and Cirrhinus mrigala from Ram Taal Lake, Meerut: A Comparative Study of Allometric Growth and Environmental Influence

Shagun Rathi, Dr. Neeru Singh*, Dr. Mohd. Faisal Siddiqui
Department of Life Science, Keral Verma Subharti College of Science,
Swami Vivekanand Subharti University, Meerut
*Corresponding author: neeru.su201900345@subharti

The length–weight relationship (LWR) and condition factor (K) of Channa punctatus and Cirrhinus mrigala collected from two ecologically distinct freshwater systems—the lentic Ram Taal Lake in Uttar Pradesh, India, and the lotic Ganga River—are examined in this study. Log-transformed linear regression was used to determine important growth parameters using biometric data from 20 specimens (10 per species). The findings indicated that Channa punctatus had negative allometric growth ($b = 2.468$, $R^2 = 0.995$) and Cirrhinus mrigala had positive allometric growth ($b = 3.342$, $R^2 = 0.7301$). Compared to Cirrhinus mrigala ($K = 14.96$), Channa punctatus ($K = 71.18$) had a significantly higher average condition factor (K), indicating superior physiological condition in riverine species. These results highlight how environmental factors affect fish health and growth, offering useful information for fishery management and conservation.

Keywords*: Length–Weight Relationship (LWR), Condition Factor (K), Allometric Growth, Channa punctatus, Cirrhinus mrigala, Freshwater Fish, Riverine vs. Lentic Habitat.*

IHASE-2025/140

Synergistic Advances in Biopharmaceuticals, Bioinformatics, and Genetics in Horticultural Sciences

Richa Sao, Anita Kerketta, Bharti Sao and Amit Dixit
Affiliations: Mahatma Gandhi University of Horticulture and Forestry,
Durg, Chhattisgarh, 491111, India
Corresponding author mail address: richasao@mguvv.ac.in

The convergence of biopharmaceutical research, bioinformatics, and genetics has opened new frontiers in horticultural sciences, enabling the development of high-value therapeutic compounds and the improvement of medicinal and aromatic crops. Horticultural plant species, especially medicinal and aromatic plants, are important reservoirs of bioactive metabolites that serve as potential components for novel drug discovery. Advances in plant genomics and molecular genetics have facilitated the identification and functional characterization of genes involved in the biosynthesis of secondary metabolites and active ingredients with therapeutic relevance.

The integration of bioinformatics and computational biology tools has revolutionized data analysis, allowing researchers to decode complex biosynthetic pathways, predict gene functions, and design metabolic engineering strategies for enhanced metabolite production. In addition, omics approaches—such as genomics, transcriptomics, proteomics, and metabolomics—provide comprehensive insights into the molecular mechanisms governing metabolite accumulation. Moreover, Biopharmaceutical applications derived from horticultural species include plant-based vaccines, antibodies, and recombinant proteins, which are gaining prominence due to their cost-effectiveness, scalability, and safety. The integration of computational modeling with genetic improvement strategies accelerates the identification of elite germplasm and molecular targets for breeding programs. This multidisciplinary synergy not only enhances the biopharmaceutical potential of horticultural crops but also contributes to sustainable healthcare solutions and bioeconomic growth.

Keywords: *Biopharmaceuticals, Bioinformatics, Medicinal and Aromatic Plants, Active Ingredients, Genomics*

IHASE-2025/141

Cellulose–ZnO Nanocomposite Coatings: A Green Chemistry Approach for Food Preservation

Dr. Ram Bilas Meena
Department of Chemistry, Government College Kota, Rajasthan, India
Email: rambilasgck@gmail.com

In recent years, the growing demand for sustainable and non-toxic food preservation technologies has led to increased attention toward biopolymer-based edible coatings reinforced with nanomaterials. The present study explores the synthesis and application of cellulose–zinc oxide (ZnO) nanocomposite coatings as an eco-friendly and multifunctional barrier for food protection. Utilizing green chemistry routes, ZnO nanoparticles were synthesized using plant-based reducing agents and uniformly embedded within a regenerated cellulose matrix. The resultant nanocomposite exhibited superior physicochemical properties, including enhanced tensile strength, reduced water vapor transmission rate, and improved UV-light blocking capacity.

The chemical interaction between hydroxyl groups of cellulose and ZnO nanoparticles, confirmed by FTIR and XRD analysis, contributed to structural stability and homogeneous dispersion. Antibacterial assays demonstrated strong inhibitory activity against Escherichia coli and Staphylococcus aureus, primarily due to reactive oxygen species (ROS) generation and Zn^{2+} ion release. Furthermore, the coating exhibited significant antioxidant potential, effectively minimizing lipid oxidation and color degradation in coated food samples. Application trials on fresh-cut fruits and dairy products revealed extended shelf life and maintained sensory quality without chemical residue formation.

This study emphasizes the potential of cellulose–ZnO nanocomposite coatings as a green, safe, and biodegradable alternative to synthetic preservatives. The combination of biopolymer chemistry and nanotechnology not only enhances food safety but also supports environmental sustainability, aligning with the principles of circular bioeconomy in food systems.

Keywords: *Cellulose nanocomposite, Zinc oxide nanoparticles, Green chemistry, Antibacterial coating, Antioxidant activity, Food preservation, Shelf life.*

IHASE-2025/142

Rhizosphere microbial diversity and its functional role in Khasi mandarin (*Citrus reticulata* Blanco) - a mini review

Buddhisatya Dowarah[1*] and Pauline Alila[2]
[1]Department of Horticulture, Faculty of Agricultural Sciences, Rajiv Gandhi University, Rono Hills, Doimukh- 791112, AP
[2]Department of Horticulture, School of Agricultural Sciences, Nagaland University, Medziphema campus-797106, Nagaland
[*]Email id- buddhisatyado@gmail.com
Ph- 7896958911

The rhizospheric soil of Khasi mandarin (*Citrus reticulata* Blanco) harbours a diverse and functionally dynamic microbial community that plays a crucial role in regulating soil fertility, nutrient cycling, and plant health. Beneficial microbes such as arbuscular mycorrhizal fungi (AMF) and plant growth-promoting rhizobacteria (PGPR), enhances nutrient mobilization, root physiology and overall crop productivity. Studies have demonstrated that species such as *Glomus deserticola, Azotobacter chroococcum*, *Pseudomonas*, and *Bacillus* significantly improve nutrient uptake, soil structure, and plant vigour through synergistic interactions within the rhizosphere. The rhizosphere acts as a biochemical interface, influencing soil carbon (C), nitrogen (N) and phosphorus (P) cycling via microbial-driven processes fueled by plant root exudates. Metagenomic analyses of citrus rhizospheres reveal that bacterial phyla like Proteobacteria, Actinobacteria, Acidobacteria, and Bacteroidetes, along with fungal groups such as Ascomycota and Basidiomycota, dominate these ecosystems, forming a core microbiome crucial for nutrient transformation and disease suppression. Research in citrus-growing systems underscores that soil management practices profoundly influence microbial diversity and community structure. While conventional fertilization can reduce microbial richness, organic amendments and intercropping promote beneficial taxa, enhancing soil nutrient availability and functional stability. Studies in Khasi mandarin specifically indicate that healthy rhizospheres harbour a diverse array of beneficial microorganisms, including *Trichoderma*, *Penicillium*, *Bacillus* and *Bradyrhizobium*, whereas diseased soils are often dominated by pathogenic taxa such as *Pythium*. The identification of potent microbial isolates like *Bacillus subtilis* K4-4 as effective bio-control and bio-fertilizer agents further highlights the potential of exploiting rhizosphere biodiversity for sustainable citrus production. This brief review described the advantageous effects of several microorganisms found in the rhizosphere of Khasi mandarin, which contributes to the development, biomass and enhancement of the crop itself by providing macro and micronutrients.

Keywords*: Microbial diversity, Rhizosphere, Khasi mandarin, Nutrient cycling*

IHASE-2025/143

Evaluation of Water Quality and its suitability for fish culture in Surwal Dam Reservoir, Rajasthan

Dr. Rajendra Singh Rajawat
Assistant professor, Government College, Kota

Fisheries potential of any aquatic ecosystem is largely governed by quality of water, which affect health, growth, survival and productivity of fish. The present study is based on assessment of key water quality parameters such as Temperature, pH, Dissolved Oxygen, Alkalinity, Total Hardness, and nutrient content over a period of one year (September 24- August 25) from 2 different sites. Results revealed moderate nutrient enrichment, adequate dissolved oxygen, and alkaline pH favoured plankton growth, thereby enhancing fishery productivity. The water quality index suggested the reservoir to be moderately polluted and overall suitable for fish culture. The study concludes that regular monitoring and management of water quality are essential to maintain the ecological balance and maximize fisheries potential. This assessment provides valuable insight for the suitability of dam reservoir for fish production.

Keywords *– Pisciculture, Freshwater, Aquatic ecosystem*

IHASE-2025/144

The Role of Chemistry in Enhancing Food Preservation and storage Life

Dhanraj
Assistant Professor
Department of Chemistry, Government College Kota, Rajasthan, India.
Email: danrajchem01@gmail.com

Chemistry plays a fundamental role in modern food preservation by managing the physical, chemical, and biological processes responsible for food spoilage. A range of chemistry-based techniques are employed to inhibit microbial growth, oxidative reactions, and enzymatic deterioration. Antioxidants such as ascorbic acid, tocopherols, and phenolic compounds slow lipid oxidation, preserving the color, flavor, and nutritional quality of foods. Antimicrobial agents, including organic acids (such as sorbic and benzoic acids), nitrates, and naturally derived compounds like essential oils, function by disrupting microbial cell membranes and inhibiting enzymatic activity. pH regulation through acidification or fermentation modifies the chemical environment to suppress microbial proliferation. Chelating agents like EDTA sequester metal ions that catalyze oxidation, thereby improving product stability. In addition, modified atmosphere packaging (MAP) and active packaging utilize chemical principles to control gas composition or gradually release protective compounds, further extending product shelf life. Together, these chemistry-driven preservation strategies, often integrated with physical methods such as dehydration and refrigeration, enhance food safety, extend shelf life, and maintain overall quality.

Keywords: *Food preservation, food chemistry, antioxidants, antimicrobial agents, pH control, chelating agents, packaging chemistry*

IHASE-2025/145

Biopolymer Chemistry in Food Preservation

Dr. Suresh Kumar Meena
Department of Chemistry, Government College Kota, Rajasthan, India
Email: drsureshkumarmeena5@gmail.com

The escalating global demand for safe and sustainable food preservation methods has positioned biopolymer chemistry as a critical area of research. Biopolymers, which include polysaccharides like starch, cellulose, chitosan, and alginate and proteins like gelatin and whey protein, are naturally derived macromolecules that offer compelling alternatives to synthetic preservatives and packaging materials. Their inherent characteristics, such as biocompatibility, biodegradability, and ability to form films and coatings, make them ideal for extending the shelf life and maintaining the quality of food products.

The core application of biopolymer chemistry in food preservation revolves around the creation of edible coatings and films. These thin layers, applied directly to the food surface, function as selective barriers. They can effectively regulate the transfer of gases like oxygen and carbon dioxide, moisture, and volatile flavor compounds, thereby minimizing oxidation, controlling respiration rates, and reducing desiccation. Furthermore, biopolymers can serve as matrices for the controlled release of antimicrobial agents e.g., essential oils, bacteriocins and antioxidants, delivering a localized and sustained protective effect directly at the food-atmosphere interface.

Current research focuses on modifying biopolymer structures through techniques like cross-linking, blending, and the incorporation of nanomaterials to enhance their mechanical strength, barrier properties, and thermal stability. Overcoming challenges such as maintaining film integrity in high-moisture environments and upscaling production are key to widespread commercial adoption. Ultimately, biopolymer-based preservation systems offer a green chemistry approach to food technology, promising enhanced food safety, reduced food waste, and a lower environmental footprint.

Keywords: *Biopolymers, Food Preservation, Edible Coatings, Polysaccharides, Proteins, Antimicrobial, Shelf Life.*

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Ai And Ml Integrated Soil Moisture Based Automatic Irrigation System

A. P. Bowlekar, S. T. Patil, U. S. Kadam, M. S. Mane, S. B. Nandgude and N. K. Palte

Department of Irrigation and Drainage Engineering, College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra

*Corresponding author email address: adwaitbowlekar1808@gmail.com

Water scarcity and inefficient irrigation practices are major challenges to sustainable agricultural production. Traditional manual irrigation often leads to over- or under-irrigation, resulting in water wastage and reduced crop productivity. To address these limitations, the present study focuses on the design and development of an Artificial Intelligence (AI) and Machine Learning (ML) based low-cost automatic irrigation system for precision water management. The system was developed using a Raspberry Pi microcontroller, soil moisture and temperature sensors, solid-state relays, and solenoid valves to enable automated irrigation control. An AI–ML algorithm analyzed real-time sensor data to predict irrigation requirements and adjust water application dynamically. Field evaluation was conducted for cabbage (Brassica oleracea L.) under a micro-sprinkler system at Dr. BSKKV, Dapoli (Maharashtra). The system maintained soil moisture within ±2% of the desired range and reduced water consumption by 20–25% compared to manual irrigation, without any yield reduction. The average weight and specific gravity of cabbage were higher under the automated system due to consistent soil moisture availability. The total development cost was approximately ₹3,000, making it suitable for small and medium-scale farmers. The study demonstrates that the integration of AI, ML, and IoT technologies can significantly improve irrigation efficiency, reduce labour dependency, and promote sustainable precision agriculture.

Keywords: *Artificial Intelligence, Machine Learning, Automatic Irrigation, Precision Agriculture, Water Use Efficiency*

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Association of *Vibrio* spp. with algal bloom induced stress and deteriorating water quality in shrimp ponds of Haryana, India

Funde Aniket[1]*, Shivam Pandey[1], Rachna Gulati[1], Md. Idrish Raja Khan[1]
Department of Aquatic Animal Health Management, College of Fisheries Science, CCS HAU, Hisar, Haryana, India

As part of the National Surveillance Programme for Aquatic Animal Diseases (NSPAAD), a field investigation was conducted to assess the occurrence of *Vibrio* species in shrimp ponds exhibiting heavy algal blooms in Sirsa district, Haryana. Ten polyliner ponds with dense algal proliferation and poor water quality were examined. Water and shrimp samples were collected aseptically and analyzed for physicochemical and bacteriological parameters. Water quality assessment using a HANNA multiparameter device revealed elevated pH (8.57 ± 0.24) in pond T6 and high dissolved oxygen (8.50 ± 0.15 mg/L) in pond T8. On-site isolation of bacteria from moribund shrimps on TCBS agar showed yellow-pigmented colonies presumptive of Vibrio spp., which were confirmed through biochemical characterization, identifying two pathogenic *Vibrio* species. Microscopic observation of algal samples confirmed the dominance of Green Algae (Chlorophyceae) and Blue-Green Algae (Cyanobacteria). The co-occurrence of *Vibrio* species with intense algal bloom conditions indicates that bloom-induced stress and deteriorating water quality contributed to shrimp morbidity and mortality. The findings highlight the necessity for integrated environmental and microbial surveillance to mitigate disease risks and promote biosecure and sustainable shrimp aquaculture in northern India.

Keywords*: Algal bloom, Vibrio spp., shrimp pond, water quality, Haryana, NSPAAD*

IHASE-2025/148

The Hidden Harvest: Quantification and Characterization of Microplastics in Agricultural Runoff from the Dam Catchment

Rohan R Kundapur[1] , Dr. Manu M Joseph[1]
[1]M.Sc (Biotechnology)
Department of Life Sciences, CHRIST (Deemed To Be University), Central Campus, Hosur Road, Bangalore, India
Email ID- rohanrkundapur@gmail.com
[2]Assistant Professor
Department of Life Sciences, CHRIST (Deemed To Be University), Central Campus, Hosur Road, Bangalore, India
Email ID- manujoseph@christuniversity.in

The increasing use of plastics in modern agriculture ("plasticulture"), including mulch films, irrigation pipes, and packaging, has created a significant pathway for microplastic (MP) contamination in aquatic environments. Agricultural runoff, in particular, can transport these contaminants from fields into major water systems. This study provides a critical, first-time assessment of MP pollution originating from agricultural runoff in the Tungabhadra Dam catchment area. Triplicate 50 L bulk water samples were collected, and MPs were isolated, counted, and categorized by morphology. Fourier-Transform Infrared (FTIR) and Raman Spectroscopy were used to identify their polymer composition.

The mean microplastic concentration in the runoff was determined to be 2.55 ± 0.15 particles/L, confirming a consistent flow of contamination. Morphological analysis revealed that fibres (46.2%) and fragments (37.4%) were the dominant shapes. Polymer analysis identified Polyethylene (PE) (53.0%) as the most abundant polymer, followed by Polyethylene terephthalate (PET) (29.5%) and Polysulfone (17.5%). These results confirm that agricultural runoff is a direct and significant vector for MP pollution in the Tungabhadra catchment. The polymer composition, particularly the high prevalence of PE, strongly indicates an agricultural

origin consistent with the degradation of materials like plastic mulching and irrigation tubing. The presence of PET and Polysulfone suggests a wider range of pollution sources, including packaging and specialized farming equipment components. This study provides critical baseline data, highlighting the urgent need for sustainable plastic waste management strategies in the agricultural sector to protect the water quality of vital downstream reservoirs.

Keywords *Microplastics, Agricultural Pollution, Tungabhadra Dam, Polyethylene (PE), Runoff, FTIR, RAMAN*

IHASE-2025/149

Integrated Fungicide–Bacterial Biocontrol Strategy Against Charcoal Rot in Chrysanthemum.

D. Shanmuga Priya[1*], K. Eraivan Arutkani Aiyanathan[2] and S. Harish[1]

[1]Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore-641003, Tamil Nadu, India.

[2]Department of Plant Pathology, Agricultural College and Research Institute, Madurai 625104, Tamil Nadu, India.

Presenting author* email id: dshanmugapriya95@gmail.com

Chrysanthemum, a commercially important flower crop in India, suffers substantial yield and quality losses due to charcoal rot caused by *Macrophomina phaseolina*. In the present study, six isolates of *M. phaseolina* were recovered from infected chrysanthemum plants. The isolates exhibited variability in colony morphology on PDA, particularly in sclerotial size, shape, colour, and pathogenicity. Concurrently, ten rhizosphere bacterial antagonists (Bacillus spp. and *Pseudomonas* spp.) were isolated, characterized, and screened for antifungal activity under both in vitro and in vivo conditions. ITS sequence analysis revealed the most promising bioagents as *Bacillus subtilis* (Bs 8) and *Pseudomonas putida* (Ps Sp). Among fungicides evaluated, Tebuconazole 50% + Trifloxystrobin 25% WP recorded complete mycelial inhibition (100%) of *M. phaseolina* in vitro. In the biocontrol assay, *P. putida* (Ps Sp) resulted in 54% mycelial inhibition, followed by *B. subtilis* (Bs 8) with 39% inhibition. Under greenhouse conditions, seedling dip + soil drench with Tebuconazole 50% + Trifloxystrobin 25% WP @ 0.1% at 30 days after planting achieved the highest charcoal rot reduction (94%), while seedling dip (10 g L^{-1}) + soil application (10 g pot^{-1}) of *P. putida* (Ps Sp) recorded 85% disease reduction. Increased activities of defense enzymes—peroxidase (PO), polyphenol oxidase (PPO), and phenylalanine ammonia-lyase (PAL)—were recorded in fungicide-treated plants. The study demonstrates that an integrated approach using fungicides and bacterial bioagents offers an effective and sustainable strategy for managing charcoal rot of chrysanthemum.

Keywords: *Chrysanthemum; Charcoal rot; Macrophomina phaseolina; Bacterial biocontrol agents; PO; PPO; PAL; Fungicides.*

IHASE-2025/150

Evaluating the Coefficient of Variation for body weight in Malabari goat populations

Charlotte Coretta Rodricks, K.A. Bindu and Pramod S.
*Corresponding author: drcharlotterodricks@gmail.com
[1.]Parikrama Veterinary Science College, Kashti
[2.]Kerala Veterinary and Animal sciences University, Pookode

Body weight was recorded from different Malabari populations from organized farms located at four centres, viz. University Goat and Sheep farm (UGSF), Mannuthy, Arya Vaidya Sala (AVS), Kottakkal, Livestock Research station (LRS), Thiruvizhamkunnu and Goat and Sheep farm, Instructional Livestock Farm Complex (ILFC), Wayanad. The mean and standard deviation was calculated from the data using SPSS V.24 and using the standard formula, coefficient of variation was calculated. The coefficient of variation for body weight was found to be 23.62% from Mannuthy, 22.78% from Kottakkal, 15.16% from animals from Wayanad and 2.72% from Thiruvizhamkunnu. While all the populations accounted for had low coefficient of variation it was found that the population from Thiruvizhamkunnu had the least coefficient of variation value indicating that the Malabari population there was highly adapted to its surrounding areas and showed uniform consistency as a population. Further due to its location in the hills and due to higher selection intensity the coefficient of variation could be low. When going for farming for commercial purposes it is better to select a population with low co efficient of variation which indicates their uniformity as a whole.

Keywords: *Malabari goat, Coefficient of variation, Population, Body weight*

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Comparison of Antimicrobial and Antioxidant Activity Between Aqueous Methanolic Extracts of Neem and Tulsi Leaves

Shaurya Mitra1, Jobi Xavier*
Christ University, Bengaluru, Karnataka - 560029

Neem (Azadirachta indica) and Holy Basil or Tulsi (Ocimum basilicum), have been used in various therapeutic practices and products due to their various properties which can also be used against diseases. This study aims to establish a comparative study between the antimicrobial and antioxidant activity of neem and tulsi leaf extracts prepared in 80% methanol. Antimicrobial test was performed using well-diffusion method on nutrient agar employing Escherichia coli and Bacillus subtilis as test microorganisms. The antioxidant activity was measured using DPPH Assay and FRAP Assay. The total phenolic and total flavonoid contents were also measured. Neem extract showed higher zone of inhibition, in antimicrobial test, against both test microorganisms (16.5±0.06 and 18.2±0.1 mm), than tulsi (14.3±0.09 and 13.4±0.05 mm). For both DPPH and FRAP antioxidant assays, neem and tulsi leaf extracts showed an increase in activity with concentration. However, neem showed higher scavenging activity in DPPH assay and also higher absorbance values for FRAP assay. The total phenolic content and total flavonoid content of neem (73.75 ± 6.98 mg GAE/g and 109.19 ± 7.175 mg QE/g) was found to be higher than those of tulsi (56.6 ± 4.95 mg GAE/g and 90.53 ± 1.43 mg QE/g) at same concentration. The study concludes that both neem and tulsi show high antioxidant and antimicrobial activity owing to their high phenolic and flavonoid contents, however, neem shows higher activity for both. This gives neem a wider range of applications in therapeutics and further research and development of products and supplements.

Keywords: *DPPH, FRAP, neem, tulsi, zone of inhibition*

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The effect of different media on seed germination and seedling performance of *Adenanthera pavonina* L.

Karanjalker Gourish and Avni Karanjalker
Goa College of Agriculture (Affiliated to Goa University), Ela Farm, Old Goa
Email Id: gourishkaran@gmail.com

The Red wood tree Adenanthera pavonina L. belonging to family Fabaceae is well known for its ethnomedicinal values. This species has been used against human ailments like asthma, diarrhea, inflammations, rheumatism, tumour, ulcers, skin burns etc. The effect of different media treatment viz. T1- Soil; T2-vermicompost; T3-cocopeat; T4-Soil(1)+Cocopeat(1) and T5-Soil(1)+Vermicompost(1) on seed germination and seedling performance was investigated under shade net conditions in protrays. During the present investigation, the highest germination rate 66.3% was observed in T5 followed by T3 (60.57%) and T2 (58.65%). The time taken for final germination from sowing varied from 30.5 to 38.25 days amongst the treatment and least time within 29 days was observed in T5. The days taken for first gemination varied from 10-12 days after sowing amongst the treatment and earliest germination was observed in T5 (10 days). The highest mean daily germination (1.75%), germination index (0.67), seedling vigour index (847.4) and reduced mean germination time (29.0 days) as compared to control (38.25 days) was observed in T5. Regarding performance of the seedlings, the highest shoot length was observed in T4 (15.28 cm), closely followed by T5 (13.55cm). The other growth parameters viz. stem girth (0.2 mm), no. of leaves (8.1) and root length (18.66cm) were higher in T5. Use of the suitable media could improve the seed germination, vigor and performance of the seedlings. Present study reveals that media composition of 1:1 soil and vermicompost could be used to produce vigorous seedlings with enhanced seed germination and performance of red wood tree. This could be helpful in producing planting material of this medicinally important forest tree for afforestation and planting activities.

Key word: *Adenanthera pavonina, media, sowing, germination, seedling vigour, growth.*

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Effect of cashew seed nut orientation on germination and growth parameters

Karanjalker Gourish
Goa College of Agriculture (Affiliated to Goa University), Ela Farm, Old Goa
Email Id: gourishkaran@gmail.com

Cashew (Anacardium occidentale L.) is considered as the third highest consumed nut commodity of the world. Because of the stylar scar position, bold size and physical nature of cashew seed, the accurate orientation position should be known to follow for sowing in nursery. In the present study, the effect of four seed nut orientation viz. T1 (stalk end upright), T2 (horizontal scar side downward), T3 (side natural position) and T4 (horizontal scar side up) on germination and growth parameters was investigated in polybags under polyhouse conditions. During the present investigation, effect of orientation treatments on germination and seedling growth revealed significant differences. The earliest germination started at 6th day after sowing that ranged from 84 to 100% till 17 DAS in T4 followed by T1. The germination percentage varied from 7 to 21% at 15 DAS and complete 100% germination was observed at 30DAS in all treatments. During the 30 days of observations, the germination% was highest in T4 followed by T1. The significant differences were observed amongst the treatments for all growth parameters. The highest stem length (26.11cm), No. of leaves (8.16) and no. of branches (4.19) and seedling vigour was observed in T1 followed by T4. Least values for germination and growth parameters were observed in other treatments (T2 and T3). This study reveals that T1 (stalk end upright) has shown better germination parameters, whereas T4 (horizontal scar side up) was observed with improved growth performance. The cashew seed could be positioned in either stalk end upright or horizontal scar side up for production of quality seedlings in nursery.

Keywords: *Cashew nut, seed nut, orientation position, seedling vigour, germination.*

IHASE-2025/154

Mapping of Tree Outside Forest (TOF) and Retrieval of their Biophysical Parameters at district Sonipat, Haryana, India

Darshana Duhan[1], Dharmendra Singh[2] and Sandeep Arya[3]
[1]Department of Soil & Water Engineering, CCS Haryana Agricultural University, Hisar, Haryana
[2]Haryana Space Applications Centre, Hisar, Haryana (India)
[3]Department of Forestry, CCS Haryana Agricultural University, Hisar, Haryana (India)
[*]**Email id:** darshuduhan@hau.ac.in

Urban plant diversity is shaped by the physical surroundings as well as the attitudes and preferences of city dwellers regarding certain plant species. Numerous tree mapping techniques have been discussed in academic research, yet estimates of tree cover continue to vary considerably among different datasets, and there is limited comparison of the thematic precision of the produced tree maps. The current study used Sentinel-2 data and field data to map the tree cover and identification of tolerant species at district Sonipat, Haryana (India). Tree cover was extracted using non-crop area from LULC with an accuracy of 86%. The evergreen and semi-evergreen locally available species *A. indica; F. benghalensis* and *F. religiosa* were identified as tolerant on the basis of literature survey. The identified species were mapped using five different supervised classifiers. The maximum likelihood classifier exhibits the highest overall accuracy of 83.18 % and kappa 0.78. The biophysical parameters such as LAI and AGB was also retrieved. The LAI ranges from 1.23 m^2/ m^2 to 2.42 m^2/ m^2 and AGB varied from 64.34 t/ha to 402.46 t/ha. This study helps the researchers to better assess, understand, and comprehend the above-ground biomass, carbon stock, better conservation strategies throughout the entire district with the use of the data. High resolution and hyperspectral data along with machine learning algorithms should be used in future for better understanding and less time-consuming sustainable management strategies of tree cover in urban areas.

Keywords*: Tree Outside Forest, LULC, LAI, Sentinel-2 data, Haryana*

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Exploring the Antioxidant and Antimicrobial Potential of Plantain (Malbhog sp.) inflorescence

Prasasti Sarma[1], Dr. Arun K B[1*]
M.Sc (Biotechnology)
[1]Department of Life Sciences, CHRIST (Deemed To Be University), Central Campus, Hosur Road, Bangalore, India
Email ID- prasastisarma2003@gmail.com
Assistant Professor
[1]Department of Life Sciences, CHRIST (Deemed To Be University), Central Campus, Hosur Road, Bangalore, India
* Corresponding Author- arun.kb@christuniversity.in

Musa species widely known for their nutritional and ethnomedicinal attributes, offer considerable therapeutic potential. The banana inflorescence , is an edible yet underutilized by product of the agricultural field , exhibits high richness in therapeutic and pharmacological field. Musa assamica (Malbhog) , a wild banana species native to the Northeastern region of India. This study aimed to evaluate the invitro antioxidant , antimicrobial properties of the Musa assamica inflorescence extracts. Sequential extractions were performed using solvents - hexane, ethyl acetate , methanol, water, a comparative evaluation of their Total phenolic content (TPC) and Total flavonoid content (TFC) were quantified using gallic acid and quercetin as standards. The methanolic extract exhibited the highest TPC and TFC (108.23mg/GAE ; 76.11 mg/QE/g) , followed by water, ethyl acetate , hexane respectively. Based on the quantitative analysis, methanolic extract was selected for further invitro assays . The extract exhibited a concentration dependent DPPH radical scavenging activity , with an IC_{50} of 0.875 mg/ml indicating comparatively lower antioxidant , compared to standard (ascorbic acid) with an IC_{50} of 0.77mg/ml. The extract exhibited significant inhibition zones of 11.533 ± 0.6 mm and 12.8 ± 0.3 mm against E.coli and Bacillus subtilis at 100 mg/ml , indicating a moderate inhibitory effect. These findings suggest that Musa assamica inflorescence demonstrated promising therapeutic applications.

Keywords *Musa assamica inflorescence , DPPH assay , Antioxidant , Antimicrobial activity, Total Phenolic Content , Total Flavonoid Content , Bacillus subtilis , E.coli*

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Extraction of Chitinase Enzyme from Bacterial Strain for Bioremediation of Textile Effluents

Chitra Kashyap[1], Surbhi Vijay[2], Lavleen Rajawat[3], Aryan Khan[4]
[1]Department of Science, Modi Institute of Management and Technology, Kota
Corresponding Author: Chitra Kashyap
Assistant Professor Biotechnology
chitrakashyap349@gmail.com

Textile industry effluents meant to cause environmental challenges due to their composition of complex synthetic dyes, heavy metals, and organic pollutants. This study focuses on the potential of chitinase enzymes extracted from bacterial strains like *Bacillus antracis* and *Staphylococus aureus* as a demanding treatment approach for textile wastewater. Hydrolytic enzymes like chitinases basically catalyze the breakdown of chitin by cleaving β-1,4-glycosidic bonds. While chitinase production and optimization have been extensively studied, but their applications in textile effluent treatment is an emerging field. The enzyme production from various bacterial sources shows promise for cost-effective and environmentally sustainable treatment methods. This study was done to isolate and characterize chitinase-producing bacterial strains, optimization of enzyme production parameters, extraction and purification techniques, like DNS method, SDS PAGE, Chemical Oxygen Demand (COD). Biological Oxygen Demand (BOD) and all the potential mechanisms through which chitinases could contribute to textile effluent bioremediation.

Key words: *chinitase, chitin, bioremediation, chitosan, β -1,4-glycosidic bonds, textile.*

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Identification And Characterization Of Bacterial Species From Dump Yard

Ratnamala Ghosal[1], Gajendra Lodha[2], Himanshu Sharma[3], Palak Bhatnagar[4], Chitra Kashyap[5]

[1]Department of Science, Modi Institute of Management and Technology, Kota

Corresponding Author: Ms. Chitra Kashyap

Assistant Professor Biotechnology

chitrakashyap349@gmail.com

The waste grounds are considered to be the largest reservoir of the eco-system in which microbial populations of distinct microbial characteristics and metabolic pathways have taken as their habitat, and these are extremely tolerant to stressful and higher contaminated conditions. These microbes tend to adapt to these habitats by developing metabolic mechanisms and certain genetic characters to withstand in such contaminated conditions so that they can thrive and become favorable to these unfavorable and toxic environments. This project involves the understanding and study of microbes like bacteria that are isolated from the Baran city dump reservoirs, a city of Rajasthan state, are deemed to have potential bacterial colonies of various physiological adaptability and metabolic activity. It also involves the investigation and analysis of this microbiome using biochemical test and microscopic examination for morphological characteristics, which would be helpful in the discovery of microbial species diversity location- wise as well as their habitats and various applications such as environmental biotechnology, waste management etc.

Key words: *bacterial identification, microbial diversity, waste decomposition.*

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Sustainable Maize Diseases Management Strategies in India

S. I. Harlapur
Department of Plant Pathology, College of Agriculture, Dharwad,
University of Agricultural Sciences, Dharwad - 580 005, Karnataka, India
E-mail: harlapursi@gmail.com

Maize is an important food, feed and fodder crop of India and it is the most versatile emerging crop having wider adaptability under varied climatic conditions. It occupies around 9.89 million hectors area and production of 31.65 million tones with an average productivity of 3.79 tones per hector. India ranks fourth in the area and seventh in the production, representing around 4 per cent of the world maize area and 2 per cent of total production. In India, maize is third major cereal crop after rice and wheat and its cultivation is gaining momentum as food, feed, fuel and fodder crop apart from major component of basic raw material for the number of industrial products. Maize occupies a pivotal role in Indian economy and is being traded all over country. A wide array of diseases have been known to attack maize crop throughout the country, its cultivation is limited by diseases which cause grain loss of about 13 per cent of the total production. Diagnosis of emerging diseases, yield loss assessment, epidemiology and integrated disease management has an important role in sustainable agriculture and enhancing maize productivity by providing maximum economic yields. However, climate change has had a profound impact on maize production, posing severe challenges to the stability and sustainability of maize yields. Climate change has brought uncertainty and changes to precipitation patterns, thereby affecting maize growth and development. Due to uneven precipitation distribution and rainfall fluctuations, maize crops face the risks of water logging, water stress and insufficient irrigation, directly impacting emergence of new disease epidemics. Climate change has significantly impacted the distribution and seasonal activity of maize diseases, posing new challenges for maize production and farmers management strategies. Climate change has lead to the expansion of shift in the distribution range of maize diseases. Warm and humid climate conditions favour the survival and reproduction of certain pathogens. Climate change has increased the risk of outbreaks of maize diseases. Warming temperatures, increased precipitation coupled with higher relative humidity can provide more suitable environmental conditions for certain pathogens, leading to their population growth and faster spread, thus raising the likelihood of disease outbreaks. Climate change has complex and diverse impacts on the distribution and seasonal activity of maize diseases. It is necessary to comprehensively consider

climate factors, ecological factors, and agricultural management measures to develop appropriate control strategies, ensuring stable improvement in maize yield and quality. Maize suffers from several biotic stresses, mainly ubiquitous incidence of foliar fungal diseases in the pre-harvest stage. Maize is affected by many diseases and pests among them more than 112 diseases are caused by fungi, bacteria and nematodes all over the world. In India 62 diseases are recorded but among them 16 fungal diseases and one nematode cause major problems. The fifteen major fungal diseases include seedling diseases, foliar diseases, pre and post flowering stalk rots, downy mildews and sheath diseases. The occurrence and severity of maize diseases and resultant losses are dependent on the prevailing weather conditions, cropping pattern and hybrids grown in an area. In recent years there has been a phenomenal increase in the incidence of foliar fungal diseases in maize ecosystem.

The foliar disease namely, Turcicum leaf blight Maydis leaf blight, Common rust and Curvaularia leaf spot has attained serous dimensions in Karnataka causing significant yield reductions. Estimation of yield losses due to major foliar diseases of maize *viz*; Curvularia leaf spot, Turcicum leaf blight & Common rust was assessed in different hybrids. The hybrids differed significantly for disease severity, grain yield and fodder yield in protected and unprotected treatments. The avoidable loss in grain yield varied from 8.3 to 22.6% and fodder yield 9.4 to 24.8%. Turcicum leaf blight and maydis leaf blight were noticed during second fortnight of July and severity progressed later on and reached maximum during September in Dharwad, Haveri, Gadag and Belgaum districts. Polysora rust and common rust diseases appeared during second fortnight of August and reached maximum during first fortnight of October. Moderate to severe incidence of Diplodia ear rot and banded leaf and sheath blight diseases were noticed during second fortnight of September and attained severe form at grain filling stage. Dry weather prior to silking followed by wet weather conditions during silking favoured Diplodia ear rot infection. Curvularia leaf spot severity observed in moderate to high level at flowering to grain filling stage. The late sown crop i.e., August – September was subjected to severe incidence of foliar diseases. Post flowering stalk rots incidence was severe at flowering to grain filling stage. Low to moderate severity of Physoderma brown spot was noticed at flowering stage. Based on survey and surveillance, 'hot spots' for various diseases have been identified. Locations *viz*., Dharwad, Almora, Mandya, Srinagar, Rahuri and Bajaro were identified as hot spots for Turcicum leaf blight, Common rust and Curvularia leaf spot diseases. Locations *viz*., Ludhiana, Kalyani, Panth Nagar were identified as hot spots for Banded leaf and sheath blight and Diplodia ear rot. Post flowering stalk rot was endemic in Karnataka, Hyderabad, Coimbatore and Rahuri.

There is a major shift in disease pattern during the past years as disease of minor importance become increasingly severe and assumed epidemic proportion in

coming years. Hitherto the diseases like Downy mildew, banded leaf and sheath blight, Fusarium stalk rot, Curvualaria leaf spot and ear rot were considered as a disease of minor importance but due to changing climate and pattern of disease spectrum these diseases changed to high severity. Besides, Pokkah boeng is a new and emerging disease causing economical losses to the crop. Sporadic incidence of Phaeosphaeria leaf spot observed during rainy season. In recent years, climate change effects have profound influence on maize disease spectrum which is evidenced by epiphytotic levels of some diseases. There has been a phenomenal increase in the incidence of Pokkah boeng, Fusarium stalk rot and ear rot fungal diseases caused by *Fusarium verticillioides*. The new emerging foliar disease Pokkah boeng has attained serious dimensions causing significant yield reductions, which was favoured by heavy and continuous rainfall coupled with high relative humidity and low temperature. *Fusarium verticillioides* has a saprophytic and parasitic stage and can infect maize crop at all stages of plant development, either via the infected seed or wounds, silk channel and can also grow systemically in the plant. Under favourable conditions, *F. verticillioides* produces a large number of micro and macroconidia, which colonizes the soil and services on plant resides. The conidia as primary source of inoculum and dispersed by wind, insects and rain thereby infecting maize plans in the new growing season. Fusarium isolates were identified and confirmed using the primers ITS and TEF 1 α primers which amplified approximately at 500 bp and 700 bp, respectively and identified four different species *viz*., *Fusarium verticillioides* and *Fusarium proliferatum*, *Fusarium equiseti* and *Fusarium brachygibbosum* which were deposited in the GenBank.

Banded leaf and sheath blight (BLSB) incidence was noticed in heavy rainfall areas during flowering to grain filling stage. BLSB was predominant in paddy-maize and maize-maize cropping. Sporadic incidence of *Fusarium* ear rot was noticed at grain filling to maturity stage in heavy rainfall areas. The birds damage and earworm infestation aggravated the ear rot intensity. Phaeosphaeria leaf spot disease was noticed in moderate to severe form which was favoured by high rainfall and moderate temperature, humidity levels above 80 per cent and low night temperatures aggravated disease severity.

The screening of maize seed samples of twelve genotypes from seven multi location trials revealed that *Fusarium* spp., *Penicillium* spp., *Aspergillus* spp., *Exserohilum turcicum, Curvularia lunata, Rhizoctonia bataticola* and *Rhizopus* spp. were associated with maize seeds. *Fusarium* spp. was found dominant across the locations. The highest per cent seed germination was recorded in seed treatment with carboxin 37.5% + thiram 37.5% WP @ 2 g/kg seeds with 97.33. The highest seedling vigour and low per cent seed infection by fungal pathogens was recorded in seed treatment with mancozeb 50% + carbendazim 25% WS @ 2 g/kg. The new

seed treatment fungicide molecules *viz*., Royal Flo 40% SC @ 5.0 ml/kg seed and Ipconazole 40.70% FS @ 0.70 ml/10 kg seed found effective against the seedling blight pathogens and charcoal stalk rot diseases.

Significant reduction in severity of Curvularia leaf spot, Turcicum leaf blight and Common rust was noticed in the treatments with two sprays of Trifloxystrobin 25 % + Tebuconazole 50 % (Nativo 75 WG) fungicide @ 0.1% at 35 and 50 DAS, followed by Tebuconazole 250 EC @ 0.1%, Difenconozole 25EC @ 0.1% and Propiconozole 25 EC @ 0.1%. These treatments were statistically significant and on par with each other with respect to disease severity and grain yield. Hybrids *viz*; GH 0727, BGMH-2, DK-7074, GH-110145, DMH-03, D-4141, D-4685, and PHI-3502 registered moderately resistant reaction to Curvularia leaf spot, Turcicum leaf blight and Common rust. Hybrids *viz*; GH 150125 found moderately resistant reaction to Curvularia leaf spot and Turcicum leaf blight. Inbred lines *viz*; BM-32, BM-254-1, N-49, N-8, N-48 and N-4, registered resistant reaction to Curvularia leaf spot, Turcicum leaf blight and Common rust. Integration of tolerant hybrid GH 150125 and seed treatment with Carboxin power @ 2g/kg or combined seed treatment with *Azospirillum* sp. @25 g/kg and *Trichoderma harzianum* @ 6g/kg followed by two sprays with Azoxystrobin 18.2% + Difenoconazole 11.4% SC or Tebuconazole 250 EC @ 0.1% was found most effective IDM package for the management of foliar diseases of maize.

Recently Pokkah boeng and banded leaf and sheath blight are emerging diseases of maize causing economical loss to the crop in India, besides several fungal diseases. Foliar application of combi-product fungicides namely, Trifloxystrobin 25% + Tebuconazole 50% @ 0.1%, Azoxystrobin 18.23% + Difenoconazole 11.4% @ 0.1% + Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l 5 WSC @ 0.1% found significantly superior disease control efficacy against foliar diseases *viz*., turcicum leaf blight, common rust, curvularia leaf spot and maydis leaf blight diseases and resulted in 35 to 41% increase in grain yield over unprotected check. IDM module comprised of seed treatment with *Trichoderma harzianum* @ 10 g/kg seed + Thiram 75WP @ 2 g/kg seed, foliar application of Nimbecidine @ 5 ml/litre at 30 DAS followed by Azoxystrobin 18.2% + Difenoconazole 11.4% @ 1 ml/litre of water at 45 days after sowing found ideal IDM strategy for management of foliar fungal diseases. The new emerging disease, Pokkah boeng which causes yield losses upto 32 per cent. The disease was effectively managed by integration of seed treatment with Carbendazim 12% + Mancozeb 50% WP @ 2 g/kg seed followed by foliar application of Carbendazim 12% + Mancozeb 63% WP @ 2 g/l or Carbendazim 50 WP 2 g/l. Banded leaf and sheath blight disease was effectively controlled by seed treatment with *Pseudomonas fluorescens* @ 10 g/kg seed and foliar spray of Propiconazole 25 EC @ 0.1% at 30 and 40 days after sowing. *Pseudomonas fluorescens* @ 10 g/kg as seed treatment, soil application of biogent-

fortified FYM @ 1:5 and spray @ 0.5% found effective in suppressing the post flowering stalk rot which recorded 47.66% disease control efficacy and resulted in 21.32% increase in grain yield over untreated check. application of (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + Spinetoram 120SC @ 0.05%, (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + (Novaluron 5.25% + Emamectin benzoate 0.9% SC) @0.2%, (Fluxapyroxad 167g/1 + Pyraclostrobin 33 g/l SC) @0.1% + Lamda cyhalothrin 5% EC @ 0.5% and (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + Cypermethrin 10% EC @ 0.2% were found effective in the management of both turcicum leaf blight and fall armyworm with higher grain yield and maximum benefit cost ratio. The best performed pesticide combinations evaluated under field conditions were further assessed for pesticide residual analysis which revealed that, pesticides residue was not detected in grain and soil samples. Ecological intensification treatment resulted in lowering pest and disease pressure significantly and higher grain yield and net returns compared to farmers practice. Disease resistant sources identified are IML-11, IML-12, IML-13, IML-21, IMIC-2022, IMIC-2032, IMIC-2043, IMIC-2045, IMIC-2052, VL108723, CML-451, VL 109582, VL-109470 and VL18882, LM-13 and LM-14. Maize hybrids *viz*., RCRMH-2, GH 150125, H-8110, AH-8323, H-553, HT-5109, AH-8127 and PJHM-1 which posses multiple disease resistant reaction. The identified stable disease resistance sources that are valuable which can be used as donors for future resistance breeding programme and eco-friendly management of fungal diseases of maize.

Morpho-physiological parameters like higher chlorophyll content, highest specific leaf weight, lesser stomatal frequency and smaller sized stomata in maize genotypes played vital role in resistance against turcicum leaf blight disease. In biochemical studies, the increase in phenolics in the diseased samples revealed that phenolics play an important role in inducing resistance against further invasion of the pathogen as they are toxic to the pathogens. Higher concentration of protein in resistant genotypes played important role in governing resistance in maize genotypes against turcicum leaf blight disease and the magnitude of induction was invariably higher in resistant genotypes that susceptible one. The higher expression of peroxidase and polyphenol oxidase enzymes in the resistant genotype than those in the susceptible genotypes is an indication of their significant role in development of resistance in the host against the pathogen.

Key words: *Emerging diseases, Host resistance, Maize diseases, Pokkah boeng, Sustainable management*

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An Economic Analysis of Costs and Returns of Off-Season Vegetables in The Hilly Area of Uttarakhand

Dr Subhash Chandraa
Assistant Professor, Agricultural Economics
Balwant Vidyapeeth Rural Institute, Bichpuri, Agra

This paper aims to analyse the cost and returns and price spread of off-season vegetables crops during 2021-22. Roughly 54.5 per cent area in the state of Uttarakhand assigned for cultivation of five vegetables under study. This study was based on field survey data collected from two district of hilly areas of Uttarakhand. The main findings revealed that the gross return per ha from capsicum cultivation were found to be higher than cauliflower, beans, tomato and vegetable pea off-season vegetables crop during this year this was true for net return as well. Wages and losses constitute very negligible share of the produce thereby leaving 86-98 per cent of the produce to be marketed. A huge gap been noticed in the in the price paid by the consumers and those received by the growers indicating presence of middlemen in the supply chain. A major part of this gap is accounted for by the retailers' as well as mashkors' margin. The profitability of crop can be improved if steps are taken towards regulating the market and improving storage facility and grading and packing is another area where the farmer encounter problems, timely availability of packing material should be ensured for achieves higher profitability.

Keywords: *Hilly area, off-season vegetables, costs and returns, price spread and supply chain.*

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Advancement in Post Harvest Management of Aonla (Emblica officinalis)

Dr. Tejraj Singh Hada
Assistant Professor (Horticulture)
Balwant Vidyapeeth Rural Institute
Bichpuri, Agra, U.P.
tejrajshada@gmail.com

An experiment was carried out at the Balwant Vidyapeeth Rural Institute, Bichpuri, Agra, Department of Horticulture, during the year 2025. Amla is an indigenous fruit to the Indian subcontinent. It is a fruit that is now underutilized but has huge potential in the global market. It has got great potential in processed forms, such as candy. Attempts are being made to produce products that are not only nutritionally delicious but also acceptable among consumers. The medicinal, nutritional, and organoleptic quality of amla candy can be improved by the addition of different syrups in the amla candy like rose syrup, tulsi syrup, and ginger syrup. The experiment consisted of 4 different treatments comprising the different Flavour (hajmola , sendha, ginger, beetroot) the addition of the standard recommended dosage of citric acid and sodium benzoate. This investigation was laid out in a completely randomized design with three replications. After preparation, the amla candy samples were evaluated for Physico-chemical alterations, and sensory evaluation was done using a 9-point hedonic scale that was tested on a panel of 7 experts. These candies were stored for about 9 days at ambient temperature. From storage studies, it was revealed that total soluble solids and acidity increase gradually till the end of the experiment while pH and ascorbic acid are in decreasing order. On the basis of the organoleptic test concluded that the candy was prepared from cv. Kanchan and treatment with T2 (Amla + 68% Sugar syrup + 10% Spices) are found to be the best amla candy.

Keyword : *Post Harvest, Aonla, Candy, TSS,*

IHASE-2025/161

Role of Molecular Marker in Fruit Processing

Dr. Tejraj Singh Hada
Assistant Professor (Horticulture)
Balwant Vidyapeeth Rural Institute
Bichpuri, Agra, U.P.
tejrajshada@gmail.com

Molecular markers have emerged as powerful tools in modern fruit processing and quality improvement. They provide precise, reliable, and efficient methods for identifying genetic variations associated with important traits such as flavor, texture, color, disease resistance, and shelf life. By enabling the identification and selection of desirable genes, molecular markers help in developing superior fruit varieties that meet the demands of consumers and the processing industry. Techniques such as Random Amplified Polymorphic DNA (RAPD), Simple Sequence Repeats (SSR), Amplified Fragment Length Polymorphism (AFLP), and Single Nucleotide Polymorphism (SNP) markers have revolutionized fruit breeding and processing by allowing early detection of quality-related attributes at the genetic level. Moreover, these markers play a crucial role in authenticity testing, traceability, and the prevention of adulteration in processed fruit products. They ensure that the raw materials used are of high genetic purity and meet the required processing standards. The integration of molecular marker technology with advanced genomics and bioinformatics has further improved the efficiency of marker-assisted selection (MAS) and quality control in fruit processing industries. Future advancements are likely to focus on the development of high-throughput marker systems and genome-wide association studies to enhance processing efficiency and product quality. Thus, molecular markers serve as a bridge between traditional breeding and modern biotechnology, contributing significantly to the sustainability, safety, and innovation of fruit processing.

Keywords*: Molecular markers, Fruit processing, Genetic variation, Quality control, Marker-assisted selection, Genomic tools*

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Recent Advancements and Innovations in Post-Harvest Handling, Storage, and Technology for Vegetables: A Review

Neetesh Kumar Sharma, Assistant Professor
Balwant Vidyapeeth Rural Institute
Bichpuri, Agra, U.P.
Nitesh095959@gmail.com

The efficiency of post-harvest handling, storage, and processing technologies plays a vital role in determining the overall productivity and sustainability of agricultural systems. Recent advancements in this field have focused on minimizing quantitative and qualitative losses, improving food safety, and extending the shelf life of perishable commodities. Innovations such as automated sorting and grading systems using machine vision, sensor-based monitoring of temperature and humidity, and AI-driven decision-support tools have transformed traditional post-harvest operations. Smart packaging materials embedded with biosensors now allow real-time tracking of freshness and spoilage, while blockchain technology enhances traceability and transparency across the supply chain. Moreover, the development of energy-efficient and eco-friendly cold storage systems—including solar-powered refrigeration and controlled-atmosphere units—has enabled better storage management, especially in remote rural areas. Emerging biotechnological approaches, such as edible coatings and natural preservatives, further contribute to maintaining nutritional and sensory quality. Collectively, these innovations represent a paradigm shift from conventional storage and handling methods to data-driven, sustainable, and resource-efficient systems. Strengthening the adoption of such technologies can significantly reduce post-harvest losses, improve market access, and ensure greater food security in both developed and developing economies.

Keywords: *Post-harvest technology; Agricultural innovation; Smart storage systems; Cold chain management; Internet of Things (IoT); Artificial intelligence (AI); Smart packaging; Food preservation; Sensor-based monitoring; Blockchain traceability; Sustainable agriculture; Food security; Loss reduction; Controlled atmosphere storage; Edible coating*

Microbial-Nanotechnology for Green and Sustainable Environment

Suriya Rehman[1*], Zainab Alsalem[1], and Aleem Qureshi[2]
[1]Department of Epidemic Diseases Research, Institute for Research and Medical Consultations (IRMC), Imam Abdulrahman Bin Faisal University, P.O. Box 1982, 31441, Dammam, Saudi Arabia.
[2]Department of Environmental Engineering, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia.
Corresponding author *: surrehman@iau.edu.sa https://orcid.org/0000-0003-3087-852X

Microbial nanotechnology also known as microbial nanobiotechnology, is a fastgrowing research field with the ability to revolutionize various areas, that includes, agriculture, environment, energy and medicine. This developing technology evolves around the combination of nanotechnology and microbes to synthesize novel materials with unique characteristics and applicability. These single celled organisms have unique metabolic pathways that allows them to interplay with materials to convert them to nanoscale particles having controlled sizes, morphology, and surface modalities. Such microbially synthesized nanoparticles possess specific physical, chemical, and biological characteristics, for their utility and applicability in several technological fields. Microbes have the ability to synthesize the nanoparticles via intracellular and extracellular methods. During the Intracellular synthesis, the aggregation of nanoparticles takes place inside the microbial cells, while as in extracellular synthesis the nanoparticles are secreted into their environment. Different variety of microbial nanoparticles can be produced that includes metals, metal oxides, quantum dots, biosensors, semiconductors etc. The technique to modulate and engineer the characteristics of such nanoparticles offers potential for immense utility in fields like health, environmental, energy, and electronics. Additionally, using genetic engineering, scientists can program the microorganisms to produce proteins or enzymes that assemble themselves into nanosized apertures. This area offers the development of engineered nanomaterials with desired properties, for example enhanced stability, biocompatibility, and targeted delivery within the biological systems. Furthermore, microbes have a huge role in the advancement of nanosensors, and nanodevices. This combination of microbial systems with nanotechnology can be exploited for their natural biological sensing properties to recognize and respond to an environmental or other biological stress, that holds potential for applications in agriculture and environmental monitoring, disease detection and biosensors. This area holds a promising scope in many aspects that includes crop protection and development, food processing and packaging, and precision agriculture to develop disease resistant plant growth and food security.

Keywords: *Agriculture; Biosensors; Environment; Food security; Medicine; Microbialnanotechnology.*

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Agricultural Waste Management For Sustainable Environment

Prince Tripathi
MSc. Ag Extension (Student) Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot Satna (MP)

Agricultural waste management is an important component of achieving environmental sustainability. Agricultural by-products are burnt after harvesting to clear the straw and stubble left in the fields and to prepare the field for sowing next crop on time. Burning 1 ton of crop residues released 2 kg SO2, 3 kg particulate matter, 60 kg CO, 1460 kg CO2 or 199 kg ash which damages the air quality as well as the nutrients and beneficial microorganisms in the soil, thereby which reduces the soil's productivity (or fertility). Earlier people used to keep animals in their homes, due to which crop waste was used as fodder for these animals, but at present time this situation seems to have changed. Today we are living in the modern era where solution to every problem are available, using which crop waste can be converted into valuable resource which can benefit not only the farmers but also the environment. The methods of crop residues management are as follow : decompose by In-situ method like Bio-decomposer (Pusa decomposer) in the form of capsule develop by IARI Pusa, super seeder which is a modern technology which can be used direct sowing on third or fourth day after harvesting, thereby saving time and cost of farmers. Ex-situ Decomposition is crop residues are taken to some other place and used or decomposed, including for Animal fodder, Biogas, Compost, Soil mulching, Energy like CNG, Biochar and Brequetting. Farmers select these options can increase their income and resources and its also helpful in conserving the environment and natural resources for the use of future generations and achieving SDGs goals of UNs.

Keywords*: Agricultural waste management, In-situ, Ex-situ, methods, SDGs.*

Correlation and Path Coefficient Analysis for Yield and Its Component in Fenugreek (*Trigonella foenum-graecum* L.) under Chhattisgarh Plains

Anand Prakash Minj[*1], Rajeshwari Sahu[*2], Nutan Bhardwaj[*3]

[1*]Research Scholar (Plantation, Spice, Medicinal and Aromatic Crops) Pt. KLS, College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (C.G.)

[2*]Assistant Professor (Floriculture and Landscape Architecture) College of Horticulture and Research Station, Arjunda, Balod, MGUVV. Durg (C.G.)

[3*]Research Scholar (Floriculture and Landscaping) Pt. KLS, College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (C.G.)

Corresponding author: Email: anandminj182@gmail.com

The present investigation was conducted to find out the association among yield and its component characters in fenugreek (*Trigonella foenum-graecum* L.) using correlation and path coefficient analysis. The experiment was conducted with different genotypes of fenugreek were evaluated under field conditions to estimate the relationship between yield and various yieldcontributing traits. Correlation analysis revealed significant associations among the growth and yield-related traits in fenugreek. Seed yield per hectare, seed yield per plot, number of pods per plant showed a strong positive correlation with seed yield per hectare also days to first germination seed yield per plant, number of branches per plant and plant height also recorded positive associations, while days to first pod formation and days to 50% flowering had a negative correlation with seed yield per hectare. Path analysis revealed that positive and direct effect towards the seed yield per hectare has shown in characters *viz*., days to first germination, plant height at 45 days, number of pods per plant, seed yield per plant and seed yield per hectare. Therefore, positive selection in a favourable direction will be beneficial. Genotypes such as Hisar Sonali is significantly superior followed by AFG-5, Local-2, and RMT-305, exhibited superior performance, making them promising cultivar for breeding programs,would be beneficial for developing high yielding fenugreek genotypes adapted to Chhattisgarh plains future studies may incorporate molecular markers for validation under diverse environmental conditions and to identify yield-related genes**.**

Keywords: *Fenugreek, Trigonella foenum-graecum L., Correlation, Path analysis , Yield component, Chhattisgarh plain.*

Novel Herbal and Antibiotic Therapeutic Approach for Improving Milk Composition in Subclinical Mastitis Affected HF Crossbred Cows

Aruna Yadagiri*, Nidhi S. Choudhary, H.K. Mehta, Kamlesh Choudhary, Pawan Maheshwari, R.K. Bagherwal, Rakesh Dangi.
Department of Veterinary Medicine, College of Veterinary Science and A. H., Mhow, NDVSU, Jabalpur, M.P.

Subclinical mastitis (SCM) is an economically important and production-limiting disease in dairy cattle, adversely affecting both the quantity and quality of milk. Milk from the SCM infected cows, contaminated with bacteria makes it unhealthy for human consumption and reduces keeping quality of milk. This study directed to evaluate the changes in composition of milk in HF crossbred cows affected with SCM. The milk composition was analysed by LACTOPLUS milk analyzer. 18 HF crossbred cows confirmed with subclinical mastitis (SCM) which were divided into three groups i.e., II, III and IV, each having 6 cows. The therapeutic regimens include Group I (healthy control), Group II (treated with herbal paste prepared from *Moringa oleifera* leaves 100g, *Curcuma longa* powder 10g and common salt 10g, twice daily for 7 days as topical application) and group III were received (Ceftiofur hydrochloride (125 mg) intramammary infusion per teat once daily for 5 days and group IV with the combination of both). The higher values of SCC and pH and lower milk composition values were noticed on 0 day (Pre-treatment). There was a gradual increase in fat, SNF, protein, lactose and Titrable acidity (%) while the SCC and pH were decreasing after the treatment up to 28th day (post-treatment) in all the three therapies. Combination therapy (group IV) showed better and early effect on improvement of milk components when group II and group III regimens which showed similar effect. The study highlights the potential of integrating herbal and conventional antibiotic therapy help in improving milk quality and udder secretory activity in dairy cattle, thereby supporting the goals of sustainable livestock production and environmental safety.

Key words*: Ceftiofur hydrochloride, Milk composition, Moringa oleifera, somatic cell count, Sub clinical mastitis.*

Influence of Edible Coatings and Packaging Materials on the Post-harvest Quality and Shelf Life of Strawberry (*Fragaria* × *ananassa*) variety Winter Dawn under Ambient Conditions

Ms. Bhawna Panda[1] & Riya Bohidar[2]

[1]Assistant Professor (Fruit Science), Mahant Bisahu Das College of Horticulture & Research Station, Gaurela-Pendra-Marwahi (C.G.).
Email ID: bhawnapanda768@gmail.com,
Contact number: 9685444908

[2]M. Sc. (Horticulture) Fruit Science, College of Horticulture & Research Station, Saja, Bemetara (C.G.).
Email ID: riyabohidar641@gmail.com, Contact number:7489508605

An experiment was conducted on the effect of various surface coatings and packaging materials on the postharvest shelf life of Strawberry variety Winter Dawn under ambient storage condition at Mahant Bisahu Das College of Horticulture and Research Station, Gaurela-Pendra-Marwahi during 2024–25. The study aimed to evaluate the impact of different natural edible coatings and packaging combinations on maintaining the postharvest quality, storability, and marketability of strawberries. The experiment comprised sixteen treatment combinations using bee wax (2%), cassava starch (2%), guar gum (2%), Aloe Vera gel (20%), and Moringa leaf extract (2%) along with three packaging materials-punnet box, 3-ply corrugated fibre board and 90-gauge polypropylene-besides an untreated control.

Observations on physical and biochemical parameters revealed a gradual decline in fruit quality during storage across all treatments. However, fruits treated with edible coatings and packed in suitable materials exhibited significantly delayed deterioration compared to the control. Among the tested treatments, bee wax (2%) combined with punnet box packaging (T_7) proved most effective, retaining maximum fruit weight (19.80 g), diameter (3.14 cm), total soluble solids (7.49 °Brix), titratable acidity (0.72%), ascorbic acid (47.80 mg/100 g), and total sugars (12.30%) after six days of storage. This treatment also minimized physiological weight loss (0.72%) and unmarketable fruits (4.00%), resulting in the longest shelf life (5.59 days) compared to only 2.50 days in the untreated control. Guar gum and cassava starch coatings with punnet packaging also maintained good quality, while Aloe Vera and Moringa extract showed moderate effects.

The findings highlight that bee wax coating in combination with punnet packaging offers a natural, eco-friendly, and economically viable approach to extend the shelf life, reduce postharvest losses, and maintain superior fruit quality of strawberries under ambient conditions.

Keywords: *Strawberry, Edible coating, Packaging, Shelf life, Post-harvest quality.*

Characterization of *Pseudomonas fluorescens* Isolates from Chilli Rhizosphere Based on Biochemical and Morphological Traits

R.J. Choudhari *, R.M. Gade[1] and A.D. Theng [2]
Department of Plant Pathology. Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Akola- 444 104 (MS) India.
* Corresponding author Email: Choudharirupeshkumar@gmail.com

Pseudomonas fluorescens is a versatile plant-beneficial rhizobacterium known for its pivotal role in maintaining soil health, promoting plant growth, and protecting crops from phytopathogens. It serves as an eco-friendly and sustainable alternative to chemical fungicides, thereby reducing environmental hazards. In the present study, *P. fluorescens* isolates designated Pf1, Pf2, and Pf3 were obtained from the rhizosphere of chilli (*Capsicum annuum* L.) and evaluated for their plant growth-promoting and biocontrol attributes. The isolates were screened for the production of volatile and non-volatile metabolites, including hydrogen cyanide (HCN) and indolic compounds, which contribute to pathogen inhibition and plant growth enhancement. The antagonistic potential of the isolates was assessed against common soil-borne fungal pathogens, revealing significant inhibitory activity indicative of strong biocontrol potential. Morphological and biochemical characterization was performed through catalase, oxidase, triple sugar iron (TSI), arginine dehydrolase, starch hydrolysis, H_2S production, methyl red, citrate utilization, and gelatin liquefaction tests. Among the isolates, Pf1 exhibited superior biochemical activity and antagonistic efficacy, highlighting its potential as an effective biofertilizer and biocontrol agent for sustainable chilli cultivation.

Keywords: *Pseudomonas fluorescens, chilli rhizosphere, HCN production, biochemical characterization, biocontrol, plant growth promotion.*

Varietal evaluation of African marigold (Tagetes erecta) under Chhattisgarh plain

Nutan Bhardwaj, Rajeshwari Sahu and Anand Prakash Minj.
Research Scholar (Floriculture and Landscaping) Pt. KLS College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (CG)
"Assistant Professor (Floriculture and Landscape Architecture) College of Horticulture and Research Station, Arjunda, Balod, MGUVV. Durg (CG)
"Research Scholar (Plantation, Spice, Medicinal and Aromatic Crops) Pt. KLS College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (CG)
Corresponding author: Email: bhardwajnutan241@gmail.com

The present investigation entitled "Varietal evaluation of African marigold (Tagetes erecta) under Chhattisgarh plain" was carried out at Pt. KLS College of Horticulture and Research Station, Rajnandgaon (CG) during the xwmer season of 2024-25 The experiment was laid out in a Randomized Block Design (RBD) with eight varieties replicated thrice Significant variation was observed among the varieties for growth. flowering, yield, and quality parameters. The maximum plant beight was recorded in T-Pusa Basanti (8160 cm) The maximum plant canopy spread (E-W) (45 17cm), (N-S) (45.66cm), number of leaves plant (118) and number of secondary branches plant (3734), along with the highest stem diameter (1.50 cm) was recorded in Ta-Calcutta Gainda. The earliest bud initiation (52 90 days) and 50% flowering (75.23 days) were observed in Ts-Orange Bunch The maximum flower diameter (6.18 cm), fresh flower weight (579 g), and dry flower weight (149 g) were recorded in T Arka Bhanu F1, which also produced the highest flower yield plant (281.5 g), plot (13.78 kg), and hectare (23 47 t/ha). The maximum number of flowers plant (53.98) and highest chlorophyll content (589 mg/g) were recorded in T. Calcutta Gainda Overall, Arka Bhanu F1 and Calcutta Gainda performed superiorly for yield and growth parameters under the Chhattisgarh plain conditions

Keywords: *Marigold, Growth, yield potential, Quality parameters, Agro climate zone*

Impact of Ultrasound as a Pretreatment on the Malting Properties of Ragi and Foxtail Millet.

Gitasri Paul[1*], Labanyamayee Tudu[2], Dipsikha Kalita[3]

[1*]Research Scholar, School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: gitasriluap@gmail.com , 8638283516

[2]M.Sc., School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: 2024ctm011.labanya@students.iiests.ac.in

[3]Assistant Professor, School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: dkalita4@gmail.com

Ultrasound pretreatment of cereal grains has been shown to have positive effects on their malting properties in the literature. As millets are highly nutritious and climate-resilient crops, this study focuses on using ultrasound pretreatment to enhance malting of *Eleusine coracana* (ragi) and *Setaria italica* (foxtail millet). Soaking kinetics and germination efficiency were evaluated after treating the samples with ultrasound using a 25kHz probe sonicator (6mm probe diameter) at amplitudes of 20% and 40% for 60s and 120s, respectively, with a pulse of 3s on and 6s off at 298K, corresponding to power densities between 597 and 1195 W/L^{-1}. Soaking kinetics were modelled using the Peleg, Page, Weibull, and Midilli empirical models, where the Midilli model gave the best fit ($R^2 > 0.98$). Ultrasound reduced soaking time by 20-30% compared to untreated control seed samples. This enhanced mass transfer can be attributed to the micropores created by ultrasound. Germination also improved with enhanced seed viability and germination capacity after ultrasonication. Ragi treated with a 40% amplitude for 60 seconds showed a maximum germination of 80% and dormancy of 20%. Similarly, foxtail millet also showed the best improvement, with a 75% increase in germination capacity under the same treatment combinations. Among all the treatment conditions, moderate ones (40%, 60s) effectively enhanced soaking and germination compared to treatments of longer durations (120s). This validates ultrasound as a sustainable, non-thermal technology for improving the overall malting and functional qualities of millet grains, which require further research and investigation.

Keywords*: Ultrasound, Soaking, Germination, Millets, Pretreatment*

Overview on Plant Genetic Resources and Their Utilization in Goa

P.P. Patil[1*].; S.S. Nitave[2].; V.A. Atkari[3].; S.S. Jadhav[4] and D. P. Gawas[5]

Goa College of Agriculture, Ela Farm,
Old Goa, Goa 403 402, Goa

[1*]Assistant Professor, Department of Agricultural Botany, Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402 & Corresponding author (Email: *prashantppatil322@gmail.com*)

[2.]Assistant Professor, Department of Agronomy, Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402

[3.]Assistant Professor, Department of Agriculture Engineering, Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402

[4.]Assistant Professor, Department of Agricultural Extension Education, Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402

[5.]Assistant Professor, Department of Agricultural Botany, Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402

Plant genetic resources are useful for present and future agriculture and horticulture production. Germplasm is the lifeblood of plant breeding without which breeding is impossible to conduct. They are particularly needed for the genetic improvement of crop plants. Because of their usefulness and their ongoing erosion in the agro ecosystems, it was necessary to establish large collection of plant genetic resources. Plant Genetic Resources (PGR) constitute the foundational raw material for crop improvement globally. The state Goa, situated on the west coast of India, is characterized by a high-rainfall, humid tropical climate, lateritic soils, and a vast network of low-lying, saline-affected Khazan lands. Its agricultural system relies on a narrow base of commercial cultivars, leading to genetic vulnerability against emerging pests, diseases, and climate change impacts (e.g., increased salinity and erratic rainfall). Plant Genetic Resources (PGRs), particularly the rich local landraces of rice, vegetables, and fruit crops, are the primary resource for developing climate-resilient varieties tailored to these specific conditions. Also the state of Goa situated in the biodiversity-rich Western Ghats, possesses a unique and valuable reservoir of traditional and wild genetic diversity, particularly in staple crops like rice, finger millets and pulse crops and commercially important crops such as cashew, coconut, arecanut and diverse horticultural species (spices, vegetables, and fruits). So available germplasm provides the materials used to initiate a breeding programme. The available germaplsm or landraces has to be characterized and evaluated in order to introduce it into breeding programmes. Prebreeding and germplasm enhancement are necessary as first steps for the

introduction of primitive material into modern varieties. Strategic conservation efforts (both in situ and ex situ), coupled with advanced molecular characterization and pre-breeding initiatives, are essential to develop the new high cultivars with biotic and abiotic resistance for Goan condition.

Key words :- *Plant Genetic Resources, land races, breeding, germplasm, conservation*

Animal Health and Welfare, Integrating Human, Animal and Environmental Health (One Health Approach)

Subtheme: Zoonotic Disease Prevention and Control

Antimicrobial resistance: An emerging threat for public health

Ravikant Verma
Department of Zoology, CCS HAU, Hisar (Haryana), 125004
rkantazad@gmail.com

Aquaculture is a rapidly growing industry that accounts for almost half of the fish used for human consumption worldwide. Intensive and semi-intensive practices are used to produce large fish stocks, but frequent disease outbreaks occur, and antimicrobials have become a customary practice to control them. As a consequence of the use of antibiotics in aquaculture, antibiotic resistance is induced in the surrounding water bodies, even in sediments. Bacteria can diffuse antibiotic-resistance and mobile-resistance genes through horizontal gene transfer, further spreading genetic determinants. Once triggered, antibiotic resistance quickly spreads among aquatic microbial communities and, from there, can reach human pathogenic bacteria, making the use of antibiotics for human health vain.

The emergence and spread of AMR from the unrestricted use of antimicrobials in livestock feed has been a major contributing factor. The prevalence of antimicrobial-resistant bacteria has attained an incongruous level worldwide and threatens global public health as a silent pandemic, necessitating urgent intervention. Therapeutic options for infections caused by antimicrobial-resistant bacteria are limited, resulting in significant morbidity and mortality with high financial impact. The paucity of discovering and supplying new novel antimicrobials to treat life-threatening infections by resistant pathogens stands in sharp contrast to demand. Twenty-eight bacteria were isolated from the pond water samples or swabs from body lesions of Indian Major Carps from various village ponds nearby districts of Hisar. *Aeromona hydrophila*, *Pseudomonas aeruginosa*, *Vibrio Cholarea* , *Enterococcus sp.*, *Streptococcus sp.* and *Staphylococcus sp* were found more prevalent in collected samples. The bacterial isolates were analyzed for antimicrobial susceptibility to five antibiotics (Cefexime, Ofloxacin, Chloramphenicol, Ampicillin and Rifampin+Isoniazid) and found MDR. Another study recorded that 30% of MDR isolates of *Aeromonas* sp. out of isolated microbes were reported in the village ponds in and around Hisar. A global effort must be made to cease antimicrobial overuse in aquaculture and encourage stakeholders to adopt other disease-prevention measures. Considering the studies, it was found that using herbal extracts against the MDR bacterial isolates was influential in their management.

Key words: *Aquaculture Antimicrobials Antimicrobial resistance*

Harnessing the Resilience of Horse Gram: A Climate-Smart Approach to Sustainable Nutrient Management

Muthamma M.B1, Mohan TC1, Charukesi R[1*]
[1.]Department of Biotechnology and Bioinformatics, School of Life Sciences,
JSS Academy of Higher Education & Research, Mysuru, Karnataka, India.
Contact No: 9449570827
Email- muthammamb25@gmail.com
Email of corresponding author – charukesi@jssuni.edu.in

Climate variability continues to challenge agricultural productivity by imposing multiple abiotic stresses such as drought, salinity, temperature extremes, and nutrient deficiencies, as well as biotic pressures from pests and diseases. These factors not only reduce crop yield and quality but also threaten long-term soil fertility. In response, the heavy use of chemical fertilizers has become common, yet this practice increases costs and contributes to environmental degradation. As a climate-resilient and underutilized legume, horse gram (*Macrotyloma uniflorum*) offers a sustainable alternative due to its ability to thrive under nutrient-poor and arid conditions. However, the physiological and molecular mechanisms that enable its tolerance to low macronutrient availability remain largely uncharacterized. This study aims to standardize an in vitro hydroponic system to investigate the adaptive responses of horse gram under nutrientlimited conditions. Through physio-morphological analyses and nutrient profiling using ionomics, the research seeks to uncover how horse gram maintains nutrient uptake, utilization, and homeostasis under stress. The study further explores nutrient crosstalk among macronutrients to understand regulatory interactions that sustain growth under nutrient-deficient environments. The outcomes of this research will provide new insights into the nutrient efficiency and resilience of horse gram, facilitating the development of low-input, climate-smart, and sustainable cropping systems. Integrating such findings with precision agriculture will support improved nutrient management strategies, enhance food and nutritional security, and promote sustainable environmental management in the era of climate change.

Keywords*: Horse gram, Nutrient limitation, Hydroponics, Ionomics, Abiotic stress*

Learning from Weeds: Deciphering nutrient use efficiency mechanism in *Parthenium hysterophorus* and implications for the development of Nutrient-Efficient crops, insights toward reducing fertilizer dependency

Subrahmanya Hegde[1], Mohan T C[1], Charukesi R[1]*
[1.]Department of Biotechnology and Bioinformatics, School of Life Sciences,
JSS academy of Higher
Education and Research, Mysuru, Karnataka, India.
Contact No: 8431806540
Email: subrahmanyahegde@jssuni.edu.in
Email of corresponding author: charukesi@jssuni.edu.in

Sustainable crop production under nutrient-limiting conditions poses a major challenge in modern agriculture, especially with rising global food demands and declining soil fertility. Excessive reliance on chemical fertilizers for essential macronutrients such as nitrogen, phosphorus, and potassium (NPK) has resulted in severe environmental degradation and reduced soil health. Identifying plants with efficient nutrient sensing, acquisition, and utilization mechanisms is therefore critical for developing low nutrient stress resilient crops and sustainable agricultural systems. *Parthenium hysterophorus*, an invasive weed renowned for its resilience, serves as a valuable model to study adaptive strategies under macronutrient-deficient conditions. In this study, plants were grown across a gradient of macro-nutrient regimes (0–2000 μM) to assess physiological responses to varying nutrient availability. At extremely low nutrient levels (0–5 μM), Parthenium exhibited pronounced root architectural modifications, indicating a strong nutrient-sensing ability and adaptive response for enhanced uptake. Interestingly, plants attained saturated shoot biomass even at moderate nutrient levels (~250 μM), suggesting superior nutrient use efficiency. Under high nutrient supply (500–1000 μM), nutrient accumulation was predominantly confined to roots, implying a regulatory mechanism that limits excessive translocation to shoots, possibly to prevent toxicity. To further unravel the molecular mechanisms underlying these adaptive traits, future de novo transcriptomic analysis will be employed to identify key genes and regulatory networks associated with nutrient sensing, uptake, and detoxification. Collectively, this study positions *Parthenium hysterophorus* as a promising model for exploring natural resilience mechanisms that can inform the development of nutrient-efficient and environmentally sustainable crop systems.

Keywords: *Macronutrient deficiency, Nutrient use efficiency, Adaptive root architecture, Parthenium hysterophorus, Transcriptomic analysis*

Odisha's Journey Towards Blue Transformation in Fisheries and Aquaculture

Sushree Ratnamanjari Senapati
Email ID: sushree.fishco22@gmail.com
: +91 9853762104
Fisheries and Animal Resource Development Department,
Govt. of Odisha, Bhubaneswar

Odisha, a maritime state with 575 km of coastline and rich aquatic ecosystems, holds immense potential in fisheries and aquaculture. Contributing 10.6% to the State's agricultural economy, Odisha ranks as India's 4th-largest fish producer, accounting for 6% of national fish output, and has a per capita fish consumption of 17.73 kg. With 6.76 lakh ha of freshwater and 4.18 lakh ha of brackish water resources, it produced 11.93 lakh MT of fish in 2024–25, generating livelihoods and enhancing food and nutritional security for rural communities. The sector employs 10% of the agricultural workforce, with an average monthly income of ₹8,500. Government initiatives like Pradhan Mantri Matsya Sampad Yojana (PMMSY), Rastriya Krushi Vigyan Yojana (RKVY), Blue Revolution, and Mukhyamantri Matsyajibi Kalyan Yojana (MMKY) have been instrumental in sectoral development. Initiatives like the Matsya Pokhari Yojana (MPY) enabled 18,574 fishers to excavate 11,011.67 ha of ponds, while 9,710 Women Self-Help Groups (WSHGs) engaged in pisciculture across 9,197.90 ha of Gram Panchayat (GP) tanks. Efforts to empower women through Bio-floc and GP tank-based fish farming have created new livelihood opportunities. With a focus on horizontal and vertical expansion, the government aims to raise productivity by more than 5 tons/ha/year, positioning fisheries as a key driver of Odisha's rural economy.

Keywords*: Odisha, livelihood generation, women empowerment, Government schemes, rural economy*

Integrating Traditional and Modern Agronomy for Climate-Resilient Agriculture

Sonu Kumar*
Amity University Noida Uttar Pradesh
sonueduweb@gmail.com
***Corresponding author email:** sonueduweb@gmail.com,
Contact No. : 7549237397

Climate change, land degradation and diminishing natural resources, present agriculture with hitherto unheard-of issues. It is crucial to combine traditional agronomic knowledge with contemporary scientific advancements for sustainable output. Centuries of farming experience have shaped traditional agronomy, which places a strong emphasis on crop diversity, ecological balance and sustainable use of natural resources. These methods, which include indigenous soil and water management, organic manuring and mixed cropping, have supported farming communities across a variety of agro-ecological settings. However, the increasing degree of climate variability necessitates the use of contemporary agronomic techniques, such as data-driven decision-making, enhanced crop varieties, precision farming and remote sensing.

A synergistic strategy to improve resistance against climatic stresses like drought, floods, and temperature extremes is to integrate traditional and modern agronomy. By increasing productivity and efficiency while preserving ecological integrity, modern methods can improve and optimize old processes. To reduce input consumption and environmental effect, for example, conventional water-harvesting and organic fertilization methods can be paired with precision irrigation and nutrient management. Similarly, local techniques that maintain soil fertility and biodiversity can be used to grow climate-resilient crop varieties. In addition to supporting sustainable resource management and long-term food and livelihood security, this integrative framework encourages farmers' capacity for adaptation. It promotes inclusive and situation-specific agricultural solutions. Hence, combining traditional and modern agronomy creates robust agro-ecosystems that can survive the uncertainties of a changing climate while also increasing productivity. In order to achieve climate-resilient, sustainable agriculture for current and future generations, this all-encompassing strategy is essential.

Keywords: *Climate resilience, indigenous knowledge, modern agronomy, precision farming sustainable agriculture*

Myoinositol: Antidiabetic compound identification and *in-silico* studies in cape gooseberry (*Physalis peruviana* L.) genotypes

Mohamed Jassim J[1*], Saraswathy S[1*], Veeranan Arun Giridhari V[2], Anitha T[3] and Umadevi M[4]

[1]Department of Fruit Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam - 625604, Tamil Nadu, India
[2]Centre of Postharvest Technology, Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University, Coimbatore - 641003, Tamil Nadu, India
[3]Department of Postharvest Technology, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam - 625604, Tamil Nadu, India
[4]Department of Rice, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore - 641003, Tamil Nadu, India
Corresponding author - mohdjassim544@gmail.com; saraswathy.s@tnau.ac.in

Cape gooseberry is one of the underutilized fruit crops with multiple sources of antioxidants against human diseases. An investigation was conducted on evaluation of cape gooseberry genotypes and biomolecule identification with a focus on its potential therapeutic application was carried out at Department of Fruit Science, Horticultural College and Research Institute, Periyakulam. GCMS analysis revealed the presence of myoinositol, an antidiabetic compound found in various genotypes of cape gooseberry. Molecular docking studies were performed to assess the binding affinity of myoinositol in relation with key enzyme involved in the diabetes pathway: α-amylase (1B2Y). Among the genotypes evaluated, PKM-PP-7 exhibited the highest abundance of myoinositol, along with notable antioxidant properties, including significant levels of total phenols and flavonoids. Molecular docking results revealed that myoinositol compounds from PKM-PP-7 showed a high binding affinity of -6.3 kcal mol^{-1} with α-amylase, indicating strong potential for antidiabetic activity. This *in-silico* study highlights the promising role of cape gooseberry genotypes, particularly PKM-PP-7, as a source of bioactive compounds that could be developed for diabetes management. The findings provide valuable insights for future research and product development targeting type II diabetes therapeutics, using cape gooseberry as a functional food or nutraceutical source.

Keywords: *Cape gooseberry, Antidiabetic, Myoinositol, α-amylase.*

Advancing Interpretability of Spatial Machine Learning for Digital Soil Salinity Mapping

Ramesh Abhishek[1], Shobhit Maheshwari[1], Neeraj Saini[1], Naveen Sharma[2]
[1]Department of Civil Engineering, Faculty of Engineering & Technology,
SGT University, Gurugram, India
[2]Department of Social Sciences, Faculty of Agricultural Sciences,
SGT University, Gurugram, India
Corresponding author: naveen_fasc@sgtuniversity.org

Advancing the interpretability of spatial machine learning models for digital soil salinity mapping is crucial for making these tools more transparent and trustworthy to users. Soil salinity poses a serious challenge to agricultural productivity worldwide, and accurate mapping is essential for effective management. While machine learning techniques have shown great promise in predicting and mapping soil salinity using remote sensing data, they are often criticized as "black boxes" because their decision processes can be difficult to understand. This lack of transparency hinders practical adoption by farmers, land managers, and policymakers who need clear insights to inform their decisions. This work focuses on improving interpretability by applying explainable machine learning methods specifically tailored for spatial data in soil salinity studies. The approach involves training various spatial machine learning algorithms on multispectral satellite data combined with ground measurements of soil electrical conductivity. The models are then evaluated not only on accuracy but also on their ability to provide interpretable outputs that align with known soil processes. Ultimately, making spatial machine learning models more interpretable supports better soil salinity management by enabling stakeholders to trust and effectively use these advanced tools. This leads to improved decision-making for sustainable land use and agricultural productivity, especially in regions where soil salinity threatens long-term soil health and crop yields.

Keywords: *Remote sensing, Digital soil mapping, spatial machine learning*

Bioefficacy and Residue Dynamics of Insecticides against *Bactrocera dorsalis* in Guava

Meenakshi Devi and Surendra Singh Shekhawat
Assistant Professor of Entomology, Faculty of Agricultural Sciences,
SGT University, Gurugram, Haryana, India.
Email address: meenakshi_fasc@sgtuniversity.org

A study was conducted to evaluate the population dynamics, bioefficacy, and residue profiles of insecticides against the fruit fly, *Bactrocera dorsalis*, in guava. Monitoring revealed the peak adult population occurred in the 33rd standard meteorological week, correlating with specific temperature, humidity, and rainfall conditions. The bioefficacy of several insecticides, including malathion, spinosad, lambda-cyhalothrin, imidacloprid, dimethoate, and nimbecidine (azadirachtin), was tested with two foliar sprays. All treatments were significantly more effective than the control. Nimbecidine 0.03% was the most effective, achieving the maximum reduction in oviposition marks (81.81%) and the lowest number of maggots per fruit (0.25). It was closely followed by imidacloprid (75% reduction). Malathion was the least effective, with only a 54.83% reduction. The residue dissipation of dimethoate, malathion, and lambda-cyhalothrin was studied at single and double doses. Initial deposits were highest for dimethoate, followed by malathion and lambda-cyhalothrin. Malathion dissipated the fastest, with half-lives of 3.0 and 3.3 days. Lambda-cyhalothrin had a half-life of about 4.5 days, while dimethoate was the most persistent with half-lives of 6.72 and 8.15 days. Residues of malathion fell below the maximum residue limit (MRL) immediately after application, while dimethoate required a 3-day waiting period at the higher dose. In conclusion, nimbecidine was the most effective and safe option against *B. dorsalis*. The residue data provides essential guidance for establishing safe pre-harvest intervals for synthetic insecticides in guava cultivation.

Keywords: *Bactrocera dorsalis, guava, bioefficacy, insecticide residues, nimbecidine.*

Integrating Smart Farming, Climate-Resilient Practices, and Sustainable Value Addition for Strengthening Agri-Food Systems

Heena[1], Farhana Majid[2]
[1]Assistant Professor, SGT University, Gurugram, Haryana
[2]Assistant Professor, SGT University, Gurugram, Haryana

The growing challenges of climate variability, resource degradation, and rising food demand call for innovative and sustainable transformations in the agri-food sector. This paper presents an integrated approach combining smart farming technologies, climate-resilient agricultural practices, and value-addition strategies to enhance productivity, sustainability, and farmer livelihoods. The study reviews advancements in sensor-based crop monitoring, robotics, automation, and digital agriculture and evaluates their potential for precision input use and real-time decision-making. Emphasis is placed on climate-smart interventions such as agroecology, regenerative agriculture, carbon farming, and natural farming, which collectively contribute to soil health restoration and environmental resilience. Additionally, the role of post-harvest technologies, food processing innovations, and nutraceutical development is explored to strengthen value chains and reduce losses. By linking agriculture, health, and environment through interdisciplinary insights, the paper highlights pathways for sustainable food security and rural development. The study concludes that integrated technological–ecological models can significantly transform horticulture, agriculture, veterinary, and allied sectors, enabling a resilient and sustainable future aligned with national and global sustainability goals.

Keywords: *Smart farming, Climate-smart agriculture, Sustainability, Value addition, Digital agriculture*

Formulation and Quality Evaluation of Drumstick-Based Ready-to-Serve (RTS) Fruit Blends

Dr. Pooja Pant
Associate Professor, Department of Horticultural Sciences,
Faculty of Agricultural Sciences,
SGT University Gurugram, Haryana

The study, entitled "Formulation and Quality Evaluation of Drumstick-Based Ready-to-Serve (RTS) Fruit Blends," was conducted at the Post-Harvest Laboratory, Faculty of Agricultural Sciences, SGT University, Gurugram. The research aimed to develop a nutritious and palatable RTS beverage by blending drumstick (Moringa oleifera) juice with selected fruit juices and natural sweeteners in varying combinations. Nine treatments were prepared: T1 (Drumstick + Strawberry, Honey 25% + Jaggery 75%), T2 (Drumstick + Kiwi, Honey 25% + Jaggery 75%), T3 (Drumstick + Pineapple, Honey 25% + Jaggery 75%), T4 (Drumstick + Strawberry, Honey 50% + Jaggery 50%), T5 (Drumstick + Kiwi, Honey 50% + Jaggery 50%), T6 (Drumstick + Pineapple, Honey 50% + Jaggery 50%), T7 (Drumstick + Strawberry, Honey 75% + Jaggery 25%), T8 (Drumstick + Kiwi, Honey 75% + Jaggery 25%), and T9 (Drumstick + Pineapple, Honey 75% + Jaggery 25%). The treatments were analyzed for physico-chemical attributes (total soluble solids, acidity, total and reducing sugars, pH, and mineral content including zinc, iron, magnesium, sodium, and potassium) along with sensory quality parameters. Among all formulations, T3 (Drumstick + Pineapple with 25% honey and 75% jaggery) exhibited superior sensory acceptability and a more favourable nutrient composition.

The findings indicated that blending drumstick and pineapple juices with a predominant proportion of jaggery enhances both nutritional quality and consumer preference. This formulation demonstrates strong potential for commercial production of natural, health-oriented RTS beverages enriched with essential micronutrients.

Keywords: *Drumstick, Moringa oleifera, RTS beverage, Fruit blend, Pineapple, Honey, Jaggery, Sensory evaluation, Nutritional quality*

A Machine Learning Approach to Predict the Maize (Corn) Productivity in India

Suman
Assistant Professor, Shri Guru Gobind Singh Tricentenary University Gurugram
Email:suman_fasc@sgtuniversity.org

This study used 1961–2023 FAOSTAT data to forecast maize area, production, and yield in India. The Trend analysis shows that maize production increased from 4.3 million tonnes in 1961 to 38.1 million tonnes in 2023. The harvested area increased from 4.5 to 10.7 million hectares, and yield increased more than 3.5 times (from 957 to 3,545 kg/ha). This study aims to compare the forecasting ability of advanced time series analysis and machine learning techniques. A statistical benchmark an ARIMA model was compared to an LSTM network, a machine learning model that finds complex time-based correlations. The models were trained using 1961–2015 data and tested on 2016–2023 data. For area, yield, and production, the LSTM model always outperformed the ARIMA model in Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE). The linear ARIMA model was inadequate in capturing the non-linear growth trends and internal movements of the agricultural system, but the LSTM is proficient in this regard. The results clearly indicates that classical time series models may provide an adequate forecast, but machine learning methods like LSTM are better for predicting the complex structure of the shifting trends. The LSTM model's accurate forecasts assist policymakers and farmers plan for food security, supply chain management, and economic and climatic adaptation.

Keywords*: Agricultural Productivity, India, FAOSTAT, Maize, Machine Learning, ARIMA, LSTM, Time Series Analysis, RMSE.*

Digital Innovations and Agribusiness Transformation: Enhancing Efficiency and Sustainability in Agri-Value Chains

Naveen Sharma[1], Ramesh Abhishek[2*]
[1]Department of Social Sciences, Faculty of Agricultural Sciences, SGT University, Gurugram
[2]Department of Natural Resource Management, Faculty of Agricultural Sciences, SGT University, Gurugram
Author's email & contact: naveen_fasc@sgtuniversity.org, 8295669322
Corresponding author's email: ramesh_fasc@sgtuniversity.org

Considering the fast transformation that digital technologies are bringing about in the agricultural sector, the incorporation of these technologies into the management of agribusiness has become an absolute necessity in order to achieve sustainable growth and effective value chain operations. Recent studies have shed light on the ways in which digital agricultural solutions, such as Internet of Things (IoT)-based monitoring, precision input management, artificial intelligence (AI)-driven advisory systems, and digital market platforms, are effectively enhancing decision-making processes for farmers, agri-entrepreneurs, and supply chain players. For the purpose of expanding market access and decreasing the risks that are encountered by small and marginal farmers, digital agribusiness technologies, such as e-marketplaces, blockchain for traceability, and digital financing services, are particularly advantageous. Not only do these technologies improve operational efficiency, but they also support behaviours that are climate-smart and environmental sustainability. In order to hasten the implementation of smart agriculture, the abstract places an emphasis on the necessity of increased digital literacy, the development of platforms that are centred on farmers, and the promotion of cooperation between multiple stakeholders. This type of innovation has the potential to significantly contribute to the development of agribusiness systems that are durable, transparent, and profitable in the future.

Keywords: *Digital agriculture, Agribusiness management, Value chains, Sustainability.*

International Conference Organised By Goa College Of Agriculture And Mguvv,Durg,Chhattisgarh Biotechnology and Genetic Engineering: Chemical Perspectives on Molecular Innovation

Mr. Narendra Meel
Assistant Professor, Chemistry
SSSS Govt. College, Bidasar (Churu)
Email: meelnarendra93@gmail.com
Ph: 8107825651

Biotechnology and genetic engineering represent the convergence of chemistry, biology, and engineering to manipulate living systems at the molecular level. From a chemical standpoint, these fields leverage principles of organic synthesis, enzymology, and supramolecular interactions to redesign nucleic acids, proteins, and metabolic pathways. CRISPR-Cas9, a prokaryotic defense mechanism repurposed as a programmable nuclease, exemplifies precision chemistry: its guide RNA forms a stoichiometric complex with Cas9, enabling site-specific phosphodiester bond cleavage with sub-nanomolar affinity. This tool has reduced genome editing timelines from years to days, with off-target rates now below 0.1% through rational protein engineering and base-editor variants.

Chemists contribute synthetic biology by expanding the genetic code—incorporating non-canonical amino acids via orthogonal tRNA/synthetase pairs—or constructing artificial metabolic pathways using retrosynthetic logic. For instance, the heterologous expression of plant alkaloid pathways in *Escherichia coli* has achieved titers exceeding 1 g/L, driven by flux balance analysis and cofactor regeneration modules. These advancements underpin pharmaceutical breakthroughs, including mRNA vaccines stabilized by nucleoside-modified chemistries and CAR-T therapies reliant on lentiviral transduction efficiencies optimized through envelope glycoprotein pseudotyping.

Yet challenges persist: DNA synthesis costs, though plummeting, limit gigabase-scale constructs, while epigenetic silencing and immune recognition confound therapeutic efficacy. Future directions demand interdisciplinary chemical innovation—photocaged morpholinos for spatiotemporal control, machine learning-guided protein design, and continuous biomanufacturing platforms. Ultimately, biotechnology transforms chemistry from observer to architect of life's instruction set.

Keywords : *Biotechnology, enzymology, CRISPR-Cas9, spatiotemporal, morpholinos etc.*

Green synthesis of zinc oxide nanoparticles using the root extracts of *Trigonella foenum graecum* and evaluation of their antioxidant, photocatalytic, and cytotoxic properties.

Anis Kumar Mishra
CHRIST (Deemed to be) University, Bengaluru
Karnataka, 560029

Trigonella foenum graecum (fenugreek) has a wide range of therapeutic characteristics thanks to its bioactive constituents, which include alkaloids, flavonoids, saponins, and dietary fibres. The roots of *Trigonella foenum-graecum* are usually considered waste and are usually discarded. The current study focuses on the sustainable use of these biowaste of nanoparticle synthesis and its potential applications. Here, the fenugreek roots were used as a precursor for the ZnONPs synthesis and for the evaluation of their antioxidant, cytotoxic, and dye-degrading properties. The green-synthesised, TFB-ZnONPs were characterised using UV-vis spectroscopy, with a maximum absorbance peak at around 359 nm. The FTIR showed the functional groups present in the root extracts and the TFB-ZnONPs. The FE-SEM and the EDX were used to check the surface morphology, their size, and the chemical groups attached to them, respectively. Spherical surface morphology was found, with an average particle size calculated to be around 52 nm. The IC_{50} value for antioxidant assays of the TFB-ZnONPs came around 75 and 100 ppm for DPPH and H_2O_2 assays, respectively. The highest FRAP value shown by the TFB-ZnONPs was at around 125 ppm i.e. 1.46. They also show significant dye-degrading properties against the RO16 dye, i.e., 77.6% and the degradation follows the pseudo-first-order kinetics. They show considerable cytotoxicity towards the root growth inhibition in the germinating *Vigna radiata* seed and also in the Yeasts' cell, i.e., at a concentration of 100 μgmL^{-1}, they caused a 52.4% reduction in root growth compared to untreated samples and led to a significant decrease in live cell counts, with cell viability measured at 57.2% in the *Vigna radiata* root growth inhibition assay and the trypan blue assay for Yeasts' cell culture, respectively. Green-synthesised TFB-ZnONPs, derived from fenugreek root, have antioxidant, dye-degrading, and cytotoxic properties, making them suitable for long-term biomedical and environmental applications.

Keywords *Trigonella foenum graecum, TFB-ZnONPs, biowaste, antioxidant, cytotoxicity, dye degradation.*

Advancing the Innovative Approaches of Detecting Pesticidal Residues in Vegetables: A Review of Technological Innovations

Poonam
Research Scholar, Zoology (Entomology),Baba Mastnath university, Rohtak

The growing demands for food with ever increasing human population have widespread use of pesticides. Pesticide residues may possess short-term or long-term toxicity issues depending upon their type and exposure. Pesticides can have a variety of detrimental effects on their anticipated target, which includes humans. Therefore, there is great need to firmly regulated and monitored properly pesticide residues in foods to protect the healthiness of consumers. To do this, precise, responsive, and robust investigative methods are essential for effective management of pesticide. Liquid chromatography-tandem mass spectrometry and gas chromatography-tandem mass spectrometry techniques are often used. The most popular method for detecting pesticide residues is to utilise a triple quadrupole mass analyzer in the selective reaction monitoring mode. However, at least two products are required for chemical identification, and the ion ratio from sample extracts should be within 30 % of calibration standards from the same sequence. This belief encompasses several technologies aimed at achieving speedy, selective, cost-effective, and sensitive food safety screening. Optical or electrochemical transducers are frequently used to monitor biorecognition events, which are primarily based on bio-affinity interactions between selective biomolecules such as antibodies or enzymes and pesticide residues. Therefore, the present review is aimed at discussing the various rapid detection methods to detect the presence of pesticide residues in vegetables and foods.

Key words: *Pesticides, detection methods, techniques, vegetable foods, toxicity*

Sustainable Pigments from Indigenous Goan Flora: A Study

Dr. Andrew D'Souza 1 , Fr. Dr. Bolmax Pereira 2 , Dr. Mira Parmekar 1, Mrs. Milagrina D'Souza1, Mrs. Juliette Ravel Roy Chowdhury
[1]Department of Chemistry, St. Xavier's College, Mapusa, Goa, India
andrewdsouza.dhe@gmail.com
[2]St. Joseph Vaz College Cortalim Goa, India

This study explores the extraction and application of natural dyes derived from indigenous Goan plant species, offering a sustainable alternative to conventional synthetic dyes in the textile industry. The research investigates the influence of various extraction techniques, mordanting processes, and dyeing conditions on color yield, fabric performance, and overall sustainability. Our findings highlight the potential of natural pigments sourced from Night-Flowering Jasmine (Nyctanthes arbor-tristis), Banana Flower (Musa spp.), Turmeric (Curcuma longa), Marigold (Tagetes erecta), Malabar kino or Indian kino (Pterocarpus marsupium) , Real Mustard Tree (Salvadora persica) , Indian Ash Tree (Lannea grandis), and Velvet bean (Mucuna pruriens) as eco-friendly, non-toxic, and biodegradable alternatives for textile coloration. By demonstrating the practical applicability of these locally available natural dyes, this research contributes to the advancement of sustainable textile production and supports the global shift toward eco-conscious and circular fashion systems. It provides valuable insights into the integration of green chemistry and traditional knowledge in modern dyeing practices, thereby reducing the environmental footprint of the textile sector.

Keywords: *Natural dyes, Sustainable textiles, Indigenous flora, Eco-friendly pigments, Mordanting, Green chemistry, Circular fashion, Environmental sustainability*

Effect of herbal material (Amla) on growth performance of Common carp *(Cyprinus carpio)*

***Nitish Bansal[1], R.K. Gupta[2], Gajender Singh[3] and Shruthi H.V.[1]**
[1]Department of Fisheries Resource Management, College of Fisheries Science, CCSHAU, Hisar-125004, Haryana; [2]Department of Zoology, College of Basic Sciences & Humanities, CCSHAU, Hisar-125004, Haryana; [3]Krishi Vighyan Kendra, Panchkula-134113, Haryana
*Corresponding email: nitish0008@hau.ac.in; +91-9729184302

This experiment aimed to evaluate the effect of dietary supplementation of herbal material (Amla) on the growth performance of Common carp (*Cyprinus carpio*). The experiment was conducted under a Completely Randomized Design (CRD) in a screen house setting, fish were fed diets incorporating amla at 1.0%, 1.5% and 2.0% of total feed ingredients, with a control group. Growth parameters length and weight were observed monthly for 180 days, along with regular monitoring of physico-chemical water parameters. The results demonstrated a significant enhancement in growth performance with increasing Amla concentrations. Common carp fed 2.0% Amla exhibited the highest average length (17.87 cm) and weight (196.76 g) at the end of the experiment, outperforming the control and lower treatment groups in a dose-dependent manner. Water quality parameters such as pH, dissolved oxygen, free CO_2, alkalinity and conductivity remained within optimum ranges across all treatments, indicating no adverse environmental impact. Statistical analyses confirmed the significance of these improvements. Future perspectives suggest that Amla, as a natural and cost-effective feed additive, holds promising potential for sustainable aquaculture by improving fish growth and health. Its incorporation can reduce reliance on synthetic supplements and antibiotics, aligning with eco-friendly practices and consumer demand for organic fish products. Further research could explore effects of Amla on fish immunity, disease resistance and feed conversion efficiency, as well as its applicability across diverse aquaculture practices.

Keywords*: Amla, Common carp, Growth performance, Herbal feed additive, Sustainable aquaculture*

Exploring phenolic diversity in Indian Cashew (*Anacardium occidentalae* L.) cultivars through LC–MS/MS and multivariate analysis for functional utilisation

***Manjesh G.N., Veena G.L., and Jamboor Dinakara Adiga**
ICAR-Directorate of Cashew Research, Dakshina Kannada, Karnataka, India- 574202.
*Corresponding & Presenting author; (gn.manjesh5@gmail.com)

The cashew industry generates substantial biomass, including leaf litter, pseudo fruits, kernels, shells, and testa. Among these, pseudo fruits, which constitute nearly 90% of the fruit mass, are the most abundant yet remain largely unutilized despite their richness in bioactive molecules. This study characterised the phenolic profiles of tissues (leaves and pseudocarps) from Indian cashew cultivars using high-performance liquid chromatography (HPLC) coupled with a tandem quadrupole detector mass spectrometry (TQD MS/MS) system. Significant variation was observed in morphological traits (notably pseudocarp weight and width) and phenolic composition across cultivars. Multivariate analysis employing Orthogonal Partial Least Squares Discriminant Analysis produced a robust model ($R^2X = 0.532$, $R^2Y = 0.89$, $Q^2 = 0.873$), effectively mapping the phenolic landscape and identifying key discriminating compounds. Among the 18 metabolites quantified, cumulative phenolic content was highest in leaves of the Purple type cultivar and pseudocarps of VTH-174, with 3-hydroxybenzoic acid predominant in Purple type leaves and *t*-cinnamic acid in VTH-174 pseudocarps. Hierarchical cluster analysis further distinguished metabolite abundance patterns, enabling targeted selection of raw material (leaf or pseudocarp) for specific applications. Similarly, the PCA revealed marked variation in metabolic profiles, accounting for 64.65% of the total variance. The phenolic-rich cultivars identified hold strong potential for incorporation into functional foods, nutraceuticals, beverages, pharmaceuticals, dairy and bakery products, plant based meat alternatives, and as valuable genetic resources for future crop improvement.

Keywords: *Genotypes, Cashew nut, Phytocompounds, Quality*

Formalin Residues in Marketed Fish of Haryana: Effects on Quality Attributes and Strategies for Mitigation

Sanjeev Sharma [1]*, Dalip Kumar Bishnoi [1], Maloth Mohan [1], Nitish Bansal [1], Krishan Kumar Yadav [1], Pallavi Bhalavey [1], Rishi Pal Yadav [1], Khushbu Gurawa [1], Nirmal Patel [1], and Deeksha Hooda [1]

[1]College of Fisheries Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar-125004, Haryana, India
*Email: sanjeevfpt@hau.ac.in

Formalin, a solution of formaldehyde, is widely misused in the fish trade due to its antimicrobial and tissue-firming properties. This study investigates the prevalence and impact of formalin adulteration in fish marketed across four major cities of Haryana, India-Faridabad, Yamuna Nagar, Panipat and Bahadurgarh. Seven species, including both locally sourced and imported, were assessed across seasons to evaluate formalin content and its effects on physicochemical and textural properties. Results revealed significantly ($p<0.05$) higher formalin levels in imported fish, particularly during warmer months (May), with pangas and catla showing peak contamination (>30 mg/kg). Furthermore, analysis revealed that exogenous formalin adulteration significantly ($p<0.05$) lowered muscle pH, protein solubility and water-holding capacity, while increasing hardness, reflecting protein cross-linking and structural degradation. Microbial load was lower ($p<0.05$) in adulterated samples due to formalin's antimicrobial action. To mitigate contamination, four decontamination strategies were evaluated: tepid water immersion (50-55 °C), saline washing (5% NaCl), frying (180 °C) and tap water rinsing. Tepid immersion achieved the highest formalin reduction (up to 99.7%). Parallel association confirmed formalin's negative impact on fish muscle integrity, underscoring the need for routine monitoring. Overall, this study highlights formalin misuse, its adverse quality impacts, effective removal methods and regulatory implications.

Keywords: *Formalin residues; Fish quality; Physicochemical properties; Textural properties; Food safety surveillance.*

Evaluation of garlic ecotypes (*Allium sativum* L.) performance on growth and yield attributes

Siddappa, R[1#], M. Ananthan[2] and, N. K. Hegde[3]
1. # Assistant professor (PSMAC), COH,Mysuru, UHS. Bagalkot-571130
2Professor (Hort.) ,Agriculture College and Research Institute Madurai,TNAU
3Professor (Hort.) and Director of Education, UHSBagalkot, Karnataka.

A study on evaluation and characterization of garlic (*Allium sativum*L.) genotypes for growth and yield was conducted at Horticulture Research and Extension Centre Arsikere,University of Horticultural Sciences, Bagalkot,Karnataka during 2022-2023.Analysis of variance showed significant difference for growth, yield and quality parameters. Various growth parameters were recorded to evaluate the 52 garlic genotype GS-38 recorded significantly highest plant height and number of leaves (72.61 cm and 10.93 cm, respectively) in pooled data.The genotype, GS-50 recorded significantly highest leaf length during rabi season and pooled analysis (46.50 cm and 43.13 cm respectively). GS-9 recorded significantly highest leaf breadth during rabi season, kharif season and pooled analysis (2.13 cm,1.98 cm and 2.05 cm, respectively). The genotype GS-35 recorded significantly highest leaf area during rabi season, kharif season and pooled analysis (55.01 cm2, 48.03 cm2 and 51.66 cm2,respectively). The genotypes GS-24 recorded lowest days to maturity during rabi, kharif season and pooled analysis (106.95,112.67 and 109.81 days respectively).while,GS-24 recorded minimum days to maturity during rabi season, kharif season and pooled analysis (106.95,122.67 and 109.81 days respectively).In the yield and yield attributing characters among the genotypes revealed that, GS- 38 recorded significantly highest bulb weight during rabi season, kharif season and pooled analysis (20.14 g,17.63 g and 18.88 g, respectively).The genotype GS-35 recorded significantly higher number of cloves during kharif season and pooled analysis (21.82 and 21.80 respectively).Based on weight of cloves characters documented in the genotypes, GS-38 recorded significantly maximum weight of cloves during rabi season, kharif season and pooled analysis (2.58 g, 2.35 g and 2.46 g, respectively). The genotype GS-38 recorded significantly highest bulb per hectare during rabi season, kharif season and pooled analysis (10.18 tonnes, 8.43 and 9.31tonnes per hectare respectively) and followed by GS-36 recorded bulb per hectare during rabi season, kharif season and pooled analysis (9.93 tonnes, 8.60 and 9.31 tonnes per hectare respectively) and genotype GS-50 recorded bulb per hectare during rabi season, kharif and pooled analysis (9.76 tonnes, 8.41 tonnes and 9.08 tonnes respectively).Over all the study concluded that the garlic genotypes GS-36, GS-38 and GS-50 performed best in all seasons and could be taken for multiplication trail for releasing as variety under central dry zones of Karnataka.

Key words: *Garlic, yield attributes, bulb yield, bulb weight, rabi, kharif.*

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Mr. SURESH KUMAR
Assistant Professor, Mathematics
SSSS Govt. College Bidasar(Churu)
smusumaths@gmail.com

Innovations in food processing and preservation:

Innovations in food processing and preservation have been evolving rapidly, driven by the need for sustainability, food safety, nutritional value, and convenience.High-pressure processing (HPP) uses intense pressure (rather than heat) to kill harmful bacteria, yeasts, and molds in food. It helps extend shelf life while maintaining the food's nutritional content, flavor, and texture. This technology is often used for juices, deli meats, and ready-to-eat meals. The advantage is that HPP allows for minimal use of preservatives and maintains more of the natural flavors and vitamins.Freeze drying removes water from food by freezing it and then reducing the surrounding pressure, which allows the water to sublimate (turn directly from ice into vapor). This method preserves food for long periods without refrigeration and retains much of the original flavor, texture, and nutritional value. It's commonly used for fruits, vegetables, and meals for the military, astronauts, or emergency kits.Edible coatings and films are thin layers applied to food to act as barriers to oxygen, moisture, and microorganisms. These can be made from natural ingredients such as chitosan, cellulose, or even proteins like casein. The coatings help preserve the food's shelf life, reduce spoilage, and sometimes even boost its nutritional content (like added antioxidants).

Nanotechnology is being used to develop smarter packaging materials that can interact with food to enhance its preservation. For example, nanoparticles can be embedded into packaging to detect spoilage, control moisture, or release preservatives in response to changes in the food's environment. Some nanomaterials are antimicrobial, which further extends shelf life and reduces the risk of contamination. Innovations like smart packaging and cold plasma sterilization make it easier to ensure food is safe and convenient for consumers, particularly with ready-to-eat meals and packaged fresh foods. Many of these technologies reduce waste, minimize the need for chemical preservatives, and conserve energy.

Overall, food processing and preservation innovations are pushing the industry toward healthier, more sustainable, and more convenient solutions for both producers and consumers.

***Key Words**: Innovation, vitamins, microorganisms, convenience, Nanotechnology etc.*

Applications of Machine Learning in Medicinal Plant Research

Shakuli Kashyap
College of Agriculture Sciences, TMU, Moradabad, UP
shakuli2803@gmail.com

Many modern medicines are derived from or inspired by plant compounds (e.g., aspirin from willow bark, quinine from cinchona). Medicinal plant research helps to identify bioactive compounds with therapeutic potential against diseases such as cancer, diabetes, malaria, and infections. They provide alternative or complementary therapies with fewer side effects compared to synthetic drugs. It validates and preserves traditional medicinal systems such as Ayurveda, Siddha, Unani, and Traditional Chinese Medicine. Scientific evaluation bridges the gap between traditional use and modern pharmacological evidence. Combining machine learning, genomics, and phytochemistry has emerged as a transformative force in drug discovery, compound prediction, and plant classification. This review highlights recent advancements, methodologies, and future prospects of machine learning in medicinal research, emphasizing its pivotal role in bridging computational innovation with biological discovery.

Keywords: *Machine Learning, Medicinal Plants, Phytochemistry, Precision Medicine, Complementary therapies*

Effect of Sowing Dates on Thermal Time Requirement and Heat Use Efficiency in Sesame (*Sesamum indicum* L.) Cultivars: Implications for Climate-Resilient Production

CH. Gowthami, M. Ratnam, S. Bharathi, T. Sujatha
Department of Agronomy, Advanced Post Graduate Centre, Lam, Guntur.
Acharya N.G. Ranga Agricultural University.
Corresponding author: chellurigowthami11@gmail.com| **+91- 8688536216**

The effect of sowing dates on thermal time requirement and heat use efficiency (HUE) in sesame (*Sesamum indicum* L.) cultivars is crucial for optimizing crop production in varying climatic conditions. This study examines the influence of sowing dates on thermal time and HUE, focusing on how different cultivars respond to temperature variations during the growing season. Sowing date variations, especially in regions with unpredictable weather patterns, significantly affect the thermal time needed for sesame development and its ability to efficiently convert thermal energy into biomass and seed yield. Research shows that earlier sowing dates tend to provide more favourable thermal conditions for sesame growth, reducing the thermal time required for plant development (Rao *et al*., 2017). In contrast, late sowing, often coinciding with higher temperatures during the reproductive phase, can lead to increased thermal time and lower yields due to heat stress (Kumar *et al*., 2020). Additionally, sesame cultivars exhibit varying degrees of heat use efficiency depending on their genetic makeup and adaptability to temperature extremes. Heat-tolerant cultivars generally demonstrate better HUE under late sowing conditions, as they can more effectively use thermal energy for seed development (Singh *et al*., 2019). Studies highlight that optimizing sowing dates based on local temperature profiles and cultivar-specific responses can significantly enhance both thermal time accumulation and HUE, thereby improving sesame yield and resilience to climate variability (Choudhary *et al*., 2021). Future research should focus on breeding heat-resistant sesame cultivars and refining sowing date recommendations for different agro-ecological zones to ensure consistent productivity in the face of climate change. Integrating thermal indices with phenology-based models could refine sowing date recommendations for sustainable sesame production.

Keywords*: Sesame*, *sowing date*, *thermal time*, *heat use efficiency*, *climate resilience*.

Post-Mortem Changes in Sheep Died Due To Leopard Attack

Ashok Kumar*, Goverdhan Singh, K. Purohit, A. Rathore, M. Kumari, V. Yadav, J. Verma, A. Meena, R. Kumawat, P. Gill, N. S. Fenin, A. P. Korde, M. Choudhary, Lokendra
Department of Veterinary Pathology
College of Veterinary and Animal Science, Navania, Udaipur- 313601 (Rajasthan)
Presenting Author: - Ashok Kumar
akjethiwal12@gmail.com**, 9667301341**

A Sonadi sheep, approximately 1.5 years of age, was found dead following a predator attack. Necropsy examination revealed lacerated wounds primarily on the cervical region. These injuries were sharp, deep and consistent with feline penetration by both the upper and lower jaws of a large feline predator. The puncture wounds measured approximately 2.5 cm in width and 2.4 cm in depth. The right hind limb was fractured and partially consumed by the predator. The sheep exhibited deep penetrating wounds at the level of the larynx and proximal trachea. Lacerations over the neck and facial region were evident, with extensive subcutaneous tissue tearing and severe haemorrhage. The trachea showed punctured wound marked congestion and contained frothy exudate throughout its lumen. Footprints of a leopard were found on the farm wall, supporting a large-feline predation event. The lungs were severely emphysematous and necrotic foci were observed on the liver. Based on the frothy tracheal exudate, pulmonary collapse and pronounced cervical trauma, the cause of death was concluded to be asphyxia secondary to tracheal compression by the leopard's jaws, analogous to strangulation mechanisms in humans.

Keywords*: Sheep, Emphysematous, Sonadi, necropsy*

Trend Analysis of Seasonal Temperature Changes in Almora, Uttarakhand

Neha Pandey
Research Scholar,Division of Dairy Extension,ICAR-National Dairy Research Institute,Karnal,Haryana, 132001
Email:9999nehapandey@gmail.com
Phone no: 9837185769

The present study analyzed the long-term temperature trends across different seasons in Almora district, Uttarakhand, using the non-parametric Mann–Kendall (MK) test and Sen's slope estimator. The results revealed a statistically significant increasing tre nd in temperature during all seasons, with varying magnitudes. During the pre-monsoon period, the Z value (0.96) and Sen's slope (0.0413 °C year^{-1}) indicated a moderate positive trend ($\mathbf{p = 0.027}$). The monsoon season exhibited the most pronounced warming, as reflected by a high Z value (2.46) and Sen's slope (0.0330 °C year^{-1}) with a highly significant trend ($\mathbf{p = 3 \times 10^{-13}}$). Postmonsoon and winter seasons also showed increasing temperature trends, with Z values of 1.07 and 0.71 and Sen's slope estimates of 0.015 °C year^{-1} and 0.0169 °C year^{-1}, respectively ($\mathbf{p = 0.036}$ and $\mathbf{p = 0.046}$). Overall, the findings indicate a consistent and statistically significant warming trend across all seasons in Almora, suggesting the influence of regional climatic variability and emphasizing the need for adaptive measures in temperature –sensitive sectors such as agriculture and water management.

Keywords*: Temperature, Uttarakhand, Mann-Kendall, trends*

Sweetpotato (*Ipomoea Batatas* L.): A Colorful Superfood For Combating Hidden Hunger and Promoting Nutritional Security

Nikita Ingle[1], K. Prasad[1], Shubham Morya[2], Amit Kumar[3] and Shankar Rajpoot[4]

[1]Department of Horticulture, Postgraduate College of Agriculture (PGCA), RPCAU, Pusa, Bihar

[2]College of Horticulture and Forestry, Pasighat, Arunachal Pradesh

[3]Post Harvest Management, College of Horticulture, IIHR, Bangalore

[4]Department of Post Harvest Technology, Rani Lakhmi Bai Central Agricultural University, Jhansi

Email ID: nikitaingle643@gmail.com

Sweetpotato (*Ipomoea batatas* [L.] Lam.) is a highly nutritious and functional crop gaining global importance for its role in combating hidden hunger and enhancing food security. Rich in essential nutrients such as dietary fiber, β-carotene (vitamin A precursor), vitamins C and B6, polyphenols, and minerals, sweetpotato contributes to improved health and nutrition. Colored varieties, particularly orange and purple-fleshed sweetpotatoes, are excellent sources of β-carotene and anthocyanins, which exhibit strong antioxidant, anti-diabetic, and cardioprotective properties. Beyond the roots, sweetpotato by-products (SPBs) including leaves, peels, and starch-processing residues are valuable sources of bioactive compounds such as chlorogenic acid, caffeoylquinic acid, pectin, polysaccharides, and functional proteins like β-amylase. These components show remarkable anti-obesity, anti-cancer, and antioxidant activities, offering opportunities for developing value-added nutraceuticals and functional foods. Advanced and sustainable extraction technologies can enhance the recovery of these health-promoting compounds from SPBs, promoting waste utilization and circular bioeconomy. Despite progress, large-scale incorporation of these bioactives into commercial food and healthcare products remains limited. Strengthening research industry collaboration is essential to fully exploit sweetpotatos potential as a nutrientdense, functional crop for addressing malnutrition and promoting sustainable food systems.

Keywords: *Sweetpotato, colored varieties, bioactive compounds, hidden hunger, value-added products, nutrition, sustainability*

Development and Nutritional Evaluation of Diabetic-Friendly Millet-Based NankhataiEnriched with Herbs and Spices

Dr. Sanjana Pandey
Assistant Professor, Department of Food Technology, NIAMST, NIMS University, Jaipur,
Rajasthan, 303121
Corresponding author: Sanjana.pandey@nimsuniversity.org

The present research focuses on the development of a sweet and savory shortbread biscuit, *Nankhatai*, formulated as a diabetic-friendly product with 0% added sugar. The study aims to design a traditional delicacy suitable for individuals with elevated blood sugar levels, enabling them to enjoy a sweet product without the risk of glycemic spikes. The formulation includes partial substitution of refined wheat flour with millet flours such as sorghum, pearl millet, and little millet, which are rich in fiber, micronutrients, and possess a low glycemic index. The addition of functional herbs and spices not only enhances flavor and aroma but also provides health benefits such as antioxidant activity, anti-inflammatory effects, improved digestion, and cholesterol regulation. Reduction in sugar and ghee content further improves the nutritional profile of the product, making it a healthier alternative for diabetic and health-conscious consumers. Analytical evaluations of protein, carbohydrate, fat, and total energy content will be conducted following FSSAI guidelines and standard methods to assess nutritional adequacy and compliance. This study aims to develop a *sweet, nutritious, and diabetic-friendly Nankhatai* that combines traditional taste with modern nutritional value.

Keywords: *Diabetic-friendly product, Millet-based Nankhatai, Functional ingredients, Herbs and spices, Nutritional evaluation, FSSAI standards.*

Sensor-Based High-Throughput Phenotyping Platforms for Accelerating Crop Improvement

Nitu Kumari[1], Rajni Kant[1] and Ekhlaque Ahmad[1]
[1]Department of Genetics and Plant Breeding, Birsa Agricultural University,Kanke,834006
Email: nituroy2309@gmail.com
Contact no.: 9041766143

Sensor-based high-throughput phenotyping (HTP) has emerged as a game-changing approach to bridge the gap between genotypic data and observable plant performance. Traditional phenotyping methods are often slow, laborious, and prone to human error, which limits breeding progress. In contrast, modern HTP systems integrate advanced sensors—such as hyperspectral, thermal, LiDAR, and RGB cameras—mounted on drones, ground vehicles, or stationary platforms to capture non-destructive and high-resolution measurements of key plant traits. These sensors allow precise quantification of parameters like canopy temperature, chlorophyll content, biomass, and water use efficiency throughout the crop life cycle. By combining sensor-generated phenomic data with genomics, artificial intelligence, and machine learning models, breeders can predict complex traits such as yield, drought resilience, and nutrient efficiency with improved accuracy. Recent applications in rice, wheat, and maize have demonstrated how sensor-assisted selection can accelerate genetic gain and enable real-time stress monitoring in diverse environments. Although challenges persist—such as high setup costs, calibration requirements, and handling of massive data volumes—the benefits in terms of speed, accuracy, and scalability are undeniable. Overall, sensor-based HTP represents a cornerstone of precision breeding and digital agriculture. It offers immense potential for developing climate-resilient, high-yielding crop varieties, making it a critical tool for futureoriented crop improvement programs.

Keywords: *High-Throughput phenotyping, Sensor, Precision breeding*

Robotics and Automation: shifting the Indian Agriculture from Conventional to Smart Farming

Rajni Kant[1], Nitu Kumari[1], Deepika Kiro[2]
[1,2]Ph.D. Scholar
[1]Department of Genetics and Plant Breeding
[2]Department of Horticulture
Birsa Agricultural University, Kanke, Ranchi – 834006
Email - Rajnikant.mkg@gmail.com
Ph.no. - 7870809087

Agriculture plays a vital role in sustaining human life by providing food, fiber and other essential resources. However, the fast growing population and thereby rising food demands causes formidable obstacles on its sustainability. Labor-related issues, such as the lack of skilled farm employees because of rural-to-urban migration, reduce the productivity and profitability of conventional farming. "Smart farming" using automation and robotics seems like a game-changing option to handle these issues. By focusing on automation and robotics, smart farming addresses these issues by minimizing the need for human labour and optimizing operations. The automated smart agriculture robots integrates advanced robotic technologies including sensors, Arduino and Bluetooth. Combining Arduino and Bluetooth technology creates a farm robot that can be customized and controlled from a distance. This helps farmers adjust its functions as required, improving the accuracy of farming. Robots and automation can change farming. They can solve many problems faced by farmers today. The automatic smart agriculture robot is a big step forward in making farming more precise. It gives farmers better tools to farm efficiently and in a way that is good for the environment. Automation and robotics have mainly focuses on minimizing environmental impact and simultaneously maximizing agricultural produce. This demonstrates how smart farming may help ensure a sustainable future for the industry.

Key words: *Smart farming, Automation, Robotics, Sustainability.*

IHASE-2025/201

Moringa – As food and resource for Women Empowerment through Self Help Groups of Raipur District of Chhattisgarh

Dr. Rekha Singh* and Dr. Jitendra Singh*
*Associate Proffesor, College of Horticulture & Research Station, Sankra Patan.MGUVV, Durg. Chhattisgarh .
** Director Research MGUVV.Durg C.G.
Email (Corresponding author): jeetrekha1994@gmail.com

Moringa oleifera is a multi-purpose herbal plant used as human food and an alternative for medicinal purposes worldwide. It has been identified by researchers as a plant with numerous health benefits including nutritional and medicinal advantages. It contains essential amino acids, carotenoids in leaves, and components with nutraceutical properties, supporting the idea of using this plant as a nutritional supplement or constituent in food preparation. As such prospective, moringa business is a goldmine for an entrepreneur. According to the Agropreneur, Moringa business is one of the best agribusinesses that are highly profitable with low investment cost as it gives a quick return in the same year of investment. In recent years SHGs have become a significant movement in India for revenue generation at village level with empowering women and eradicating poverty in the rural and urban areas. Looking to the nutritional benefits of moringa leafs and pods, Krishi Vigyan Kendra, Raipur conducted On Farm Trials (OFT) and field level Demonstrations (FLD) based on moringa processing, labelling and packaging solutions together with sustained capacity building, for empowering Women Self Help Group of District Raipur . Total 20 women from 11 SHG of Astha Mahila Gram Sangathan, village Biladi from Raipur District were selected for OFT/FLD. These groups were involved in community farming and have 4 acres of organic Moringa plantation. After training the products (moringa pickle and leaf powder) prepared by them were marketed. Prepared processed products are being sustainably sold by SHGs through various retail outlets and IGKV sale counter managed by KVK, Raipur. Findings of the present OFT/FLD shows that each member of the group earned an income ranging from Rs.2000 to Rs.3000 per month as an additional source of income apart from their regular source of income. In this study, it has been found that processing of moringa has high trainability, low investment and potential for sustainable income generation of women SHGs along with human health and nutrition.

***Key words**: Moringa, Nutrition, Empowerment and SHGs.*

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Comparative Evaluation of Growth Performance and Water Quality in Polythene-Lined Ponds vs. Traditional Earthen Ponds for Fish Culture

Maloth Mohan[1], Dalip Kumar Bishnoi[2], Sanjeev Sharma[3]and Nitish Bansal[4]
[1]Assistant Professor, Department of Fish Engineering, [2]Associate Professor and Head, Department of Fish Engineering, [3]Assistant Professor, Department of Fish Processing Technology and [4]Assistant Professor, Department of Fisheries Resource Management
College of Fisheries Science, CCS Haryana Agricultural University, Hisar-125004, Haryana (India).

The present study evaluated the comparative growth performance of fish and water quality characteristics in polythene-lined ponds and traditional earthen ponds over a 180-day culture period. Growth parameters, including body weight and total length, were measured at 30-day intervals to assess the impact of pond type on fish performance. Fish reared in polythene-lined ponds exhibited significantly higher growth, attaining a 16.2% greater final weight (357.95 g) and 14.1% higher final length (32.3 cm) compared to those cultured in earthen ponds (307.90 g and 28.3 cm, respectively). The specific growth rate (SGR) for weight was also superior in lined ponds (2.006% day^{-1}) relative to earthen ponds (1.949% day^{-1}), indicating enhanced growth efficiency under improved environmental conditions. Six key water quality parameters temperature, transparency, pH, dissolved oxygen (DO), ammonia, and nitrite were systematically monitored throughout the study period. Results revealed that polythene-lined ponds maintained more stable and optimal physicochemical conditions. Higher DO concentrations and lower turbidity, ammonia, and nitrite levels were consistently observed in lined ponds, reflecting better water quality management and reduced organic load. In contrast, earthen ponds exhibited greater variability in temperature and accumulation of nitrogenous wastes, which may have adversely influenced fish growth. Overall, the findings demonstrate that polythene-lined ponds provide a more controlled and favourable rearing environment, leading to improved growth performance and water quality stability.

Keywords: *Polythene-lined ponds, Earthen ponds, Fish growth performance, Water quality, Sustainable aquaculture.*

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Neuroprotective Potential of Moringa oleifera and Uvaria narum Leaf Extracts on Glyphosate-Induced Dopamine Neuron Degeneration in Caenorhabditis elegans

K. Shruthi Nagaral, B. Kisan, Siddanakoppalu N. Pramod
a. Department of Biochemistry Kuvempu Universitry Shivamoga -577451
b. Department of Molecular Biology and Agricultural Biotechnology College of Agriculture science, Raichur.
c. Department of Food Technology, Shivagangotri, Davangere University, Davanagere-577007
Corresponding author: kisanb1@gmail.com

Pesticide exposure is increasingly associated with neurodegenerative disorders such as Parkinson's disease (PD). In this study, the neuroprotective effects of Moringa oleifera and Uvaria narum leaf extracts were evaluated against glyphosate-induced dopaminergic neurotoxicity using the Caenorhabditis elegans model. Transgenic strain BZ555 (dat-1p::GFP) worms were exposed to 10 mM glyphosate with or without 600 µg/ml plant extracts, and neurodegeneration was quantified by assessing breaks, blebs, and kinks in anterior dendrites. Behavioral parameters, including pharyngeal pumping and locomotory activity, were also evaluated using Arena Tracker systems. Results demonstrated that M. oleifera and U. narum extracts significantly reduced glyphosate-induced dopaminergic degeneration by 3.3-fold and 2.2-fold, respectively. The overall neuroprotection offered by M. oleifera (60%) was notably higher than that of U. narum (30%). Treated worms also exhibited improved pharyngeal pumping rates (1.6-fold and 1.4-fold increases) and enhanced motility, indicating restoration of neuronal and muscular function. The observed neuroprotective effects are likely attributed to the rich phytochemical content particularly phenolics, flavonoids, and antioxidants—present in both plants. This study highlights the promising role of M. oleifera and U. narum as natural therapeutic agents capable of mitigating glyphosate-induced neurotoxicity. Their demonstrated efficacy in C. elegans models supports further exploration at preclinical and clinical levels for developing plant-based interventions in the management of Parkinson's and related neurodegenerative disorders.

Keywords: *Glyphosate, C. elegans, dopamine neurons, Moringa oleifera, Uvaria narum, neuroprotection.*

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Comparative Analysis of Chemotactic Responses to Volatile Compounds in *Caenorhabditis elegans* Strains

B. Kisan, K. Shruthi Nagaral, Siddanakoppalu N. Pramod

a. Department of Molecular Biology and Agricultural Biotechnology College of Agriculture science, Raichur.

b. Department of Biochemistry Kuvempu Universitry Shivamoga -577451

c. Department of Food Technology, Shivagangotri, Davangere University, Davanagere-577007

Corresponding author:kisanb1@gmail.com

This study investigated the chemotactic responses of *C. elegans* strains (N2, CX2205, NL5901) to various chemical odorants (IAA, DIA, PZ) with OP-50 for a comparative study vs. M-13 buffer for durations of 3 and 6 hours. A quadrant assay was employed, and the chemotaxis index (CI) was calculated to quantify attraction or repulsion under the influence of suspended animating (SA) agent exposure i.e Diacetyle of 40ul in a 9cm petriplate. 50 Worms were assessed by placing them at the center of the plate and allowing them for the free movement and after 3 hours of SA assessed for the chemo attraction. The results suggest the N2 and CX2205 strains showed no response to IAA, while NL5901 exhibited repulsion to DIA and PZ consistently acted as repellents for all three strains, Statistical analysis (1-way ANOVA followed by Tukey's post-hoc test) revealed significant differences in chemotaxis behavior between strains for DIA and PZ, and between N2 and NL5901 for IAA. Interestingly, in M-13 buffer, both mutant strains (CX2205 and NL5901) displayed attraction towards IAA after 3 and 6 hours of SA, suggesting potential adaptation to their altered environment. These findings highlight the diverse chemosensory behaviors of *C. elegans* strains in response to different odorants, influenced by their physiological state and environmental context.

Key words: *Chemotaxis, Attraction, DIA-Diacetyl, PZ-Pyrazine, IIA-Isoamyl Alcohol*

IHASE-2025/205

Evaluation of Nutrients Dynamics and Yield Performance of Pea under ZBNF and conventional farming system

Naman Pathania[1]*, RS Spehia[2]

[1]Department of Soil Science and Water Management, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, H.P. (173230)

[2]Senior Scientist and Head, KVK, Tabo, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, H.P. (173230)

***Corresponding author:** namanpathania3@gmail.com

The present investigation entitled "Nutritional status of pea (*Pisum sativum* L.) growing under ZBNF vis-à-vis conventional farming in Solan District of Himachal Pradesh'' was carried out during 2020-2021 in Solan district of Himachal Pradesh with the objective to evaluate the soil quality and plant nutrient contents under different farming system and work out the relationship between soil nutrients status and plant nutrient concentration. A preliminary survey of Solan district was conducted and three blocks were identified for soil and plant sampling. 30 representative surface soil samples along with plant samples (15 each of conventional and ZBNF farming system) from same site were collected and analyzed. Pea growing soils of Solan district under conventional farming system had significantly higher available primary and secondary macronutrients as well as micronutrients compared to the ZBNF farming system. N, P and K were recorded 5.21%, 14.69% and 10.27%, respectively, higher under conventional farming as compared to ZBNF farming system. Similarly, maximum secondary nutrients Ca, Mg and S were recorded 7.62%, 12.21% and 16.64%, respectively, under conventional farming system as compared to ZBNF farming system. However, organic carbon was recorded 22.85% higher under ZBNF as compared to conventional farming system. Viable microbial count (45.72×10^5 cfu g^{-1} bacteria, 6.73×10^3 cfu g^{-1} Fungi and 9.28×10^3 cfu g^{-1} Actinomycetes) were also recorded higher under ZBNF compared to conventional farming system. Further, conventional farming system recorded higher macronutrients as well as micronutrients in leaf compared to the ZBNF farming system. Resultantly, yield of pea was significantly higher (109.67 q ha^{-1}) under conventional farming system as compared to ZBNF (92.07 q ha^{-1}) but cost economics favoured ZBNF.

***Keywords**: Pea, ZBNF system, Soil Nutrients status, Microbial count, Cost Economics.*

IHASE-2025/206

Innovative Techniques In Mulberry Silkworm Rearing *(Bombyx Mori)*

Posham Raghu ram*, Kuntamalla Sujatha[1] ,Kaneez Fathima[2]
*Research scholar, [1]Assistant Professor ,[2]Assistant Professor
Department of Sericulture, Kakatiya University, Telangana
Corresponding author email and contact**; poshamraghu968@gmail.com and 9398166973**

Sericulture, the art of raising silkworms for silk production, is a vital agro-based industry, particularly in many developing economies. Traditional silkworm rearing practices, while effective, often face challenges related to disease susceptibility, labour intensity, environmental control, and feed efficiency, impacting overall productivity and silk quality. Silkworm rearing has been a cornerstone of the sericulture industry for centuries, but with the advent of modern technology and scientific advancements, there is an increasing push to improve the efficiency, sustainability, and overall productivity of this process. Innovative techniques in silkworm rearing are essential to meet the growing demands for silk while minimizing the environmental impact. This paper explores cutting-edge methodologies and technologies that are revolutionizing silkworm farming, including the use of artificial intelligence and machine learning for optimizing breeding and environmental conditions, genetic improvements through biotechnological interventions, and the integration of automated systems for monitoring and management. Technology such as gene therapy, gene editing, nano-biotechnology, transgenic technology and fortifying mulberry leaves with food additives, climate controlled rearing systems and digital monitorings provide real-time surveillance of silkworm health and environmental conditions. By incorporating these advancements, the silkworm rearing industry can not only increase yield and quality but also contribute to global sustainability efforts. Innovation has come up as technological solution to the sericulture problems along with being easy to learn, maintain and being cost effective. The aim of this paper is to present a comprehensive overview of these innovative techniques and their potential to transform the future of silkworm rearing.

Keywords: *Sericulture, Innovations, Silk, Technology, Sustainability*

IHASE-2025/207

Ultrasound-Assisted Germination and Microgreen Yield of Foxtail Millet.

Labanya Mayee Tudu[1*], Gitasri Paul[2], Dipsikha Kalita[3]

[1*]M.Sc., School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: labanyamayee124@gmail.com, 7894025016

[2]Research Scholar, School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: gitasriluap@gmail.com

[3]Assistant Professor, School of Community Science and Technology, Indian Institute of Engineering Science and Technology, Botanical Garden Area, Howrah, West Bengal 711103, India, Email: dkalita4@gmail.com

Foxtail millets (*Setaria italica*) are grass seeds with high nutritional value but low and uneven germination due to their hard seed coat. To improve uniform sprouting and enhance microgreen yield, ultrasound-assisted hydropriming was employed as a non-chemical, eco-friendly pre-treatment that accelerates imbibition and activates early metabolic processes in seeds. This study compared a standard hydroprimed control (12 hr water-soaked) with four ultrasound-assisted hydroprimed with probe sonication treatment at 40% amplitude for 1min (T1), 40% amplitude for 2 min (T2), 60% amplitude for 1min (T3) and 60% amplitude for 2 min (T4) to evaluate effects on seed viability, seedling growth and microgreen yield. Seeds were treated in distilled water at 35 °C, then germinated under controlled conditions. Measured endpoint included germination percentage, mean shoot and root length (up to day 7) and microgreen biomass at harvest (at day 7). Compared to the control, a 60% amplitude for 2min (T4) treatment increased shoot length by 322.06% and root length by 47.41%, along with the highest microgreen yield, with a dry biomass of 0.033g/100 seeds, which represents a 10% increase compared to the control. All ultrasound treatments improved germination percentage, viability, and seedling growth relative to the control; T1, T2, T3, and T4 differed in the magnitude of their effect. Shoot and root elongation correlated with increased microgreen yield. Results show that short-duration, high-intensity ultrasound (60% amplitude for 2 minutes) is more effective in improving germination and microgreen productivity. Thus, this technology provides a residue-free and energy-efficient approach for the scalable cultivation of microgreens.

Keywords*: Ultrasound, Microgreens, Germination, Millets.*

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Genetic Analysis of Powdery Mildew Resistance in F_4 Segregating Populations of Chilli (*Capsicum annuum* L.)

Rakesh S. Patil[1], V Hanumanth Nayak[2], B V Tembhurne[3] and Harshitha M[4]

[1]M. Sc. (Agri.) in Genetics and Plant Breeding, Department of Genetics and Plant Breeding, University of Agricultural Sciences, Raichur- 584104

[2]Assistant Professor, Department of Genetics and Plant Breeding, UAS, Raichur- 584104

[3]Professor and Head, Department of Genetics and Plant Breeding, UAS, Raichur- 584104

[4] M. Sc. (Agri.) in Horticulture, Department of Horticulture, UAS, Dharwad- 580005

Email address: rakeshspatil17@gmail.com

Powdery mildew, incited by the obligate biotrophic fungus *Leveillula taurica* (Lev.) Arn., is a major foliar disease constraining chilli (*Capsicum annuum* L.) production in India. The pathogen thrives between 10-37°C, with an optimum at 20°C and relative humidity of 75-85%, making it a recurring challenge in key chilli growing regions. Infected plants show chlorotic patches, defoliation and reduced photosynthetic efficiency, leading to significant yield and quality losses. Dependence on chemical fungicides for disease management escalates costs and poses environmental and health risks, highlighting the necessity for developing resistant cultivars as a sustainable alternative. The present study evaluated powdery mildew resistance in 45 F_4 families derived from the cross JNA-1 × Byadgi Dabbi during late *Kharif* 2024-25 under field conditions. The female parent JNA-1 is a male sterile line with high resistance, whereas Byadgi Dabbi is highly susceptible. Disease progression was quantified using the Area Under Disease Progress Curve (AUDPC), apparent infection rate (r) and Percent Disease Index (PDI). Based on disease severity, genotypes were classified into six categories: none immune, 11 highly resistant (HR), 9 resistant (R), 12 moderately resistant (MR), 7 moderately susceptible (MS) and 6 highly susceptible (HS). The predominance of HR, R and MR families indicates considerable genetic variability and stable inheritance of resistance traits. These resistant lines serve as promising genetic resources for developing powdery mildew resistant chilli cultivars, contributing to sustainable productivity and enhanced farmer profitability.

Key words: *Chilli, Powdery mildew, AUDPC, Apparent rate of infection, PDI.*

IHASE-2025/209

Carbon Credit Potential of Paddy Residue Management in Climate-Smart Agriculture

Gurnoor Singh[1]*, Harleen Kaur[2]
[1]College of Agriculture, Punjab Agricultural University, Ludhiana, Punjab, India;
[2]Manav Vikas Sansthan, Kapurthala, Punjab, India
*Corresponding author: Gurnoor Singh (gnoorsingh04@gmail.com; +91-9781777826)

This meta-analysis evaluates the carbon credit potential of sustainable paddy residue management under climate-smart agriculture systems in Punjab. Field trials, satellite-based validation and NGO-led projects—including the PRANA (Promoting Regenerative ans No-burn Agriculture) initiative of The Nature Conservancy with implementation partner Manav Vikas Sansthan and initiatives of Krishi Vigyan Kendras and several other NGOs—demonstrate that adopting no-burn practices through machinery such as Happy Seeder, Super Seeder, Mulcher, and Smart Seeder enhances soil organic carbon (SOC) while curbing open-field emissions. Empirical data Punjab Agricultural University (PAU) and International Maize and Wheat Improvement Center (CIMMYT) studies indicate that in-situ residue management can sequester 0.3–0.6 t C ha^{-1} yr^{-1} (≈1.1–2.2 t CO_2e ha^{-1} yr^{-1}), while avoiding residue burning prevents release of approximately 7–9 t CO_2e ha^{-1}. Under the PRANA framework, farmer sensitization through field schools, demonstrations, and front-line camps has improved adoption, reduced fire incidents, and enhanced awareness of air-quality impacts and soil health. Satellite fire-mapping (NASA FLAMES/FIRMS) and ground-level carbon monitoring provide reliable Monitoring, Reporting and Verification (MRV) systems essential for carbon-credit registration. Projects aggregating ≥4000 acres can be validated by third-party auditors (e.g., Verra or Gold Standard) for verified credits (1 credit = 1 t CO_2e). Preliminary findings suggest that coordinated no-burn and mulching practices not only mitigate climate change but also offer economic co-benefits through carbon trading, improved irrigation efficiency, and enhanced soil biodiversity. This synthesis supports scaling residue-based carbon projects across North India as a viable climate-smart pathway for sustainable intensification.

***Keywords**: paddy residue management*, *carbon sequestration*, *climate-smart agriculture*, *carbon credits*, *satellite monitoring*

IHASE-2025/210

Effect of Green Manuring on Soil DTPA-Extractable Micronutrients under Different Nitrogen Levels

SAHIL* and Dr. R S GARHWAL
Department of Soil Science, CCS HAU, Hisar, Haryana-125004
*corresponding author E-mail: jangrasahil835@gmail.com

The present investigation was undertaken to study the effect of leguminous green manures (Dhaincha and Mungbean) in combination with graded fertilizer levels on DTPA-extractable micronutrient status (Zn, Fe, Mn, and Cu) in soil. The experiment consisted of nine treatments, including control, green manure crops alone, and their integration with different fertilizer nitrogen levels (50%, 75%, and 100% RDN), laid out in a randomized block design with three replications at the Research Farm, College of Agriculture, Kaul during kharif 2024. The results revealed that incorporation of green manures significantly increased the availability of DTPA-extractable micronutrients compared to control and sole fertilizer application. Among the treatments, the highest concentrations of Zn (2.05 mg kg^{-1}), Fe (14.62 mg kg^{-1}), Mn (3.03 mg kg^{-1}), and Cu (1.54 mg kg^{-1}) were recorded under 75% RDN + Dhaincha, followed by 75% RDN + Mungbean. The control treatment recorded the lowest values for all micronutrients. The increase in micronutrient availability may be attributed to the enhanced microbial activity and organic matter decomposition due to green manuring, which promotes nutrient mineralization and chelation. It may be concluded that integration of green manures, particularly Dhaincha with 75% RDN, improves soil micronutrient availability and contributes to better soil fertility management.

Keywords: *Green manuring, Dhaincha, Mungbean, DTPA-extractable micronutrients, soil fertility*

IHASE-2025/211

Vertical Farming Disease Severity Detection and Controlled Pesticide Application Methodology

Suhani Walanju[1], Om Gawde[1], Akhilesh Deosthali[1], Shreyas Mhatre[1], Sahil Rajadhyaksha[1], Preksha Koli[2], Dr. Girish Gidaye[1]
[1]Department of Electronics And Telecommunications
[2]Department of Biomedical Engineering
Vidyalanakar Institute of Technology

Abstract — Vertical farming environments demand continuous health monitoring due to their dense, stacked growth architecture, where disease propagation can escalate rapidly across layers if not identified early. Traditional vision-based disease detection systems in agriculture primarily focus on binary classification (healthy vs. diseased) and do not quantify the actual intensity of infection making them unsuitable for precision intervention in vertical farm infrastructures, where spray volume must be optimized per plant cluster to minimize chemical waste and avoid nutrient–leaf overload. To address this gap, we present an automated infection severity detection and precision dispensing system designed specifically for vertical farming. An ESP32-CAM node captures images, a cloud-based YOLO inference model estimates infection percentage, and pesticide dosage is actuated based on severity tiers instead of fixed volumes. The entire pipeline is integrated with a vertical motorized carriage for layer-by-layer monitoring inside vertical farm racks. Experimental evaluation shows accurate severity classification and reliable dose–volume mapping, enabling reduced chemical use, minimal manpower, and consistent per-layer targeted intervention. This establishes a practical step toward intelligent, closed-loop plant protection automation in vertical farming systems.

Index Terms *– Vertical Farming, Precision Agriculture, Smart Farming, Plant Disease Level Detection.*

IHASE-2025/212

An overview of rice residue management in Haryana State

Anil Kumar[1], Rakesh Kumar[2] and Sandeep Kumar Antil[3]

[1]Associate Professor, Deptt. of FMPE, CCS HAU, Hisar

[2]Assistant Rice Breeder, Deptt. of FMPE, CCS HAU, Hisar

[3]DES, Agricultural Engineering, KVK, Sonipat, CCS HAU, Hisar

CCS Haryana Agricultural University, Hisar, Haryana, INDIA

E-mail: anilsaroha@hau.ac.in

The rice-wheat is the major cropping system of Haryana covering 18 lakh hectare areasin the state. The harvesting of rice is mainly done by combine harvesters which leaves large amount of loose and anchored crop residue in the field. The rice residue of coarse varieties is considered as inferior quality feed due to higher content of silica and lignin and is hardly used as fodder and ultimately results in burning of residue. Burning causes severe air pollution which has very bad effect on human and animal health. Paddy straw burning also results in huge loss of plant nutrients, organic matters and degrades soil properties due to wastage of residue. Paddy straw should be managed by different farm machinery options, either by In-situ management or by removal. In-situ management of paddy straw includes incorporation of paddy straw into the soil using conventional tillage machineries like harrow, cultivator, rotavator, reversible plough and super seeder etc. or retaining the paddy straw as mulch in the field and sowing with happy seeder and smart seeder directly or chopping the residue with cutter or using super SMS. The use of different machine depends on the condition of the field (type of soil, moisture content of soil and straw). The ex-situ management includes removal of straw from the field by using straw chopper, hay rake and balers and that can be used as animal fodder and silage, biogas and CHG production, briquetting and pallets, card board and packaging material, mushroom cultivation and bio ethanol production.

Key words: *Burning, Environment, Ex-situ, In-situ, Residue*

IHASE-2025/213

Climate-smart Agriculture and Adaptation Strategies, Carbon Farming

Aayush Biswas[1]*

[1]Department of Forest Resource Management, College of Forestry and Research Station, Mahatma Gandhi University of Horticulture and Forestry, Sankara, Patan, Durg, Chhattisgarh, 491111 India, E-mail: biswasaayush1907@gmail.com, +91 91659 34548
(orcid id: https://orcid.org/0009-0004-4393-8135)
*Corresponding Author: Email: biswasaayush1907@gmail.com

Climate-smart agriculture (CSA) and carbon farming are the two most important strategies that tackle food insecurity and decrease the negative effects of climate change. Research on the CSA system, which involves agroforestry, cover-cropping, conservation tillage, and integrated nutrient management, has revealed that these practices can increase crop yields by 15-30%, reduce the water use by 35%, and improve the livelihoods of smallholders. The introduction of drought-tolerant and nutrient-efficient crop varieties can further raise productivity by 18-25% in water-stressed areas. Soil carbon sequestration potential of carbon farming strategies, i.e., biochar application, cover cropping, and restoration of degraded land, has been increased from 0.2 to 1.2 t C/ha per year with a global mitigation potential of 2-5 Gt CO_2e if it is widely scaled. The participation in carbon credit programs provides smallholders with an extra income of USD 20-50 per hectare, enabling smallholders as a source of mitigation and livelihood gains. A gender-responsive CSA program has improved the resource utilization among women farmers by 12-18%; however, less than 20% of farmers eligible for climate finance currently have access to such funds, thus revealing a significant institutional gap. The incorporation of CSA and carbon farming into the policy and finance sectors can not only help to turn agricultural areas into carbon sinks but also make a sizable contribution to the achievement of national climate commitments and other sustainability goals.

Keywords: *smallholder livelihoods, soil carbon sequestration, drought-tolerant varieties, climate finance access*

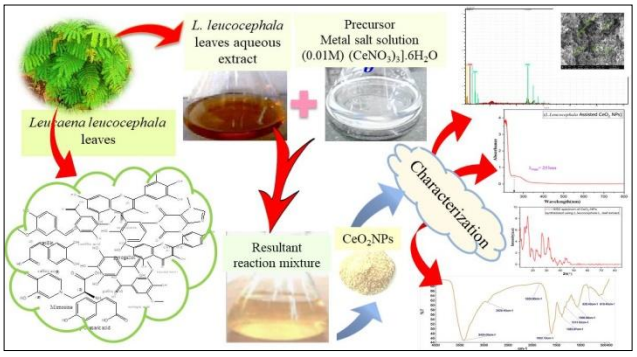
IHASE-2025/214

Waste-to-Best Approach for Eco-Sustainability: Green Synthesis and Characterization of Cerium Oxide Nanoparticles (CeO_2NPs) Using Aqueous Leaves' Extract of Invasive plant *Leucaena leucocephala*

Dr. H. R. Dhanetia (Assistant Professor)
Department of Chemistry
L.B.S Government College, Kotputli, District: Kotputli-Behror (Rajasthan)-303108
Email: harichem09@gmail.com

Abstract- To ensure the eco-sustainability of the laboratory practices and for the environmental remediation, global scientific community is advocating the environmentally benign fabrication of nanomaterials for diversified potent applications. *Leucaena leucocephala* is an indigenous invasive weed containing many allelopathic phytochemicals having very adverse effect over the other agricultural produces by suppressing their growth and productivity but these phytochemicals can be utilized for the biogenic synthesis of CeO_2 NPs without harming the ecosystem. The synthesized nanomaterials were characterized by using different techniques like UV-Visible spectrophotometer, FTIR, FESEM, and PXRD etc. for the validation of results.

Key Words: *Leucaena leucocephala, Eco-sustainability, Remediation, Phytochemicals, Invasive weed etc.*



IHASE-2025/215

Rootstock Influence on Acid Lime: A Pathway to Climate-Resilient Citrus Production

Dr U.B. Deshmukh, Chandrashekhar Ogare and Nikhil Gupta
Mahatma Gandhi University of Horticulture and Forestry, Durg (C.G.).
E-mail – Umeshdeshmukh2011@gmail.com
Contact - 8770614432

The selection of rootstocks plays a pivotal role in enhancing the resilience, productivity, and adaptability of Citrus aurantifolia (acid lime) across diverse agro-climatic zones in India. Varietal studies at the ICAR-Central Citrus Research Institute (Nagpur) demonstrated that rootstocks such as *Citrus macrophylla* (Alemow) impart superior fruit quality and bud-union compatibility compared to traditional stocks. Under abiotic stress conditions associated with climate change—such as salinity, drought and heat—rootstock influence extends to the scion's physiological and biochemical behaviour. For instance, studies show that rootstocks with higher antioxidant activity and abscisic acid (ABA) signalling, e.g. in *Citrus limonia* (Rangpur lime) tetraploids, significantly improve drought tolerance in grafted citrus. In India, recent trials exploring rootstock-mediated abiotic and biotic stress tolerance in acid lime indicate that grafting onto Rangpur lime or native stocks enhances salinity tolerance, chlorophyll retention and membrane stability, and reduces nematode populations. Integrating these varietal and species-level rootstock options across national acid-lime cultivation zones offers a strategic pathway to mitigate the impacts of rising temperatures, erratic rainfall and soil salinity. Important movements in the sector include the national rootstock screening programmes by ICAR, commercial adoption of improved stocks in key lime-growing states, and launch of multicentre trials targeting vertical integration and climate-proofing of acid lime orchards. This review underscores the necessity of combining scion–rootstock compatibility studies with stress-resilience screening and recommends a research roadmap centred on genomic-assisted rootstock selection, multi-environment trials, and standardised rootstock release mechanisms.

Keywords*: acid lime, rootstock selection, scion–rootstock compatibility, climate resilience.*

IHASE-2025/216

Comparative Analysis of Strawberry in Vertical Farming Systems

Dr U.B. Deshmukh, Dr. Toran Lal Sahu, Chandrashekhar Ogare and Nikhil Gupta
Mahatma Gandhi University of Horticulture and Forestry, Durg (C.G.).
E-mail – Umeshdeshmukh2011@gmail.com
Contact - 8770614432

Vertical farming of strawberries (*Fragaria* × *ananassa*) has emerged as a sustainable and high-efficiency alternative to conventional field cultivation. Recent advances demonstrate significant progress in optimizing yield, resource efficiency, and energy utilization. Controlled-environment studies report surface use efficiency (SUE) up to 15.2 kg fw/m² yr, water use efficiency (WUE) of 291 g fw L^{-1}, and energy use efficiency (EUE) of 10.6 g fw kWh^{-1} in ever-bearing cultivars. Commercial operations have achieved over 1.8 million kg of strawberries annually within <40 000 ft², using 97 % less land and 90 % less water than open-field systems. Technological integration—AI-driven climate control, IoT-based nutrient monitoring, and robotic harvesting—has greatly enhanced consistency and scalability. Innovations in pollination and lighting have further improved productivity and fruit quality. Mechanical vibration (≈800 Hz) under optimized vapour-pressure deficit (~2.0 kPa) conditions significantly enhances pollen transfer and fruit set in enclosed systems. Full-spectrum and red-blue LED regimes continue to be refined to enhance sweetness, colour, and yield while minimizing energy inputs. Future research focuses on cultivar optimization for compact architecture and high harvest index, dynamic LED spectral tuning, and machine-learning-assisted phenotyping. Integrating agrivoltaic systems—combining solar energy capture with vertical strawberry cultivation—has shown up to 130 % land productivity gain over single-use systems. Overall, vertical strawberry farming is transitioning from proof-of-concept to data-driven commercial viability, offering a resilient solution for sustainable, year-round fruit production in the face of climate and land-use pressures.

Keywords*: vertical farming, strawberries, controlled-environment agriculture*

IHASE-2025/217

Assessment of environmental pollutants and bacterial load affecting fish health in community ponds of Haryana

Shivam Pandey[1*], Funde Aniket Raghunath[1], Rachna Gulati[1], Md. Idrish Raja Khan[1], Lavish Saran[1]

[1]Department of Aquatic Animal Health Management, College of Fisheries Science, CCS Haryana Agricultural University, Hisar 125004

**Corresponding author- karateshivam97@gmail.com*

This study investigates the impact of environmental pollutants and bacterial load on fish health in ten unmanaged community ponds situated in Mahazat (4 ponds) and Bhatla (2 ponds) villages of Hansi, Hisar district, as well as Sanjarpur (2 ponds) in Rewari district, Haryana. Each pond, spanning approximately 1–1.5 hectares, supports polyculture of *Catla catla*, *Labeo rohita*, *Pangasianodon hypophthalmus*, *Hypophthalmichthys nobilis*, and *Cyprinus carpio* without structured management.Sampling and analysis were conducted under the National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) by the Department of Aquatic Animal Health Management, College of Fisheries Science, CCSHAU, Hisar, using a HANNA multiparameter device. Results revealed dissolved oxygen levels ranging from 1.41±0.10 ppm in T1 to 3.59±0.26 in T5, and pH values between 7.63±0.22 in T2 and 8.77±0.07 in T7. All ponds showed elevated turbidity and organic load, attributed to anthropogenic activities such as clothes washing, livestock bathing, direct animal access, plastic waste accumulation, and other pollutants. These adverse conditions resulted in notable fish stress including surface gulping, reduced activity, and mortality events. Decomposing fish carcasses further intensified foul odor and bacterial proliferation. At site T5, *Pangasianodon hypophthalmus* exhibited red disease symptoms, and isolated pathogenic bacteria were biochemically and microscopically identified as gram-negative *Aeromonas hydrophila*. These findings underscore the need for improved pond management, pollution control, and heightened community awareness to ensure sustainable fishery practices and healthy aquatic environments.

Keywords: *Environmental pollutants, Bacterial load, Fish health, Community ponds*

IHASE-2025/218

Embedded Vision–Based Real-Time Disease Mapping and Adaptive Pesticide Application Using Machine Learning

Akhilesh Deosthali[1], Om Gawde[1], Suhani Walanju[1], Shreyas Mhatre[1], Sahil Rajadhyaksha[1], Preksha Koli[2], Dr. Girish Gidaye[1]

[1]Department of Electronics And Telecommunications

[2]Department of Biomedical Engineering

Vidyalankar Institute of Technology

Abstract – The increasing prevalence of crop diseases and excessive pesticide use continue to endanger agricultural sustainability, profitability, and food security. This study proposes a smart, camera-assisted pesticide application system that combines deep learning–based disease quantification with closed-loop precision spray control to optimize chemical usage. The framework integrates three functional modules: an ESP32-CAM–based imaging unit, a YOLOv8 model for disease detection and severity classification, and a tank-actuation subsystem for adaptive pesticide dosing. High-resolution leaf images captured by the ESP32-CAM are transmitted via an HTTP IoT protocol to a Flask-based backend, where YOLOv8 classifies infection severity into four categories healthy, low, medium, and high. A linear mapping algorithm links severity levels with variable spray actuation times, enabling precise pesticide delivery. Field calibration was conducted to validate actuation timing and ensure consistency across different pesticide viscosities. The proposed system provides a low-cost, modular alternative to conventional precision agriculture technologies. Its integration of computer vision, IoT communication, and adaptive spraying demonstrates strong potential for scalable deployment, promoting sustainable and resource-efficient pest management in both vertical and open-field farming applications.

Index Terms *– Precision Agriculture, Smart Spraying, Machine Learning, IoT-based Pesticide System.*

IHASE-2025/219

Climate-smart Agriculture and Adaptation Strategies, Carbon Farming

T. Dhivyalakshmi[1*], R. Augustine[2], R. Santhosh Anto Kumar[3]
[1*,3]Research Scholars, Division of Agronomy, School of Agricultural Sciences, KITS. [2]Associate Professor, Division of Agronomy, School of Agricultural Sciences, KITS.
dhivyalakshmit23@karunya.edu.in (9159118723)
santhoshanto23@karunya.edu.in(9843992249)
augustiner@karunya.edu (9443381303)

Climate change poses a major threat to global food security, ecosystem stability, and rural livelihoods, particularly in developing nations dependent on agriculture. Climate-smart agriculture (CSA) has emerged as a comprehensive approach to sustainably increase productivity, enhance resilience (adaptation), and reduce or remove greenhouse gas (GHG) emissions (mitigation). Among CSA practices, carbon farming, a system of managing agricultural lands to capture and store atmospheric carbon dioxide, plays a pivotal role in mitigating climate change while improving soil health and farm profitability. This paper explores the integration of carbon farming techniques such as biochar application, cover cropping, agroforestry, reduced tillage, and organic amendments as vital adaptation and mitigation strategies under CSA. These methods not only enhance soil organic carbon (SOC) sequestration but also improve water retention, nutrient efficiency, and biodiversity. Furthermore, technological innovations such as digital monitoring, remote sensing, and carbon credit markets are facilitating measurement, reporting, and verification (MRV) of carbon sequestration, offering farmers financial incentives to adopt sustainable practices. The study emphasizes the importance of policy support, farmer capacity building, and region-specific adaptation strategies to implement CSA and carbon farming effectively. A multidisciplinary approach involving agronomy, climatology, economics, and data science is essential to translate research into scalable field applications. Ultimately, climate-smart and carbon-focused agricultural systems can transform agriculture from being a net emitter to a net sink of carbon, ensuring food security and environmental sustainability in a changing climate.

Keywords: *Climate-smart agriculture, Carbon farming, Adaptation strategies, Soil carbon sequestration, Sustainable agriculture*

IHASE-2025/220

Nitric Oxide (NO)-Mediated Alleviation of Salinity Stress in Rice Seedlings

Vishal Jamuni[1&2*] and Rupali Bhandari[1]

[1]Botany Discipline, School of Biological Sciences and Biotechnology, Goa University, Taleigao Plateau, Goa, 403206, India

[2]Government College of Arts, Science & Commerce, Quepem, Goa, 403705, India

*Email: botany.vishal@unigoa.ac.in

Mobile No. +91 8308894559

Salinity stress is a critical abiotic factor limiting global agricultural productivity, particularly affecting rice cultivation in the khazan lands of Goa. The present study investigated the ameliorative role of exogenously applied nitric oxide (NO), supplied as sodium nitroprusside (SNP) on rice (*Oryza sativa* L.) seedlings subjected to NaCl-induced salinity stress. Exposure to NaCl drastically reduced shoot and root length, biomass content and relative water content (RWC), indicating severe impairment of plant growth and physiological functions. In contrast, supplementation with SNP at concentrations of 25 µM, 50 µM and 100 µM significantly alleviated the adverse effects of salinity, as evidenced by improved growth parameters and enhanced RWC. Biochemical analysis revealed that salinity stress caused a decline in pigment content, total soluble sugars and protein content, accompanied by increased membrane damage. Application of NO mitigated membrane injury and restored the levels of these biochemical constituents. Moreover, NO treatments resulted in elevated proline accumulation, suggesting an enhanced osmoprotective response under stress conditions. The findings indicates that exogenous NO particularly at lower concentrations, confers tolerance to salinity stress by modulating physiological and biochemical processes associated with growth and membrane stability. Further investigations are needed to elucidate the molecular mechanisms underlying NO-mediated salt stress tolerance in rice.

Keywords*: Nitric oxide (NO), Salinity stress, Khazan lands, Sodium nitroprusside (SNP), Oryza sativa L.*

IHASE-2025/221

Nutritional Zinc Supplementation Improves Reproductive Welfare and Climate Resilience in Crossbred Bucks

Dr. Reshma Debbarma[1]*, Dr. Anjali Aggarwal[1]

[1]Animal Physiology Division, ICAR–National Dairy Research Institute, Karnal – 132001 (Haryana), India

Corresponding author: debbarmareshma9@gmail.com | +91-7005250330

Seasonal stress remains a major constraint affecting fertility and overall well-being in male ruminants. The present study explored how dietary zinc (Zn) fortification supports reproductive physiology and oxidative stability in crossbred bucks (Alpine × Beetal) exposed to varying environmental conditions. Eighteen clinically healthy bucks (2–4 years) were equally distributed into three groups: a control (basal diet), T_1 (basal + 40 ppm Zn), and T_2 (basal + 60 ppm Zn). The investigation spanned winter, spring, and summer, representing contrasting thermal regimes. Supplemented animals exhibited significant ($p < 0.05$) improvement in semen attributes such as volume, motility, viability, and acrosomal integrity. Elevated activities of glutathione peroxidase, superoxide dismutase, and catalase were accompanied by a notable decline in malondialdehyde levels, indicating reduced lipid peroxidation. Enhanced testosterone secretion and diminished cortisol concentration further signified improved endocrine resilience under heat load. Overall, the study establishes that dietary zinc enrichment strengthens reproductive performance and antioxidant defense mechanisms, promoting thermotolerance and physiological welfare in bucks. Such mineral-based interventions offer an eco-sustainable and welfare-driven approach for maintaining reproductive efficiency in small ruminants amid climatic variability.

Keywords: *Zinc enrichment, Semen traits, Oxidative balance, Thermotolerance, Small ruminants*

IHASE-2025/222

Clinical Management of Canine Babesiosis with Doxycycline and Herbal Support: A Case Report

Aruna Yadagiri*[1], Tejaswar Gaddam[1], Sri kala Devarakonda[1] and M. Satish Chandra[2]

[1]Department of veterinary medicine.

[2]Department of veterinary gynaecology.

A three-year-old male dog was presented to the Teaching Veterinary Clinical Complex (TVCC), Garividi, Vizianagaram, A.P, with a history of anorexia, weakness, and vomiting for three days. Clinical examination revealed pyrexia, icteric mucous membranes, and generalized lymphadenopathy. Hematobiochemical analysis showed thrombocytopenia, neutrophilia, and elevated serum levels of alanine aminotransferase (ALT), alkaline phosphatase (ALP), aspartate aminotransferase (AST), and creatinine, suggestive of hepatic and renal involvement. Abdominal ultrasonography revealed hepatomegaly, splenomegaly, ascites, renal cortical injury, and a distended gallbladder. Microscopic examination of Giemsa-stained peripheral blood smears demonstrated the presence of *Babesia canis*, which was further confirmed by quantitative PCR. The dog was treated with doxycycline at 10 mg/kg body weight once daily, supplemented with *Carica papaya* leaf extract for thrombocytopenia and the hepato-protectant silymarin for a period of 21 days. Supportive therapy including fluid administration and vitamin supplementation was also provided. The dog exhibited marked clinical improvement with normalization of hematobiochemical parameters and complete recovery by the end of the treatment period. This case highlights the importance of prompt diagnosis, appropriate therapeutic management, and the beneficial role of ethnoveterinary herbal formulations as supportive therapy in the successful management of canine babesiosis.

Key Words: *Babesia canis, Carica papaya, Doxycycline, Icteric, Thrombocytopenia.*

IHASE-2025/223

Ameliorative Effects of Exogenously Applied Proline on Physiological and Biochemical Parameters of *Oryza sativa* L. under Copper Stress

Rupali Bhandari* and Rashveeta Gadekar
Botany Discipline, School of Biological Sciences and Biotechnology, Goa University, Goa - 403 206
Email address: *rupali.bhandari@unigoa.ac.in, Contact No. 8669609317

Heavy metal accumulation poses serious threats to agriculture and human health. Copper, though essential for plant growth, becomes toxic in excessive amounts. Rice is a staple food for much of the global population and improving rice production in heavy metal contaminated soils is vital. This study explores the use of exogenous proline to relieve copper toxicity in rice by assessing key morphological, physiological, and biochemical factors. Proline, an amino acid that accumulates under stress, acts as an osmoprotectant and helps mitigate oxidative damage, supports antioxidant defense, and enhances stress tolerance in plants. In our study, rice seedlings were exposed to 3 mM and 5 mM copper stress and treated with 15 mM, 20 mM, and 30 mM concentrations of proline. Copper stress significantly inhibited plant growth, reduced biomass, and led to a decline in pigment, total sugars and protein levels. It also induced membrane lipid peroxidation, as evidenced by increased malondialdehyde (MDA) levels, and triggered oxidative stress through elevated ROS accumulation. The application of exogenous proline effectively alleviated the toxic effects of copper stress in rice plants, by enhancing chlorophyll content, promoting biomass accumulation, and improving osmotic balance. Additionally, proline treatment significantly reduced levels of malondialdehyde (MDA) and reactive oxygen species (ROS), indicating a decrease in lipid peroxidation and oxidative damage. The activity of antioxidant enzymes, particularly superoxide dismutase (SOD), was notably increased in the proline-treated plants, highlighting an improved antioxidative defense mechanism. Furthermore, proline application led to an increase in endogenous proline levels and helped restore protein and sugar content under copper stress. These findings suggest that proline improves the tolerance of rice plants to copper stress by maintaining cellular homeostasis, protecting against oxidative damage, and enhancing growth and metabolic functions. Overall, the results demonstrate that exogenous proline can be an effective strategy for mitigating heavy metal toxicity and supporting rice cultivation in copper contaminated soils.

Keywords: *Copper toxicity, Proline, Oryza sativa, Oxidative stress, Antioxidants.*

IHASE-2025/224

Design and Multiphysics Simulation of a Flexible Stem-Attached Hybrid Piezoelectric–Triboelectric Nanogenerator in COMSOL for Self-Powered Smart Agriculture and IoT Plant Sensing Applications

Sahil Rajadhyaksha[1], Preksha Koli[2]
[1]Department of Electronics and Telecommunication
[2]Department of Biomedical Engineering Vidyalankar Institute of Technology, Mumbai

The development of flexible, plant-compatible energy harvesting systems is essential for enabling battery-free sensing in precision agriculture. This work presents the design and COMSOL-based simulation of a flexible, stem-mounted hybrid nanogenerator that integrates piezoelectric and triboelectric mechanisms to convert wind-induced plant motion into electrical energy. The device structure includes a PVDF piezoelectric film layered on a TPU flexible substrate, combined with triboelectric contact-separation surfaces and a soft bio-adhesive layer to ensure secure and non-damaging attachment to plant stems. The 3D Multiphysics model evaluates mechanical deformation, stress distribution, and electromechanical energy output under variable wind loading conditions. Simulation results indicate that the nanogenerator can produce power in the microwatt range, sufficient to intermittently operate ultra-low-power IoT sensor nodes used for plant or environmental monitoring. Importantly, the stress imparted to the plant stem remains below physiological tolerance limits, ensuring minimal interference with natural growth and movement. This study demonstrates the feasibility of using hybrid energy harvesters as sustainable power sources for distributed agricultural sensor systems and establishes a foundation for future development of fully self-powered smart farming technologies.

Index Terms — *Hybrid nanogenerator, piezoelectric harvesting, triboelectric generator, plant- motion energy.*

IHASE-2025/225

Sensor Technologies for Crop Monitoring

R. Santhosh Anto Kumar[1*], R. Augustine[2], T. Dhivyalakshmi[3]

[1*,3]Research Scholar, Division of Agronomy, School of Agricultural Sciences, KITS Coimbatore.
(santhoshanto23@karunya.edu.in (9843992249), dhivyalakshmit23@karunya.edu.in)

[2*]Associate Professor, Division of Agronomy, School of Agricultural Sciences, KITS Coimbatore.
(augustiner@karunya.edu)

Advancements in sensor technologies have revolutionized modern agriculture by enabling real-time, precise, and data-driven monitoring of crop growth and field conditions. Sensor-based crop monitoring systems integrate various types of sensors such as optical, thermal, hyperspectral, soil moisture, and nutrient sensors, to collect accurate field data on plant health, soil parameters, and environmental conditions. These technologies support precision agriculture by providing actionable insights for optimizing irrigation, fertilization, and pest management, thereby enhancing productivity while reducing input costs and environmental impacts. Remote sensing through unmanned aerial vehicles (UAVs), satellites, and Internet of Things (IoT)-based wireless sensor networks further enhances spatial and temporal monitoring capabilities, allowing farmers to detect stress symptoms, nutrient deficiencies, and diseases at early stages. Data analytics and artificial intelligence tools are increasingly being integrated with sensor systems to interpret complex datasets for decision support and yield prediction. The adoption of sensor technologies also facilitates sustainable agricultural practices by promoting efficient resource utilization and minimizing ecological footprints. Despite their potential, challenges such as high costs, limited accessibility, and data management complexities remain barriers to large scale implementation, particularly in developing regions. This paper highlights the latest advancements, applications, and challenges of sensor technologies in crop monitoring, emphasizing their critical role in transforming conventional farming into a smart, resilient, and sustainable agricultural system suitable for future food security needs.

Keywords: *Sensor technologies, crop monitoring, precision agriculture, IoT, sustainable farming.*

IHASE-2025/226

Extreme Rainfall Patterns in Indian Megacities Under Changing Climate Regimes

Nayana G. S[2].*, Abhilash Kumar Paswan[1,2]
[1]National Institute of Advanced Studies, Bengaluru, India
[2]Water Army Organization

Climate Change is a pressing issue of the 21st century, leading to several climate disasters and threats to water and food security worldwide. The nature, extent and impact of climate change have varied spatially globally. This study evaluates behavioral characteristics of rainfall events across major Tier-1 cities in India using two gridded IMD products at different spatial resolutions: a 0.25° dataset spanning 1950–2024 and a finer 0.1° dataset covering 1991–2023. Daily rainfall characteristics were categorized as per IMD to understand the frequency and intensity of rainfall and hence impact of climate change over mega cities. Preliminary results indicate that light-to-moderate rainfall (2.5–35.5 mm day^{-1}) events dominate the daily rainfall events in majority of the cities, however, vary temporally. La Nina years produce the largest increases in high-intensity event frequency, while El Nino years consistently suppress high-intensity occurrence relative to normal monsoon years. High-end rainfall events (>64 mm day^{-1}) are spatially concentrated, appearing most prominently in Mumbai and Bengaluru. Besides this, it was also observed that spatial resolution of datasets has a great influence on such study, especially the extreme events. The systematic, almost twofold increase in rainy-day counts, in some cities, in the coarser product shows significant scale-dependent biases from station density, and interpolation methods. These differences greatly impact the interpretation and planning and decision making of climate related disasters such as urban flood risk assessments. Therefore, for Indian cities, it is important to consider multi-resolution datasets and ensemble techniques while making decisions about infrastructure or policy.

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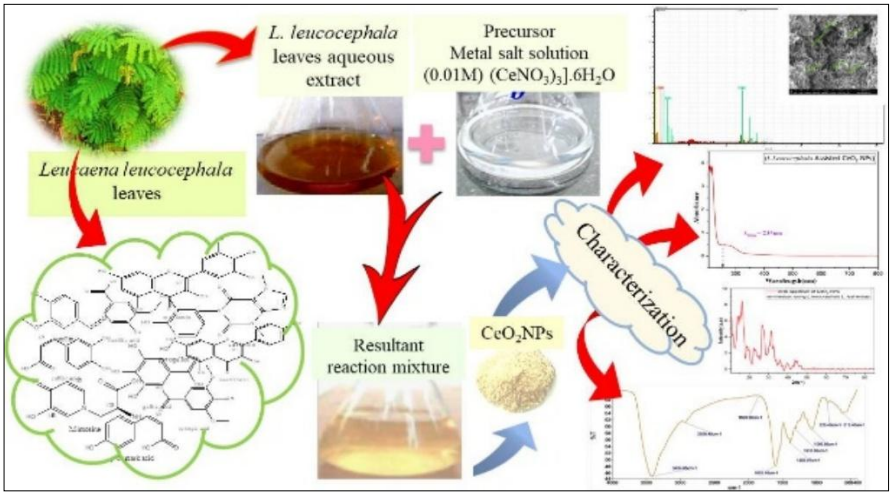
Waste-to-Best Approach for Eco-Sustainability: Green Synthesis and Characterization of Cerium Oxide Nanoparticles (CeO_2NPs) Using Aqueous Leaves' Extract of Invasive plant *Leucaena leucocephala*

Dr. H. R. Dhanetia
(Assistant Professor)
Department of Chemistry
L.B.S Government College, Kotputli, District:
Kotputli-Behror (Rajasthan)-303108
Email: harichem09@gmail.com

wTo ensure the eco-sustainability of the laboratory practices and for the environmental remediation, global scientific community is advocating the environmentally benign fabrication of nanomaterials for diversified potent applications. *Leucaena leucocephala* is an indigenous invasive weed containing many allelopathic phytochemicals having very adverse effect over the other agricultural produces by suppressing their growth and productivity but these phytochemicals can be utilized for the biogenic synthesis of CeO_2 NPs without harming the ecosystem. The synthesized nanomaterials were characterized by using different techniques like UV-Visible spectrophotometer, FTIR, FESEM, and PXRD etc. for the validation of results.

Keywords: *Leucaena leucocephala, Eco-sustainability, Remediation, Phytochemicals, Invasive weed etc.*



IHASE-2025/228

Seasonal Incidence and Biological Control of Pink bollworm

Anu (B2024A08M)
Department of Entomology, CCS Haryana Agricultural University, Hisar, Haryana
*E-mail- anu.lax.177@gmail.com

The present investigation was carried out in the Cotton Section, Department of Entomology, CCS Haryana Agricultural University, Hisar, during the year 2024–25 to study the seasonal incidence, off season survival and biological control of pink bollworm (*Pectinophora gossypiella*) in Cotton. To study the seasonal incidence of pink bollworm, 5 pheromone traps were installed in the field at five different locations. Data was collected from these traps at weekly intervals to study the infestation of pink bollworm. Now to control excessive infestation of insect, instead of insecticides we opted for the biological control. We divided the entire field into 21 plots and used *Trichogramma bactrae* species in the form of tricho cards to control the infestation. We used tricho cards having different no. of eggs that is 162, 324 and 468 eggs in different plots and that too at different intervals. In few plots, cards were installed at 10 days interval and in few plots, tricho cards were installed at 15 days interval. These things were done in order to study the influence of no. of eggs taken and the influence of time (at what interval, tricho cards had more influence - 10 days or 15 days) on the infestation of pink bollworm. This method was opted as it is the most sustainable method and it has no severe impact on the environment. The results in the field were astonishing as there was least infestation in the field with tricho cards whereas plots without tricho cards had severe infestation. Hence, this can be one of the best alternative methods by which we can control the infestation of pink bollworm which is one of the most severe pests in cotton especially in North India.

Keywords: *Pink bollworm, Trichogramma bactrae, Pheromone traps, Sustainable method*

IHASE-2025/229

Precision Agrihub: Solar-Powered IoT System for Real-Time Soil Nutrient and Environmental Monitoring Using LoRa Technology.

shravan Kumar Singh[1], abhijeet Kaushik[2], kalpana Banjare[3], ravi R. Saxena[4], mohammad Arif Khan[5], abhinav Kaushik[6], vishnu Vaibhav Dwivedi[7], santosh Biswas[8], pratibha Dongre[9]

[1] Department of Electrical Engineering, IIT Bhilai, 6th Lane Road, Jevra, Chhattisgarh – 492015, India, shravans@iitbhilai.ac.in

[2]National Informatic Centre (NIC), Mahanadi Bhawan, Atal Nagar, Nava Raipur- 492002, abhijeet.kaushik@igkv.ac.in

[3]Indira Gandhi Krishi Vishwavidyalaya, Krishak Nagar Raipur, Chhattisgarh – 492012, kalpana.banjare@igkv.ac.in

[4] Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Sankra-Patan, Durg, Chhattisgarh – 491111, drravirsaxena@gmail.com

[5]Department of Mechatronics Engineering, IIT Bhilai, 6th Lane Road, Jevra, Chhattisgarh 491001, India, arif@iitbhilai.ac.in

[6]Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Sankra-Patan, Durg, Chhattisgarh – 491111, kaushikabhinav22@gmail.com

[7]IIT Bhilai Innovation and Technology Foundation (IBITF), IIT Bhilai, 6th Lane Road, Jevra, Chhattisgarh 491001, India, ctoibitf@iitbhilai.ac.in

[8]IIT Bhilai Innovation and Technology Foundation (IBITF), IIT Bhilai, 6th Lane Road, Jevra, Chhattisgarh 491001, India, santosh@iitbhilai.ac.in

[9]IIT Bhilai Innovation and Technology Foundation (IBITF), IIT Bhilai, 6th Lane Road, Jevra, Chhattisgarh 491001, India, pratibhad@iitbhilai.ac.in

This study presents the design and development of a solar energy-based Internet of Things (IoT) system for real-time monitoring and remote data logging of soil nutrients and environmental parameters using LoRa (Long Range) communication technology. The proposed system enables continuous observation of critical soil and environmental factors, providing actionable insights for effective farm management and sustainable agricultural practices.

The developed system incorporates multiple sensors to measure NPK (Nitrogen, Phosphorus, and Potassium) concentration, soil moisture, soil temperature, pH, and ambient humidity and temperature. The sensor data are processed by a microcontroller unit (ESP32/Arduino) and transmitted via the LoRa transceiver module (SX1278) to a central gateway located up to 1.2 kilometre away. The received data are stored in a cloud-based platform and visualized through an IoT dashboard, enabling farmers and researchers to access real-time soil health information remotely.

A solar photovoltaic (PV) system with a charge controller and rechargeable battery powers the field node, ensuring autonomous, continuous operation in remote agricultural regions without dependence on the electrical grid. The system's low-

power architecture and long-range LoRa connectivity make it suitable for large-scale deployments in rural and semi-urban farmlands. Field implementation was carried out to evaluate the performance of the prototype under actual farming conditions. The results demonstrated reliable sensor performance, efficient data transmission, and stable solar energy utilization. The collected data facilitated the assessment of soil fertility, irrigation scheduling, and nutrient management decisions. The LoRa-based communication achieved a transmission range exceeding 2 km with minimal power consumption. The proposed solar-powered IoT system offers a cost-effective, energy-efficient, and scalable solution for precision agriculture applications. It effectively bridges the technological gap between farmers and real-time field data, promoting sustainable farming practices. Future work will focus on integrating machine learning algorithms and automated control systems for predictive analysis and intelligent farm management.

Keywords: - *Solar-powered IoT system; Precision agriculture; Soil nutrient monitoring; Environmental parameters; LoRa communication; Real-time data logging*

IHASE-2025/230

Exploring the potential of algal extract for improving plant growth under salt stress.

Royston D'silva* and Dr. Rupali Bhandari
Botany Discipline, School of Biological Sciences and Biotechnology, Goa University, Taleigao Plateau, Goa, 403206, India
*Email: botany.royston@unigoa.ac.in
Contact No.: +91 7507408094

Developing sustainable and eco-efficient practices to improve crop performance under environmental stress is essential for ensuring resilient agricultural systems. Seaweed-based biostimulants represent a promising alternative to synthetic inputs, enhancing plant growth and tolerance to abiotic stress through their diverse bioactive compounds. In the present study, extracts of *Sargassum* sp. were prepared using hot water extraction (HWE) and maceration techniques, and their phytochemical composition and bioactivity were evaluated. Qualitative screening revealed the presence of phenolics, carbohydrates, proteins and saponins, with HWE exhibiting higher total sugar content, protein, phenolic and flavonoid levels than maceration. The HWE extract was subsequently assessed for its effects on seed germination and early seedling growth of *Sorghum bicolor* L. under saline conditions (80 and 100 mM NaCl). Seeds were primed with the extract before germination assays, and 0.5% and 2% concentrations of extract were used for pot experiments. Application of *Sargassum* extract (SE) enhanced germination percentage, germination index and seedling vigour index and reduced mean germination time under both control and salt-stressed conditions. In the pot experiments, SE improved shoot and root growth, pigment content and biochemical parameters under salt stress. At 80 mM NaCl, 2% SE was most effective in enhancing growth, pigments and biochemical contents, whereas at 100 mM NaCl, 0.5% SE provided greater recovery in most parameters. These findings indicate the potential of SE-based extracts as a biostimulant in saline conditions; however, further investigation is necessary to identify the optimal concentration and to elucidate the underlying mechanisms governing their effects.

Keywords: *Sargassum extract, extraction techniques, biostimulant, salt stress, Sorghum*

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Exploring the potential of algal extract for improving plant growth under salt stress.

Royston D'silva* and Dr. Rupali Bhandari
Botany Discipline, School of Biological Sciences and Biotechnology,
Goa University, Taleigao Plateau, Goa, 403206, India
*Email: botany.royston@unigoa.ac.in

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Keywords: *Sargassum extract, extraction techniques, biostimulant, salt stress, Sorghum*

IHASE-2025/232

Fisheries and Coastal Livelihoods: Evaluating the Potentials and Challenges of the Pagui Community in Goa-India.

Ms. Shradha Pagui[1] Ms. Dixita Shinde[2]

[1]Assistant Professor, Department of Geography, Government College Arts, Science & Commerce, Quepem-Goa. Contact-7507991340 shrpagi0794@gmail.com

[2]Assistant Professor, Department of Geography, Government College Arts, Science & Commerce, Quepem-Goa. Contact-9545048945 dixitashinde11@gmail.com

Goa, being a coastal state, is well known for its marine fishing activities. In addition, freshwater and *Khazan* fishing are also prevalent across the state. Several traditional fishing communities such as the Kharvi, Taris, Ramponkars, and Pagui are distributed across Goa, each recognized for their distinctive fishing methods. This research specifically focuses on the Pagui community in the Canacona taluka of Goa, where fishing serves as their primary source of livelihood and a vital aspect of their social identity. The aim of the study is to explore their sustainable fishing practices and the challenges encountered by them, if any. Adopting a mixed-method approach, both qualitative and quantitative data were utilised for the study. The findings reveal that the Pagui community practices several traditional fishing methods such as *Rapon, Paywado, Pagir, Pagop, Angling, Kuthani, Kathalin,* and *Aatto.* These techniques are sustainable in nature and are carried out without causing harm to the environment. Among these, *Paywado, Kathalin,* and *Rapon* methods provide higher economic returns. However, the community currently faces several challenges due to commercial advanced fishing methods, development along the coast, tourism growth, and pollution. The study emphasizes the need for administrative interventions to protect and promote the sustainable fishing practices of this community.

Keywords: *Goa, Coastal, Fishing, Sustainability, Pagui.*

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Restoring Hepato-Renal Function: Assessing the Protective Potential of *Crossandra infundibuliformis* Against Cadmium Oxide Nanotoxicity

Ms. Kalpita Premanand Gaonkar[A], Ms. Sarita Rebelo[B], Dr. Shamshad Shaikh[C]
Zoology Discipline, School of Biological Sciences and Biotechnology, Goa University, Taleigao Plateau, Goa, India.
[A]gaonkarkalpita07@gmail.com, [B]zoology.sarita@unigoa.ac.in,
[C]shamshad.shaikh@unigoa.ac.in

Herbal drug therapy, a core component of traditional and alternative medicine, is widely utilized in the treatment of various disorders due to the phytochemical richness and antioxidant properties of plant-derived compounds. This study investigates the therapeutic potential of *Crossandra infundibuliformis* leaf extract in alleviating cadmium oxide nanoparticle (CdO NP)-induced hepatic and renal toxicity in *Mus musculus*. The mice were divided into six groups, negative, positive controls, treatment groups receiving the extract either concurrently with CdO NPs for 14 days (co-administration) and sequentially for 28 days following CdO NP exposure. Behavioral and morphological changes were monitored, followed by detailed biochemical and histopathological analyses. The findings revealed that *C. infundibuliformis* extract significantly mitigated the toxic effects induced by CdO NPs. Notable improvements were observed in biochemical parameters, including total protein, albumin, glutathione (GSH), thiobarbituric acid reactive substances (TBARS), superoxide dismutase (SOD), catalase, urea, bilirubin, alkaline phosphatase (ALP), and alanine aminotransferase (ALT). Additionally, cadmium accumulation was significantly reduced, and the liver and kidney histoarchitecture were effectively restored, with the most pronounced recovery observed in the sequential treatment group compared to the concurrent group. These results highlight the strong therapeutic efficacy of *C. infundibuliformis* in counteracting cadmium-induced hepatic and renal damage, supporting its potential role as a natural detoxifying and protective agent.

Keywords: *Amelioration, Liver, Kidney, Nanoparticles*

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Green Veterinary Medicine: Herbal Therapy in the Management of Canine Skin Diseases

Srikala D[1]., Ravi Kumar P., Mahesh R., Swetha Kanthi S., Sravanthi M., Tejaswini V., Sujatha T., Raju BVB., and Bhargav Kumar K.

[1]Associate Professor, Veterinary Medicine, College of Veterinary Science, Garividi, Sri Venkateswara Veterinary University

Skin diseases are among the most common health problems in dogs, often requiring prolonged management. Increasing concern over antimicrobial resistance, adverse effects of corticosteroids, and chemical residues has encouraged veterinarians to explore eco-friendly herbal alternatives. The present study evaluated the efficacy of herbal therapy in managing canine skin diseases under the concept of Green Veterinary Medicine. Twenty dogs of different ages, breeds, and genders showing alopecia, pruritus, erythema, scaling, and malodour were selected. Diagnosis was based on history, skin scraping, cytology, and microbial culture. Treatment involved topical application of herbal preparations such as Neem (Azadirachta indica), Aloe vera, Turmeric (Curcuma longa), Tulsi (Ocimum sanctum), and others along with herbal shampoos and dietary supplementation with omega-3, 6 and 9 fatty acids and antioxidants. Noticeable improvement was observed within two to four weeks, including reduced pruritus, hair regrowth, and restored skin texture without adverse effects. Herbal therapy proved effective, with anti-inflammatory, antimicrobial, antioxidant, and wound-healing actions. The approach minimized chemical residues and supported sustainable veterinary practice. Herbal therapy thus offers a safe, effective, and environment-friendly alternative for managing canine dermatological disorders, aligning with the principles of Green Veterinary Medicine.

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Widespread Impact of Lab Animals on Medical Research

Prem Kumar Patel*
PFA Institute of Research Uttar Pradesh, Prayagraj
E-mail: pfaallahabad.pfairup@gmail.com
pkpatelhawoawbi@gmail.com Phone - (05335) 297124, 9935726817

It is a very need of lab animals in India for the manufacturing of various types of Covid-19 and Cancer medicines etc. It is very difficult to conduct research in the medical field in a successful and efficient manner without lab animals. For this, it is very important to have an Animal Facility House (AFH) in the concerned research institute. Apart from this, it is very important for the concerned research institutes to register themselves with the Committee for Control and Supervision of Experiments on Animals (CCSEA) under the Ministry of Fisheries, Animal Husbandry and Dairying, Government of India (Department of Animal Husbandry and Dairying). The better conditions of lab animals, the better research results will prove to be. The Institutional Animal Ethical Committee (IAEC) must always take care that no animal cruelty is allowed to happen to any lab animals. The Institutional Animal Ethics Committee should also ensure that animal welfare to be followed in a better way in the animal facility house. Mostly it has been seen that lab animals are tortured in most of the animal facility house. For medical research, it is very important that the animal facility house be operated in Standard Operating Procedure (SOP) provided by CCSEA. So that there is no hindrance in any drug manufacturing research project. For this, the Institutional Animal Ethics Committee formed by CCSEA should be made accountable. So that the research project for manufacturing sufficient quantity of medicines can be successfully approved. In our country, it is very need for every medicine in adequate quantity for every disease, In this situation, it is mandatory for the Institutional Animal Ethics Committee formed by CCSEA to follow every guideline to successfully conduct experiments on lab animals.

Keywords - *Lab Animals, Medical Research, Animal Facility House, Animal Welfare, Animal Cruelty.*

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Floating Roots, Flourishing Blooms: Aeroponics as the Future of Floriculture

Chaithali H.B[1], Amreen Taj[1*] and Nagajyothi G.N[1]**

[1]M.Sc. scholar, Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru. University of Horticultural Sciences, Bagalkot 587 104. Karnataka.

[1*]Assistant professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru. University of Horticultural Sciences, Bagalkot, Karnataka.

[1**] Ph. D scholar, Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru. University of Horticultural Sciences, Bagalkot 587 104. Karnataka.

amreentajald@gmail.com

The growing global population and rapid urbanization have intensified the strain on natural resources, resulting in diminishing cultivable land and water scarcity. These challenges necessitate innovative agricultural systems that ensure higher productivity with minimal resource use. Aeroponics, a cutting-edge soilless cultivation technique, offers a promising approach by growing plants in an environment where roots are suspended in air and periodically misted with nutrient-rich solutions. Unlike hydroponics, aeroponics maximizes oxygen availability to roots, leading to accelerated growth, healthier plants and superior quality produce. In floriculture, this technique is particularly beneficial for high-value flower crops where uniformity, aesthetics and post-harvest life are critical. Aeroponics enables precise control over growing conditions, allowing production of flowers such as orchids, gerberas, carnations, anthuriums, and chrysanthemums throughout the year. The system reduces water consumption by up to 95% compared to soil cultivation and eliminates the need for chemical soil treatments. It also allows vertical farming, making it suitable for space-limited urban areas and commercial greenhouses. The method's clean, controlled environment ensures disease-free propagation and rapid multiplication of planting material, which is especially useful for ornamental plant nurseries. Beyond improving efficiency, aeroponics contributes to sustainable horticulture by conserving resources and reducing environmental impact. Overall, aeroponics in floriculture represents a forward-looking solution that aligns with global goals of sustainable production, enabling growers to meet the rising demand for quality flowers while addressing critical issues of food, water and land scarcity.

Keywords: *Aeroponics, soilless cultivation, nutrient-rich solutions, sustainable horticulture.*

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Blooming Without Soil: The Promise of Hydroponics in Modern Floriculture

Chaithali H.B[1], Amreen Taj[1*] and Nagajyothi G.N[1]**

[1]M.Sc. scholar, Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru. University of Horticultural Sciences, Bagalkot 587 104. Karnataka.

[1*] Assistant professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru. University of Horticultural Sciences, Bagalkot, Karnataka.

[1**] Ph. D scholar, Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru. University of Horticultural Sciences, Bagalkot 587 104. Karnataka.

Mail ID: amreentajald@gmail.com

The rapid increase in global population has intensified the demand for food, water and cultivable land, leading to a growing need for sustainable agricultural systems. Hydroponics, a soil-less cultivation technique, offers an efficient and resource-saving alternative for crop production, including floriculture. It involves growing plants in nutrient-enriched water solutions, ensuring optimal growth conditions while minimizing water and nutrient wastage. In floriculture, hydroponics plays a crucial role in meeting the rising demand for high-quality cut flowers and ornamentals with consistent year-round production. This technique allows precise control over environmental factors such as pH, light, temperature and nutrient concentration, resulting in improved flower yield, uniformity and enhanced aesthetic quality. Common hydroponic methods include nutrient film technique (NFT), deep water culture, drip irrigation and aeroponics. Flower crops such as *Gerbera jamesonii* (gerbera), carnation (*Dianthus caryophyllus*), chrysanthemum (*Chrysanthemum morifolium*), lily (*Lilium*), orchids and Anthurium (*Anthurium andraeanum)* thrive well under hydroponic systems. The major advantages include higher productivity per unit area, reduced dependency on soil fertility, water conservation up to 90%, faster growth rates and suitability for urban and controlled environments. Moreover, hydroponics reduces the risk of soil-borne diseases and enables cultivation in non-arable regions. Overall, hydroponics represents a modern, sustainable and high-efficiency technology for ornamental crop production, ensuring better resource utilization and environmental sustainability. In conclusion, hydroponics represents a futuristic approach to floriculture, addressing challenges of population growth, land scarcity and climate change while ensuring continuous, quality flower production with minimal environmental impact.

Keywords: *soil-less cultivation, productivity, sustainability, climate change, quality flower production*

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Value Addition in Marigold: From Floral Beauty to Functional Utility

Nagajyothi G N[1]., Dr. Amreen Taj[1*]. and Chaithali H B[1]**

[1]Ph. D scholar., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1*]Assistant Professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1**]M.Sc., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

Mail. Id: amreentajald@gmail.com

nagajyothichary297@gmail.com

Marigold (Tagetes erecta, T. patula) is an important ornamental crop widely cultivated in Karnataka, Tamil Nadu, Andhra Pradesh and West Bengal, where it holds a major share in the loose flower market due to its extensive use in garlands, decorations and religious rituals. Besides its ornamental significance, marigold plays a vital role in landscape horticulture because of its vibrant colors, adaptability and ease of cultivation, making it ideal for mass planting, edging and border decoration in gardens. However, the large quantity of floral waste generated after ceremonial and decorative use poses serious disposal challenges, highlighting the need for effective value addition and waste management strategies. Traditionally, marigold is used in preparing herbal medicines due to its antiseptic and healing properties. Industrially, it is a rich source of carotenoids such as lutein and zeaxanthin, used as natural food colorants, nutraceuticals and cosmetic ingredients with antioxidant and anti-aging benefits. The essential oil (0.1–0.3%) extracted from flowers and leaves contains ocimenone, limonene, tagetone and α-terthienyl, compounds with antimicrobial, antifungal and insecticidal properties valuable in perfumes, soaps, creams, and aromatherapy. Floral waste is also utilized in making dhoop and agarbatti, serving as a sustainable alternative to synthetic materials. Agriculturally, marigold acts as a biopesticide, nematicide due to the presence of α-terthienyl compound suppresses soil-borne pests and pathogens; spent petals and press cake residues are recycled into organic manure, compost and biofertilizers, thus improving soil fertility and promoting sustainable farming In the poultry and livestock, marigold powder and lutein extracts enhance egg yolk colour, improve pigmentation and strengthen immunity. Ecologically, it functions as a trap crop and its waste aids in producing biochar, compost, vermicompost and biogas, promoting circular bioeconomy. Thus, through its multifaceted traditional, industrial, agricultural and ecological applications, value addition in marigold not only enhances marketability and income generation but also promotes environmental protection, transforming it into a truly multipurpose crop of immense economic and ecological importance.

Keywords: *Carotenoids, Environmental sustainability, Essential oils, Floral waste utilization, industrial applications*

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Organic farming: A Sustainable Flower Farming

Nagajyothi G N[1]., Dr. Amreen Taj[1*]. and Chaithali H B[1]**

[1]Ph. D scholar., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1*]Assistant Professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1**]M.Sc., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

Mail. Id: amreentajald@gmail.com

nagajyothichary297@gmail.com

Floriculture, a vital branch of horticulture concerned with the cultivation of flowering and ornamental plants for gardens, landscaping, aesthetic and commercial purposes. Currently, about 3.25 lakh hectares is under floriculture in India, producing nearly 3 million tonnes of loose flowers such as marigold, jasmine and chrysanthemum and 800 million cut flowers including rose, gerbera and gladiolus. However, the excess use of synthetic fertilizers and pesticides deteriorating the soil fertility, harming pollinators, increased chemical residues on flowers and polluted the environment; and even creating health hazards such as skin allergies and respiratory problems. With the growing global awareness of environmental safety and sustainability, the demand for eco-friendly, chemical-free ornamental products is rising, making organic flower farming a viable and profitable alternative. Organic floriculture involves the cultivation of flowering plants using natural inputs and biological methods instead of harmful chemicals. Nutrient management involves the application of farmyard manure (20–25 t/ha), vermicompost (2–3 t/ha), neem cake (500 kg/ha) and biofertilizers like *Azospirillum*, *Rhizobium* and *Phosphobacteria* (2–5 kg/ha). Growth stimulants such as panchagavya (3–5%), jeevamrutha and seaweed extract enhance bloom size, color and fragrance, while botanical pesticides like neem oil, garlic extract and Trichoderma species protect crops from pests and diseases. Mulching with organic matter helps conserve moisture and suppress weeds by 25–30%. Overall, organic floriculture improves soil fertility by 20–30%, reduces production costs, enhances flower colour, fragrance, and vase life, and meets international organic certification standards, ensuring sustainable and eco-friendly flower production.

Keywords: *Organic floriculture, biofertilizers, neem oil, panchagavya, sustainable flower farming.*

IHASE-2025/240

Biodegradable Plastics as a Sustainable Alternative in Agriculture

Nagajyothi G N[1]., Dr. Amreen Taj[1*]. and Chaithali H B[1]**
[1]Ph. D scholar., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.
[1*]Assistant Professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka.
[1**]M.Sc., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.
Mail. Id: amreentajald@gmail.com
nagajyothichary297@gmail.com

Plastics have become indispensable in modern life due to their versatility, light weight, and affordability, finding applications in packaging, construction, household goods and especially in agriculture. Globally, plastic production has exceeded 400 million tonnes annually, with nearly 3–5% used in agricultural activities. In India alone, over 3 lakh tonnes of plastic are estimated to be used each year for mulching, irrigation and greenhouse covers, pipes and silage films, contributing to enhanced crop yield, by improves soil moisture retention by 20–30% and can increase crop yield by 10–25%. However, the excessive and indiscriminate use of synthetic, non-biodegradable plastics such as polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC) persist in the soil for hundreds of years, causing microplastic accumulation, reduced porosity, altered pH and a 30–40% decline in microbial activity and impeded nutrient cycling, ultimately deteriorating the soil fertility and ecosystem health. To overcome these challenges, biodegradable plastics have emerged as sustainable alternatives. Materials such as polylactic acid (PLA), polybutylene adipate terephthalate (PBAT) and polybutylene succinate (PBS) are capable of decomposing under natural microbial action, minimizing long-term soil contamination. Their application in mulching not only regulate soil temperature by 2–5°C, conserve moisture and enhance organic carbon and microbial biomass. Moreover, biodegradable plastics can be effectively used in nursery pots, seedling trays and controlled-release fertilizers, promoting eco-friendly agricultural practices. Thus, transitioning from conventional plastics to biodegradable alternatives is essential to restore soil health, sustain agricultural productivity and mitigate environmental pollution. Overall, the use of biodegradable mulches represents a vital step toward sustainable farming systems that balance productivity with ecological preservation.

Keywords: *Crop productivity, Plastic mulching, Biodegradable plastics, Soil health, Sustainable agriculture*

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Roses: Nature's Fragrant Treasure for Beauty, Health and Industry

Nagajyothi G N[1]., Dr. Amreen Taj[1*]. and Chaithali H B[1]**

[1]Ph. D scholar., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1*]Assistant Professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1**]M.Sc., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

Mail. Id: amreentajald@gmail.com

nagajyothichary297@gmail.com

Roses (*Rosa spp.*) are among the most economically and aesthetically significant flowering plants, valued for their ornamental, nutritional, medicinal and industrial importance. Beyond their decorative use, roses offer vast potential for value addition through the production of essential oils, natural pigments, food products and bioactive compounds. The petals contain 0.02–0.05% essential oil, mainly composed of citronellol, geraniol, nerol and phenylethyl alcohol, which impart fragrance and therapeutic properties. Species such as *Rosa damascena*, *R. centifolia*, *R. gallica* and *R. bourboniana* are widely cultivated for oil extraction being most suitable for perfume preparations and in aromatherapy. Roses are rich in anthocyanins, carotenoids, flavonoids and phenolic acids, contributing to their vibrant colours and high antioxidant activity. Rose hips, the fruit, are an excellent source of vitamin C (300–2000 mg/100 g), carotenoids, minerals and dietary fiber, making them valuable in functional foods, herbal teas, jams and nutraceuticals. Roses exhibit anti-inflammatory, anti-diabetic, hepatoprotective, cardioprotective and anti-aging effects. Extracts from petals and hips have been shown to improve skin health, delay aging and enhance collagen synthesis due to their vitamin C and phenolic content. Rose petal extracts are used in functional beverages, energy drinks and herbal infusions that promote digestion, relaxation and detoxification. The antimicrobial and antispasmodic properties of rose bioactive compounds also support gut health and immunity. Edible petals are used to prepare *gulkand*, rose syrup, essence and flavoured beverages, while extracts are incorporated in cosmetics and pharmaceuticals. Nutritionally, roses provide carbohydrates, vitamins, minerals and antioxidants that promote immunity, digestion and skin health. In landscape horticulture, roses are extensively used for borders, hedges, climbers, ground covers and container gardens due to their wide adaptability, fragrance and long blooming period. Their ecological role in attracting pollinators and enhancing aesthetic and psychological well-being makes them indispensable in both traditional and modern landscaping. Thus, roses represent a multifaceted crop linking beauty, health and industry through sustainable value addition.

Keywords: *Antioxidants; Bioactive compounds, Medicinal properties, Rosa spp., Rose hips, Value addition*

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From Microscope to Vaccine: Advances in the Clinical Detection and Testing of Malaria

Shreya Srivathsa[1], Rupak Kumar[2]
[1]BMS College of Engineering, Bengaluru - 560 019, India
[2] ICMR, New Delhi-110029, India Correspondence: rupakraman@gmail.com

Despite decades of research into the biology, diagnostics, and treatment, malaria remains one of the most formidable global health challenges that is yet to be eradicated. Advances in biomarker discovery and molecular diagnostics have expanded the scope of early detection; however, translation to field-ready tools is still hindered by cost, infrastructure, and genetic variability. In this article, we adopt a comprehensive narrative approach to explore the established and upcoming methods of clinical detection and treatment of malaria. This work is based on an extensive review and analysis of existing literature, circulars and commentaries available in the public domain through both offline and online sources. Even with the advent of techniques such as RDTs, PCR, LAMP, and more, microscopy of blood smears prevails as the gold standard for malaria diagnosis as it determines both the infecting parasite species and its density. Therapeutically, artemisinin-based combination therapies remain the standard, but rising resistance driven by several gene mutations, the most popular of which is pfKelch13, poses a major threat emphasizing the fragility of current regimens leading to slow-clearing infections and treatment failures. Further, vaccines such as RTS, S/AS01, and R21/Matrix-M mark historic milestones, providing some hope for eradication, though their modest efficacy, strain variation, stage-specific targets, and logistic hurdles limit the broader impact. Collectively, these challenges reveal a recurring disconnect between innovation and implementation. Future progress hinges on health system preparedness, affordability, and public acceptance. Bridging these translational gaps is critical if malaria is to transition from a sustained burden to a disease on the path to eradication.

Keywords: *Malaria, Biomarker discovery, Gene mutation, Artemisinin resistance, Vaccines*

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Decadal Trend Analysis of Conventional Semen Artificial Insemination and Female Calf Production in Cattle across Agro-climatic Zones of Uttar Pradesh

Vinod Potdar* , Vikas Tiwari , Prabhat Singh , Santosh Bansal, G.C. Singh, Anoop Singh, Abhishek Pande, V B Dyasa, Sachin Joshi and Jayant Khadse

Central Research Station, BAIF Development Research Foundation, Urulikanchan, Pune, India.

*Corresponding author: E-mail: vinod.potdar@baif.org.in

Artificial insemination (AI) remains a cornerstone of cattle genetic improvement programs in India. This study analyzed a decade (2015–2025) of conventional AI data across ten agro-climatic zones of Uttar Pradesh under the BAIF programme to assess reproductive performance trends and female calf yield. The dataset included 8.96 million conventional AI records, 4.26 million total conceptions, and 1.67 million female calf births. Results revealed a consistent increase in AI services until 2018, followed by a temporary decline during 2019 -2021 likely reflecting pandemic-related field constraints and subsequent recovery peaking in 2024. Among zones, Bareilly (13.2 lakh AIs) and Prayagraj (13.1 lakh AIs) contributed the highest insemination numbers, whereas Gorakhpur exhibited rapid growth during 2022–2025, indicating program expansion in eastern Uttar Pradesh. The overall conception rate averaged 47.6%, while the female calf ratio was approximately 39.4% of total conceptions. The female calf yield improved reflecting improved semen quality assurance, technician training, and better estrus detection. These results underline regional variations in breeding efficiency and highlight the need for continuous quality control, farmer awareness to achieve balanced gender ratios and sustainable productivity gains.

Keywords: *Artificial Insemination, Calving Performance, Female Calf Ratio*

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Sustainable Maize Diseases Management Strategies in India

S. I. Harlapur
Department of Plant Pathology, College of Agriculture, Dharwad,
University of Agricultural Sciences, Dharwad - 580 005, Karnataka, India
E-mail: harlapursi@gmail.com

Maize is an important food, feed and fodder crop of India and it is the most versatile emerging crop having wider adaptability under varied climatic conditions. It occupies around 9.89 million hectors area and production of 31.65 million tones with an average productivity of 3.79 tones per hector. India ranks fourth in the area and seventh in the production, representing around 4 per cent of the world maize area and 2 per cent of total production. In India, maize is third major cereal crop after rice and wheat and its cultivation is gaining momentum as food, feed, fuel and fodder crop apart from major component of basic raw material for the number of industrial products. Maize occupies a pivotal role in Indian economy and is being traded all over country. A wide array of diseases have been known to attack maize crop throughout the country, its cultivation is limited by diseases which cause grain loss of about 13 per cent of the total production. Diagnosis of emerging diseases, yield loss assessment, epidemiology and integrated disease management has an important role in sustainable agriculture and enhancing maize productivity by providing maximum economic yields. However, climate change has had a profound impact on maize production, posing severe challenges to the stability and sustainability of maize yields. Climate change has brought uncertainty and changes to precipitation patterns, thereby affecting maize growth and development. Due to uneven precipitation distribution and rainfall fluctuations, maize crops face the risks of water logging, water stress and insufficient irrigation, directly impacting emergence of new disease epidemics. Climate change has significantly impacted the distribution and seasonal activity of maize diseases, posing new challenges for maize production and farmers management strategies. Climate change has lead to the expansion of shift in the distribution range of maize diseases. Warm and humid climate conditions favour the survival and reproduction of certain pathogens. Climate change has increased the risk of outbreaks of maize diseases. Warming temperatures, increased precipitation coupled with higher relative humidity can provide more suitable environmental conditions for certain pathogens, leading to their population growth and faster spread, thus raising the likelihood of disease outbreaks. Climate change has complex and diverse impacts on the distribution and seasonal activity of maize diseases. It is necessary to comprehensively consider climate factors, ecological factors, and agricultural management measures to develop appropriate control strategies, ensuring stable improvement in maize yield and quality. Maize suffers from several biotic stresses, mainly ubiquitous incidence of foliar fungal diseases in the pre-harvest stage. Maize is affected by many diseases

and pests among them more than 112 diseases are caused by fungi, bacteria and nematodes all over the world. In India 62 diseases are recorded but among them 16 fungal diseases and one nematode cause major problems. The fifteen major fungal diseases include seedling diseases, foliar diseases, pre and post flowering stalk rots, downy mildews and sheath diseases. The occurrence and severity of maize diseases and resultant losses are dependent on the prevailing weather conditions, cropping pattern and hybrids grown in an area. In recent years there has been a phenomenal increase in the incidence of foliar fungal diseases in maize ecosystem.

The foliar disease namely, Turcicum leaf blight Maydis leaf blight, Common rust and Curvaularia leaf spot has attained serous dimensions in Karnataka causing significant yield reductions. Estimation of yield losses due to major foliar diseases of maize *viz*; Curvularia leaf spot, Turcicum leaf blight & Common rust was assessed in different hybrids. The hybrids differed significantly for disease severity, grain yield and fodder yield in protected and unprotected treatments. The avoidable loss in grain yield varied from 8.3 to 22.6% and fodder yield 9.4 to 24.8%. Turcicum leaf blight and maydis leaf blight were noticed during second fortnight of July and severity progressed later on and reached maximum during September in Dharwad, Haveri, Gadag and Belgaum districts. Polysora rust and common rust diseases appeared during second fortnight of August and reached maximum during first fortnight of October. Moderate to severe incidence of Diplodia ear rot and banded leaf and sheath blight diseases were noticed during second fortnight of September and attained severe form at grain filling stage. Dry weather prior to silking followed by wet weather conditions during silking favoured Diplodia ear rot infection. Curvularia leaf spot severity observed in moderate to high level at flowering to grain filling stage. The late sown crop i.e., August – September was subjected to severe incidence of foliar diseases. Post flowering stalk rots incidence was severe at flowering to grain filling stage. Low to moderate severity of Physoderma brown spot was noticed at flowering stage. Based on survey and surveillance, 'hot spots' for various diseases have been identified. Locations *viz*., Dharwad, Almora, Mandya, Srinagar, Rahuri and Bajaro were identified as hot spots for Turcicum leaf blight, Common rust and Curvularia leaf spot diseases. Locations *viz*., Ludhiana, Kalyani, Panth Nagar were identified as hot spots for Banded leaf and sheath blight and Diplodia ear rot. Post flowering stalk rot was endemic in Karnataka, Hyderabad, Coimbatore and Rahuri.

There is a major shift in disease pattern during the past years as disease of minor importance become increasingly severe and assumed epidemic proportion in coming years. Hitherto the diseases like Downy mildew, banded leaf and sheath blight, Fusarium stalk rot, Curvualaria leaf spot and ear rot were considered as a disease of minor importance but due to changing climate and pattern of disease spectrum these diseases changed to high severity. Besides, Pokkah boeng is a new and emerging disease causing economical losses to the crop. Sporadic incidence of Phaeosphaeria leaf spot observed during rainy season. In recent years, climate change effects have profound influence on maize disease spectrum which is evidenced by epiphytotic levels of some diseases. There has been a phenomenal increase in the incidence of Pokkah boeng, Fusarium stalk rot and ear rot fungal

diseases caused by *Fusarium verticillioides*. The new emerging foliar disease Pokkah boeng has attained serious dimensions causing significant yield reductions, which was favoured by heavy and continuous rainfall coupled with high relative humidity and low temperature. *Fusarium verticillioides* has a saprophytic and parasitic stage and can infect maize crop at all stages of plant development, either via the infected seed or wounds, silk channel and can also grow systemically in the plant. Under favourable conditions, *F. verticillioides* produces a large number of micro and macroconidia, which colonizes the soil and services on plant resides. The conidia as primary source of inoculum and dispersed by wind, insects and rain thereby infecting maize plans in the new growing season. Fusarium isolates were identified and confirmed using the primers ITS and TEF 1 α primers which amplified approximately at 500 bp and 700 bp, respectively and identified four different species *viz*., *Fusarium verticillioides* and *Fusarium proliferatum*, *Fusarium equiseti* and *Fusarium brachygibbosum* which were deposited in the GenBank.

Banded leaf and sheath blight (BLSB) incidence was noticed in heavy rainfall areas during flowering to grain filling stage. BLSB was predominant in paddy-maize and maize-maize cropping. Sporadic incidence of *Fusarium* ear rot was noticed at grain filling to maturity stage in heavy rainfall areas. The birds damage and earworm infestation aggravated the ear rot intensity. Phaeosphaeria leaf spot disease was noticed in moderate to severe form which was favoured by high rainfall and moderate temperature, humidity levels above 80 per cent and low night temperatures aggravated disease severity.

The screening of maize seed samples of twelve genotypes from seven multi location trials revealed that *Fusarium* spp., *Penicillium* spp., *Aspergillus* spp., *Exserohilum turcicum, Curvularia lunata, Rhizoctonia bataticola* and *Rhizopus* spp. were associated with maize seeds. *Fusarium* spp. was found dominant across the locations. The highest per cent seed germination was recorded in seed treatment with carboxin 37.5% + thiram 37.5% WP @ 2 g/kg seeds with 97.33. The highest seedling vigour and low per cent seed infection by fungal pathogens was recorded in seed treatment with mancozeb 50% + carbendazim 25% WS @ 2 g/kg. The new seed treatment fungicide molecules *viz*., Royal Flo 40% SC @ 5.0 ml/kg seed and Ipconazole 40.70% FS @ 0.70 ml/10 kg seed found effective against the seedling blight pathogens and charcoal stalk rot diseases.

Significant reduction in severity of Curvularia leaf spot, Turcicum leaf blight and Common rust was noticed in the treatments with two sprays of Trifloxystrobin 25 % + Tebuconazole 50 % (Nativo 75 WG) fungicide @ 0.1% at 35 and 50 DAS, followed by Tebuconazole 250 EC @ 0.1%, Difenconozole 25EC @ 0.1% and Propiconozole 25 EC @ 0.1%. These treatments were statistically significant and on par with each other with respect to disease severity and grain yield. Hybrids *viz*; GH 0727, BGMH-2, DK-7074, GH-110145, DMH-03, D-4141, D-4685, and PHI-3502 registered moderately resistant reaction to Curvularia leaf spot, Turcicum leaf blight and Common rust. Hybrids *viz*; GH 150125 found moderately resistant reaction to Curvularia leaf spot and Turcicum leaf blight. Inbred lines *viz*; BM-32, BM-254-1, N-49, N-8, N-48 and N-4, registered resistant

reaction to Curvularia leaf spot, Turcicum leaf blight and Common rust. Integration of tolerant hybrid GH 150125 and seed treatment with Carboxin power @ 2g/kg or combined seed treatment with *Azospirillum* sp. @25 g/kg and *Trichoderma harzianum* @ 6g/kg followed by two sprays with Azoxystrobin 18.2% + Difenoconazole 11.4% SC or Tebuconazole 250 EC @ 0.1% was found most effective IDM package for the management of foliar diseases of maize.

Recently Pokkah boeng and banded leaf and sheath blight are emerging diseases of maize causing economical loss to the crop in India, besides several fungal diseases. Foliar application of combi-product fungicides namely, Trifloxystrobin 25% + Tebuconazole 50% @ 0.1%, Azoxystrobin 18.23% + Difenoconazole 11.4% @ 0.1% + Fluxapyroxad 167 g/l + Pyraclostrobin 333 g/l 5 WSC @ 0.1% found significantly superior disease control efficacy against foliar diseases *viz*., turcicum leaf blight, common rust, curvularia leaf spot and maydis leaf blight diseases and resulted in 35 to 41% increase in grain yield over unprotected check. IDM module comprised of seed treatment with *Trichoderma harzianum* @ 10 g/kg seed + Thiram 75WP @ 2 g/kg seed, foliar application of Nimbecidine @ 5 ml/litre at 30 DAS followed by Azoxystrobin 18.2% + Difenoconazole 11.4% @ 1 ml/litre of water at 45 days after sowing found ideal IDM strategy for management of foliar fungal diseases. The new emerging disease, Pokkah boeng which causes yield losses upto 32 per cent. The disease was effectively managed by integration of seed treatment with Carbendazim 12% + Mancozeb 50% WP @ 2 g/kg seed followed by foliar application of Carbendazim 12% + Mancozeb 63% WP @ 2 g/l or Carbendazim 50 WP 2 g/l. Banded leaf and sheath blight disease was effectively controlled by seed treatment with *Pseudomonas fluorescens* @ 10 g/kg seed and foliar spray of Propiconazole 25 EC @ 0.1% at 30 and 40 days after sowing. *Pseudomonas fluorescens* @ 10 g/kg as seed treatment, soil application of biogent-fortified FYM @ 1:5 and spray @ 0.5% found effective in suppressing the post flowering stalk rot which recorded 47.66% disease control efficacy and resulted in 21.32% increase in grain yield over untreated check. application of (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + Spinetoram 120SC @ 0.05%, (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + (Novaluron 5.25% + Emamectin benzoate 0.9% SC) @0.2%, (Fluxapyroxad 167g/1 + Pyraclostrobin 33 g/l SC) @0.1% + Lamda cyhalothrin 5% EC @ 0.5% and (Fluxapyroxad 167g/l + Pyraclostrobin 333g/l SC) @ 0.1% + Cypermethrin 10% EC @ 0.2% were found effective in the management of both turcicum leaf blight and fall armyworm with higher grain yield and maximum benefit cost ratio. The best performed pesticide combinations evaluated under field conditions were further assessed for pesticide residual analysis which revealed that, pesticides residue was not detected in grain and soil samples. Ecological intensification treatment resulted in lowering pest and disease pressure significantly and higher grain yield and net returns compared to farmers practice. Disease resistant sources identified are IML-11, IML-12, IML-13, IML-21, IMIC-2022, IMIC-2032, IMIC-2043, IMIC-2045, IMIC-2052, VL108723, CML-451, VL 109582, VL-109470 and VL18882, LM-13 and LM-14. Maize hybrids *viz*., RCRMH-2, GH 150125, H-8110, AH-8323, H-553, HT-5109, AH-8127 and PJHM-1 which posses multiple disease resistant reaction. The identified

stable disease resistance sources that are valuable which can be used as donors for future resistance breeding programme and eco-friendly management of fungal diseases of maize.

Morpho-physiological parameters like higher chlorophyll content, highest specific leaf weight, lesser stomatal frequency and smaller sized stomata in maize genotypes played vital role in resistance against turcicum leaf blight disease. In biochemical studies, the increase in phenolics in the diseased samples revealed that phenolics play an important role in inducing resistance against further invasion of the pathogen as they are toxic to the pathogens. Higher concentration of protein in resistant genotypes played important role in governing resistance in maize genotypes against turcicum leaf blight disease and the magnitude of induction was invariably higher in resistant genotypes that susceptible one. The higher expression of peroxidase and polyphenol oxidase enzymes in the resistant genotype than those in the susceptible genotypes is an indication of their significant role in development of resistance in the host against the pathogen.

Key words: *Emerging diseases, Host resistance, Maize diseases, Pokkah boeng, Sustainable management*

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Bioinformatics Analysis of Lung Squamous Cell Carcinoma Proteome

Narendra Kumar Sharma[1], Amit Katiyar[2], Ratnamala Ghosal[3]
[1), 3)] Banasthali Vidyapith Tonk Rajasthan
[2)] All India Institute of Medical Sciences, Delhi

This study explores the proteomic landscape of lung squamous cell carcinoma (SQCC), a major subtype of non-small cell lung cancer characterized by poor prognosis and limited treatment options. Utilizing The Cancer Genome Atlas (TCGA) transcriptomic data from 489 patients alongside antibody-based protein profiling, we identified 568 genes with prognostic significance, including 261 associated with unfavorable outcomes and 307 linked to favorable survival. Integration with CPTAC proteomic data revealed differential protein expression patterns with several proteins significantly up- or downregulated in tumor tissues compared to normal lung tissue. This comprehensive analysis using publicly available datasets from *The Human Protein Atlas* and *GDC Portal*, aimed to identify differentially expressed proteins and potential biomarkers or therapeutic targets involved in the progression of LUSC. These findings provide valuable insights into lung SQCC biology and potential targets for therapeutic intervention, underscoring the importance of integrating transcriptomic and proteomic data for cancer biomarker discovery.

Key words : *Lung squamous cell carcinoma, proteomics, bioinformatics, Human Protein Atlas, biomarkers, signalling pathways, PPI network.*

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Impact of Climate Change on Dairy Animals and Its Adaptation Strategies in Northern India: A Case Study of Himachal Pradesh

[*]Shilpa Rani and Dr Subhash Sharma
Department of Social Sciences, College of Forestry, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP)-173230
*Corresponding author: shilparani.rani535@gmail.com

Backgound: The present study has made an attempt to analyse the growth rates in milk production in India and states in nothern India and perceptions of farmers on impact of climate change on dairy animals and its adaptation strategies.
Methods: A sample of 200 farmers using multistage random sampling technique has been taken from three selected districts of Himachal Pradesh i.e. Mandi, Kullu and Shimla and secondary data has collected from government departments and various mathematical and statistical tools have been used for the study.
Results: It was revealed that milk production in India is following an inclining trend and from past years, there has been 96 percent increase in milk production. This uneven distribution of rainfall was highest in Shimla district (93.55%) which meant that the area has severely been suffered with impact of climate change. 67.03 percent of farmers in overall believed that the frequency of occurrence of natural hazard like landslide, flood, draught etc. has increased in recent decades. Proper water supply (91.21%), using appropriate rations for livestocks' different productive stages (89.01%), increasing nutrition (84.62%), have been the important adaptation strategies to mitigate climate change. 72.53 percent of the farmers in overall believed that shortage of financial support and capital investment was a major barrier to climate change adaptation strategies. Awareness camps about maintaining livestock's health (62.64%), timely vaccinations (65.93%), cross-bred of disease resistant species and preserving disease resistant dairy species are significant suggestions to deal with climate change at structural level which require time to adapt and more investment by the farmers.

Keywords: *Climate change, growth rate, milk production, livestock*

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Population dynamics of sucking pests with special reference of green leaf hopper, and Zigzag leaf hopper in mid land rice ecosystem

Yaspal Singh Nirala[1*] Pushpanjali Pankaj[2], Pushpalata Tirkey[1], Yushma Sao[1] and A. Kerketta[1]

[1]Assistant Professor, Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G.

[2]Assistant Professor, Mahatma Gandhi Udyanikee evam Vanikee Vishwavidyalaya, Durg, C.G.

*Author for correspondence: *ypsnirala@gmail.com*

A field experiment was conducted during the *Kharif* season at the Research Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur, to assess the incidence of leaf hoppers in two rice ecosystems—midland normal transplanted (MNT) and midland system of rice intensification (MSR).The maximum incidence of the green leaf hopper (*Nephotettix* spp.) was observed during the 41st and 42nd standard meteorological weeks (SMW) (October), recording 76.25 and 143.00 nymphs/adults per 25 sweeps in MNT and MSR, respectively. The zigzag leaf hopper (Recilia dorsalis) attained its peak during the 45th SMW (November), with 8.00 nymphs/adults per 25 sweeps in MNT and 19.50 nymphs/adults per 25 sweeps in MSR.

The seasonal mean population of *Nephotettix* spp. and *R. dorsalis* was higher in the MSR ecosystem (26.95 and 2.45 nymphs/adults per 25 sweeps, respectively) compared to the MNT ecosystem (20.58 and 1.23 nymphs/adults per 25 sweeps, respectively). Correlation analysis revealed that the population of *R. dorsalis* had a significant positive correlation with sunshine hours, and a significant negative correlation with minimum temperature, average temperature, evening relative humidity, and average relative humidity in both MNT and MSR. The population of *Nephotettix* spp. exhibited a significant negative correlation with morning relative humidity only in the MNT ecosystem, at both the 5% and 1% levels of significance.

Key words*: Rice, sucking pests, midland, ecosystem*

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Studies on biochemical variability among the isolates of *Sclerotium rolfsii* Sacc. Associated with collar rot in soybean

Ishwari G. Hiremath[1]* Shamarao Jahagirdar[2], Nagaraj H[1]., Ningaraj Belagalla[3], Madhurima Vinod[3] and Haralakal Kerthi Kumari[4]

[1.]Assistant Professor, Department of Plant Pathology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)

[2.]University of Agricultural Sciences, Dharwad, Karnataka, India - 580 005

[3.]Assistant Professor, Department of Entomology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)

[4.]Assistant Professor, Department of Agricultural Microbiolgy, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)

*Email: ishwarihiremath0@gmail.com

The investigations were carried out to assess biochemical variability among the isolates of *Sclerotium rolfsii* Sacc. which were collected from different soybean growing areas of Karnataka, Madhya Pradesh, Assam and Maharashtra. This was studied by estimating the oxalic acid produced in the culture filtrates of the pathogen. For this study, each isolate of *S. rolfsii* was grown individually in potato dextrose broth and oxalic acid production was quantified separately, allowed for production of sclerotia. For oxalic acid quantification, the amount of oxalic acid present in the culture filtrate was calculated as 1ml of 0.02 N potassium permanganate reacted with 1.265 mg of oxalic acid (Mahadevan and Sridhar, 1986). The experimental results indicated that there was a variation with respect to oxalic acid production among the isolates. Maximum oxalic acid production of 2.23, mg/ml was observed in KADh 6 (Isolate collected from Dharwad, Karnataka) isolate followed by 2.20 mg/ml in KADh 7 (Garag, Dharwad, Karnataka) isolate and 2.18 mg/ml in KABe 11 (Belagavi, Karnataka) isolate. Significantly least oxalic acid production (1.15 mg/ml) was observed in AMJo 4 (Jorhat, Assam) isolate and all the remaining isolates were intermediate in oxalic acid production. The maximum oxalic acid production was observed in the isolates which were producing dark brown scleortial bodies. The isolate which produced the small sized sclerotial bodies produced more oxalic acid and vice versa. This oxalic acid is considered as one of the key pathogenicity factors in *Sclerotium rolfsii*. This might have resulted in suppression of host and increased virulence.

***Keywords**: Soybean, Sclerotium rolfsii, oxalic acid, collar rot*

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Foraging activity of pollinators in guava under organic and conventional farming systems

Madhurima Vinod[1*], Ningaraj Belagalla[2], Manjunath Chouraddi[3], Hugar, P. S[4], Nagaraj, H[5] and Ishwari, G. Hiremath[6]

[1]Assistant Professor, Department of Entomology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)
[2]Assistant Professor, Department of Entomology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)
[3]Senior Scientist and Head, ICAR-KLE KVK Mattikopp, Belagavi
[4]Dean (Agri.) KLE College of Agricultural Sciences, Tenikolla, (Affiliated to UAS Dharwad)
[5]Assistant Professor, Department of Plant Pathology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)
[6]Assistant Professor, Department of Plant Pathology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to UAS Dharwad)
*E-mail: madhu19pvinod@gamil.com. Ph: 8123296898

The activity of bees *viz*., *Apis dorsata*, *Apis florea*, *Apis cerana*, *Tetragonula iridipennis* and other hymenopteran pollinators was noticed foraging in guava under both the ecosystems. The rock bee activity under organic guava ecosystem attained its peak during VIII week after 10 per cent flowering and was on par with VII, IX and X weeks whereas, during IX and X weeks under conventional farming system. The significantly highest activity of little bees under organic ecosystem was recorded during VIII and IX weeks whereas, during X week under conventional ecosystem. The maximum activity of *A. cerana* in guava was observed during VII, VIII and IX weeks under organic ecosystem whereas, during X week under conventional farming system. The maximum activity of all the pollinators was recorded at 1000 hr except for *T. iridipennis*, which were most active at 1200 hr. In general, the foraging activity of pollinators in guava was higher in organic ecosystem as compared to conventional ecosystem. The results of the present investigation strengthen the fact that organic farming system supports higher number of pollinator visitation when compared to conventional ecosystem.

Keywords: *Foraging activity, pollinators, guava, organic, conventional ecosystem*

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Characterizing the Biochemical Diversity of *Ralstonia solanacearum*, causing Bacterial Rhizome Rot Ginger (*Zingiber officinale* Rosc.) under *In vitro* conditions

Nagaraja, H[1]., Murali, R[2], Ishwari Hiremath[1], Ningaraj Belagalla[1] and Ashok Priyadarshan[3]

[1]KLE College of Agricultural Sciences, Tenikolla, Karnataka, 591119, India

[2] KSCSTE–Kerala Forest Research Institute, Peechi, Thrissur, Kerala, 680653, India.

[3]College of Agricultural Sciences, Hasan, Karnataka, 573225, India

(**Corresponding mail**: nhpatkle@gmail.com)

Ginger (*Zingiber officinale* Rosc.) is a high value crop severely affected by bacterial rhizome rot caused by *Ralstonia solanacearum*. This study characterized ten pathogenic isolates of *R. solanacearum* collected from different regions through detailed biochemical profiling. Isolates, cultured on TZC medium at 28±2°C, were analyzed for their morphological, physiological, cultural, and biochemical properties. A series of tests including acid production from carbohydrates, starch hydrolysis, gelatin liquefaction and assays for catalase, urease, hydrogen sulfide, gas production, KOH solubility, and Gram reaction were conducted to assess metabolic diversity. Acid production increased over time, with dextrose and sucrose being more favorable substrates than maltose. In starch hydrolysis, eight isolates showed a clear zone. Hydrogen sulfide production was time dependent, with a few isolates showing a strong positive reaction later. Gelatin liquefaction was initially absent but observed in some isolates after 78 hours. No gas was produced within 24 hours, but all test isolates showed positive results after 72 hours. Urease activity was detected in some isolates after 48 hours, and in all isolates by 78 hours. All isolates were Gram-negative, consistent with their thin peptidoglycan layer, and formed slimy threads in 3% KOH. The catalase test was positive for all isolates except RS-4.This research provides essential baseline data for accurate identification of *R. solanacearum* strains, supports comparison with known references, and aids future molecular and epidemiological studies aimed at improving ginger rhizome rot management.

Keywords: *Ginger, biochemical, rhizome rot and R. solanacearum*

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Fisheries and Coastal Livelihoods: Evaluating the Potentials and Challenges of the Pagui Community in Goa-India.

Ms. Shradha Pagui[1] Ms. Dixita Shinde[2]

[1]Assistant Professor, Department of Geography, Government College Arts, Science & Commerce, Quepem-Goa. Contact-7507991340 shrpagi0794@gmail.com

[2]Assistant Professor, Department of Geography, Government College Arts, Science & Commerce, Quepem-Goa. Contact-9545048945 dixitashinde11@gmail.com

Goa, being a coastal state, is well known for its marine fishing activities. In addition, freshwater and *Khazan* fishing are also prevalent across the state. Several traditional fishing communities such as the Kharvi, Taris, Ramponkars, and Pagui are distributed across Goa, each recognized for their distinctive fishing methods. This research specifically focuses on the Pagui community in the Canacona taluka of Goa, where fishing serves as their primary source of livelihood and a vital aspect of their social identity. The aim of the study is to explore their sustainable fishing practices and the challenges encountered by them, if any. Adopting a mixed-method approach, both qualitative and quantitative data were utilised for the study. The findings reveal that the Pagui community practices several traditional fishing methods such as *Rapon, Paywado, Pagir, Pagop, Angling, Kuthani, Kathalin,* and *Aatto.* These techniques are sustainable in nature and are carried out without causing harm to the environment. Among these, *Paywado, Kathalin,* and *Rapon* methods provide higher economic returns. However, the community currently faces several challenges due to commercial advanced fishing methods, development along the coast, tourism growth, and pollution. The study emphasizes the need for administrative interventions to protect and promote the sustainable fishing practices of this community.

Keywords*: Goa, Coastal, Fishing, Sustainability, Pagui.*

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Effect of nitrogen sources on Alternaria leaf blight of Ashwagandha [*Withania somnifera (*L.) Dunal]

Vibha Pandey, Kartikey Pandey* and Shubham Birla
Department of Plant Pathology, College of Agriculture, JNKVV, Jabalpur, MP-482004
*Corresponding author e-mail:- kartikeyp03@gmail.com

Ashwagandha (*Withania somnifera*) is widely used medicinal plant as its roots, leaves, and seeds contain steroidal lactones called withanolides that contribute in healing several body ailments. However, this crop gets infected with several disease causing pathogens where leaf spot/leaf blight caused by *Alternaria alternata* is the most common in all cultivated areas. Being medicinal crop, its response to macro-nutrient especially with nitrogen (N) is not same as other cereal and pulse crops. The optimum nitrogen rate improves photosynthetic processes, leaf area production, leaf area duration, and the net assimilation rate but in many cases greater use of N fertilizers affected crop disease incidence. In few cases, lower doses of N fertilization increased the severity of the disease, suggesting a complex relationship between host-pathogen interactions. Therefore, an experiment was planned under *in-vitro* and *in-vivo* conditions to evaluate the effect of nitrogen sources. Culture media supplemented with 0.35% concentration of urea was found highly (82.26%) suppressive towards *Alternaria alternata* followed other doses of urea. However, nano-urea @ 1.00 percent was found highly inhibitory towards the pathogen among different doses (0.2%, 0.4%, 0.6 and 0.8%) of nano-urea. Among urea source, 40kg N/ha was recorded superior over others in reducing the disease incidence, disease severity and increasing percent disease control. However, among nano-urea, one percent dose was found superior to other doses.

Keywords: *Ashwagandha, Nitrogen, Disease, Control*

IHASE-2025/253

Comparative Study of Infrared and Radio-Frequency Treatments over Traditional Roasting for Reduction of Anti-Nutritional Factors and Preservation of Nutrients in Millets

Sourabh Ajit Chougala[1], Udaykumar Nidoni[2], Sharanagouda Hiregoudar[3], P.F.Mathad[4], Nagaraj M Naik[5] and Saroja N Rao[6]

[1]Ph.D. Scholar (Agril.Engg.) Department of Processing and Food Engineering, UAS, Raichur-584101

[2]Professor and University Head, Department of Processing and Food Engineering, UAS, Raichur-584101

[3]Professor and Head, Department of Processing and Food Engineering, UAS, Raichur-584101

[4]Associate Professor, Department of Processing and Food Engineering, UAS, Raichur-584101

[5]Associate Professor, Department of Agricultural Microbiology, UAS, Raichur-584101

[6]Assistant Professor, Department of Agricultural Biochemistry, UAS, Raichur-584101

**Corresponding author's email: sourabh.chougala1997@gmail.com*

The study evaluates the effectiveness of novel processing technologies, Infrared (IR) and Radio-Frequency (RF) treatments, compared to traditional roasting in reducing anti-nutritional factors and preserving nutrients in millets. Anti-nutrients such as phytates, tannins and oxalates limit nutrient bioavailability and their reduction is essential for improving millet quality. Results revealed that both IR and RF treatments significantly reduced anti-nutrient content compared to roasting due to uniform and controlled heating. Infrared treatment proved most effective, achieving greater reduction in phytates and tannins while preserving essential amino acids, unsaturated fatty acids, vitamins (especially B-complex and E) and minerals like iron, zinc and calcium. This superior performance is attributed to rapid and uniform surface heating with minimal processing time, reducing oxidation and nutrient degradation. Radio-frequency treatment showed intermediate efficiency, offering substantial anti-nutrient reduction and moderate nutrient retention, while traditional roasting caused greater nutrient losses due to uneven and prolonged heat exposure. Overall, infrared technology emerged as the most promising method for enhancing millet nutritional quality, followed by radio-frequency treatment which offers a viable improvement over conventional roasting for sustainable and nutrient-preserving millet processing.

Keywords*: Infrared treatment; Radio-frequency heating; Roasting; Anti-nutritional factors; Millets*

IHASE-2025/254

Exploring the multifaceted applications of *Nephelium lappaceum* leaf mediated green synthesised silver nanoparticles : Biological role of *Nephelium lappaceum* mediated silver nanoparticles

Avalin K Lincon
(Student, Christ Deemed to be university, avalin.lincon@mbot.christuniversity.in, 7356299152) Joseph K S (Assistant professor, Christ Deemed to be university, joseph.ks@christuniversity.in 8217573958)

Silver nanoparticles (AgNPs) are synthesized using the aqueous extract of *Nephelium lappaceum* L. leaves through an environmentally sustainable, plant-mediated approach. This plant-mediated method serves as a simple, sustainable method to conventional chemical methods. The resulting nanoparticles were characterized using UV visible spectroscopy, FTIR, XRD and SEM techniques. The average size of the nanoparticle was found to be 50-60nm. These synthesized AgNPs showed effective dye degradation activity, against Reactive Yellow and Reactive orange. Cytotoxicity tests revealed a concentration-dependent effect on seed germination and root elongation, indicating possible biological interactions. Their antioxidant capacity, assessed using H_2O_2, DPPH and FRAP assays, showed good free radical scavenging activity. Moreover, when applied to *Trigonella foenum-graecum*, the AgNPs enhanced early plant growth at lower concentrations, suggesting their potential in agricultural improvement.

IHASE-2025/255

Sustainable Innovations in Digital Agriculture and Climate-Responsive Farming for Enhanced Productivity

Farhana Majid
Faculty of Agricultural Sciences (FASC), Shree Guru Gobind Singh Tricentenary University, Gurugram, Haryana, India
Farhana_fasc@sgtuniversity.org +91 7006794326

Sustainable agricultural development requires integrating technological innovations with climate-responsive practices to meet the growing demand for food, nutrition, and environmental resilience. This paper explores emerging advancements in digital agriculture, smart farming tools, and precision technologies and assesses their role in optimizing resource use and improving crop productivity. Key innovations, including sensor-based monitoring, automated irrigation systems, unmanned aerial vehicles (UAVs), and robotics, are evaluated for their effectiveness in reducing input wastage and enhancing decision-making accuracy. The study further examines climate-resilient farming strategies such as organic and natural farming, agroforestry, carbon sequestration practices, and regenerative agriculture models that contribute to long-term soil fertility, biodiversity conservation, and climate mitigation. Additionally, the scope of value addition, nutraceuticals, and advanced food processing technologies is highlighted as a pathway to strengthen farmer income and reduce post-harvest losses. By integrating digital solutions with ecological farming principles, the research emphasizes a holistic approach that connects agriculture, environment, and public health. The findings underscore the potential of multi-disciplinary innovations to transform traditional farming systems and support sustainable, productive, and climate-resilient agri-food systems for future generations.

Keywords: *Sustainable agriculture, digital agriculture, precision technologies, Climate resilience*

IHASE-2025/256

Assessment And Identification of Seed-Borne Fungal Flora in Green Gram (Vigna Radiata) From Rajasthan

Krati Sharma
Department Of Botany, M.S.J. Govt. P.G. College, Bharatpur - 321001, Rajasthan, India.

118 moong seed samples collected from Rajasthan revealed asymptomatic and symptomatic seeds. Symptomatic seeds showed various disorders and were classified into different categories. On incubation these seeds yielded a number of pathogenic as well as saprophytic fungi. A particular discoloration appeared to be caused by particular pathogen/fungi. Seeds with microsclerotia and white crust carried infection of Rhizoctonia bataticola and Fusarium oxysporum, respectively. Brown and black discolored seeds revealed Alternaria species. Aspergillus species was obtained from mouldy seeds.

Keywords: *Fusarium oxysporum, Microsclerotia, Mycoflora, Rhizoctonia bataticola.*

IHASE-2025/257

Comparative Study of Infrared and Radio-Frequency Treatments over Traditional Roasting for Reduction of Anti-Nutritional Factors and Preservation of Nutrients in Millets

Sourabh Ajit Chougala[1], Udaykumar Nidoni[2], Sharanagouda Hiregoudar[3], P.F.Mathad[4], Nagaraj M Naik[5] and Saroja N Rao[6]

[1]Ph.D. Scholar (Agril.Engg.) Department of Processing and Food Engineering, UAS, Raichur-584101

[2]Professor and University Head, Department of Processing and Food Engineering, UAS, Raichur-584101

[3]Professor and Head, Department of Processing and Food Engineering, UAS, Raichur-584101

[4]Associate Professor, Department of Processing and Food Engineering, UAS, Raichur-584101

[5]Associate Professor, Department of Agricultural Microbiology, UAS, Raichur-584101

[6]Assistant Professor, Department of Agricultural Biochemistry, UAS, Raichur-584101

*Corresponding author's email: sourabh.chougala1997@gmail.com

The study evaluates the effectiveness of novel processing technologies, Infrared (IR) and Radio-Frequency (RF) treatments, compared to traditional roasting in reducing anti-nutritional factors and preserving nutrients in millets. Anti-nutrients such as phytates, tannins and oxalates limit nutrient bioavailability and their reduction is essential for improving millet quality. Results revealed that both IR and RF treatments significantly reduced anti-nutrient content compared to roasting due to uniform and controlled heating. Infrared treatment proved most effective, achieving greater reduction in phytates and tannins while preserving essential amino acids, unsaturated fatty acids, vitamins (especially B-complex and E) and minerals like iron, zinc and calcium. This superior performance is attributed to rapid and uniform surface heating with minimal processing time, reducing oxidation and nutrient degradation. Radio-frequency treatment showed intermediate efficiency, offering substantial anti-nutrient reduction and moderate nutrient retention, while traditional roasting caused greater nutrient losses due to uneven and prolonged heat exposure. Overall, infrared technology emerged as the most promising method for enhancing millet nutritional quality, followed by radio-frequency treatment which offers a viable improvement over conventional roasting for sustainable and nutrient-preserving millet processing.

Keywords*: Infrared treatment; Radio-frequency heating; Roasting; Anti-nutritional factors; Millets*

IHASE-2025/258

Organic and Inorganic Fertilizers Effect on Growth and Yield in Coriander

G. Mani Deepak[1], G. Chandra Shekhar[2], K. Harish Kumar[3] and CH. Shanmukhi[4]

[1.] M.Sc. Student, Department of Horticulture, Malla Reddy University.

[2.] Assistant Professor, Department of Horticulture, Malla Reddy University.

[3.] Assistant Professor, Department of Agricultural Microbiology, Malla Reddy University.

[4.] Assistant Professor, Department of Horticulture, Malla Reddy University.

Coriander is an annual herb, mainly cultivated for its fruits as well as for the tender green Leaves. The experiment has been eight treatments and three replications with different combinations of organic and inorganic fertilizers Among the different treatment combination, maximum plant height (46.9 cm), number of branches per plant (10.5) number of leaves per plant (10.6), leaf yield per plant (3.4g), leaf yield per plot (211.3g), umbels per plant (41.5), umbellate per umbels (7.9), seeds per umbellate (6.4), seed yield per plant (7.7g), seed yield per plot (487.4g) were observed with treatment combination of T7 (RDN (100%) + Vermicompost + Neem cake). The highest B: C ratio (1.7) was observed with the treatment combination of T7 (RDN (100%) + Vermicompost + Neem cake) with cost of production (Rs. 1,89,624/-) gross return (1,22,245/-) and net profit (67,379/-). Tt can be concluded that growing of coriander with the combined use of organic manures and biofertilizers soil inoculation was found better growth and yield on field.

Keywords: *Coriander, Inorganic Fertilizers, Organic fertilizers, Trichoderma and Vermicompost.*

IHASE-2025/259

Effect on Growth and Yield of Mungbean [*Vigna radiata* (L). Wilczek] through Agronomic fortification of Micronutrients under Western Rajasthan

Preeti Devatwal[1], M.L. Mehriya[2] , M. L. Reager[4] and S.K Yadav[4]
[1]Research Scholar, Department of Agronomy, Agriculture University, Jodhpur
Associate professor, Department of Agronomy, Agriculture University, Jodhpur
Professor, Department of Agronomy, SKRAU, Bikaner
Assistant Professor, Department of Agronomy, AU, Kota
Corresponding mail ID: preetiwal9@gmail.com

A field experiment was carried out at Instructional Farm, College of Agriculture, Jodhpur (Rajasthan) in the *Kharif* season 2022 and 2023. Geographically, it is located between 26º 15' N to 26º 45' North latitude and 73º 00' E to 73º 29' East longitude at an altitude of 231 meter above mean sea level. The field experiment was laid out in Split-Split Plot Design (SSPD) with twenty-four treatment combinations and replicated thrice. The main plot treatments consisted of a combination of two factors *viz*, two varieties namely GM 7 and GM 4 and three levels of iron fortification levels namely control (Fe_0), soil application of 20 kg $FeSO_4$ + 0.5% Fe foliar spray at flower initiation and pod formation stages (Fe_1) and soil application of 25 kg $FeSO_4$ + 0.5% Fe at flower initiation and pod formation stages (Fe_2) in subplots. In sub-sub plots, seed inoculation with zinc solubilizing bacteria (ZSB) was combined with different doses of zinc sulphate with 0.5 % Zn foliar spray at flower initiation and pod formation stages and there were four treatments *víz*, control (Zn_0), ZSB (SI) + 15 kg $ZnSO_4$/ha + 0.5 % Zn foliar spray at flower initiation and pod formation stages (Zn_1), ZSB (SI) + 15 kg $ZnSO_4$/ha + 0.5 % Zn foliar spray at flower initiation and pod formation stages (Zn_2), ZSB (SI) + 25 kg $ZnSO_4$/ha + 0.5 % Zn foliar spray at flower initiation and pod formation stages (Zn_3) cropping have plot size 5x3m. Among the treatments and correlation study indicates that higher growth parameters viz., plant height, dry matter accumulation, RGR, CGR, chlorophyll content etc. and yield and yield attributes recorded by variety GM4 , 20 kg $FeSO_4$ soil application and foliar application 0.2 %,20 kg $ZnSO_4$ and foliar application of Zn 0.2 % with ZSB.

Key words: *Mungbean, ZSB, Iron and Zinc etc.*

IHASE-2025/260

Advanced Breeding Approaches for Genetic Improvement of Field Pea

Dr Kanak Saxena, Dr Sheuli Roy, Dr Anil Kumar
Department of Plant Breeding and Genetics,
Bihar Agricultural University (BAU) Sabour, Bihar, 813210

Field pea (*Pisum sativum* L.) is an important cool-season legume crop valued for its high protein content, nutritional quality, nitrogen-fixing ability, and role in sustainable cropping systems. However, its productivity is constrained by several biotic and abiotic stresses, along with limitations related to yield potential, climate vulnerability, and narrow genetic diversity. Modern breeding approaches offer new opportunities to accelerate genetic gains, develop climate-resilient cultivars, and enhance the overall productivity and stability of field pea.

Conventional breeding methods such as pedigree selection, backcross breeding, and mutation breeding have contributed significantly to varietal development, but their efficiency is often limited by long breeding cycles and dependence on phenotypic selection. Integration of molecular tools has revolutionized field pea breeding by enabling precise, rapid, and targeted improvement. Marker-assisted selection (MAS), quantitative trait loci (QTL) mapping, and genome-wide association studies (GWAS) have facilitated the identification of genomic regions linked with key traits such as resistance to powdery mildew, rust, and Ascochyta blight, as well as tolerance to drought and heat stress.

Advances in high-throughput phenotyping and genotyping technologies have further strengthened genomic selection (GS), which predicts breeding values using genome-wide markers and accelerates the development of superior lines. Molecular diagnostics and DNA barcoding are improving varietal purity assessment and germplasm characterization. Emerging approaches such as genome editing using CRISPR/Cas systems offer tremendous potential to introduce or modify specific genes governing traits like disease resistance, seed quality, and plant architecture with high precision.

In addition, speed breeding techniques allow multiple generations per year, reducing breeding cycle duration and enabling rapid introgression of desirable traits. Integration of bioinformatics, transcriptomics, proteomics, and metabolomics is enhancing our understanding of stress responses and supporting the development of climate-smart field pea varieties.

Overall, the amalgamation of conventional breeding with modern genomics, precision phenotyping, genome editing, and speed breeding represents a comprehensive strategy to enhance genetic gain and ensure sustainable field pea improvement.

Keywords: *Pisum sativum, Marker-assisted selection, Genome editing, High-throughput phenotyping, Climate resilience, Genetic improvement.*

IHASE-2025/261

Response of African Marigold cv. Pusa Narangi Gainda to Integrated Organic Nutrient Management in the Mid-Hill Region of Sikkim

Dipika Sarmah*[1], S. Vinodh[1], A. K. Pandey[2]

[1]Department of Floriculture & Landscaping, College of Horticulture, Central Agricultural University, Imphal, Bermiok, Sikkim -737134

[4]Department of Vegetables Science, College of Horticulture, Central Agricultural University, Imphal, Bermiok, Sikkim -737134

*Corresponding Email id: dsdipikasarmah@gmail.com

The present experiment was conducted at College of Horticulture (Central Agricultural University, Imphal), Bermiok, Sikkim to study the response of African Marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda to integrated organic nutrient management in the Sikkim in respect of growth, flower and yield. The experimental design was laid out in a Randomized Block Design with three replication and eight treatment combinations, viz. T_1: FYM (20 t/ha), T_2: Poultry manure (6 t/ha), T_3: Goat manure (10 t/ha), T_4: FYM+ PSB (200g/m^2), T_5: FYM +VAM (100 g/m^2), T_6: FYM + PSB + VAM, T_7: FYM+ P.M +G.M with control (T_8). The experimental result showed that maximum plant height (56.45 cm), plant spread (41.13cm), stem girth (1.00 cm), no of branches per plant (26.06), Days to flower bud initiation (44.50), Days to 50% flowering (70.96), Flowering Duration (86.00), No. of flowers/plant (34.22), Flower diameter (7.18 cm), Length of flower stalk (6.76 cm), Weight of the flower (13.00 gm) and Flower yield/plant (709.56 gm) was observed with T_7 and lowest was observed in control. Hence among all the treatment T_7 has a positive impact on plant growth, flower and yield attribute of African Marigold cv. Pusa Narangi Gainda.

Key words: *Organic nutrient management, FYM, goat manure, poultry manure, phosphate solubilizing bacteria, VAM*

IHASE-2025/262

Targeted Enrichment of Elephant endotheliotropic herpesvirus for Complete Genome Sequencing in Elephants

Kirtika Sharma[1,2], K.G. Sai Balaji[4], Gaurav Kumar Sharma[1], Abhijit M. Pawde[1], Sonalika Mahajan[5], Ravikant Agrawal[3], Pracheta Janmeda[2] and Karikalan Mathesh[1*]

1. Centre for Wildlife Conservation Management and Disease Surveillance, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, Bareilly 243122, India
2. Department of Bioscience and Biotechnology**,** Banasthali Vidyapith, Tonk, Rajasthan, 304022, India
3. Biological Products Division, ICAR-Indian Veterinary Research Institute, Izatnagar Bareilly, Izatnagar Uttar Pradesh 243122, Uttar Pradesh, India
4. CADRAD, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, Bareilly 243122, India
5. Biological Standardization Division, ICAR-Indian Veterinary Research Institute, Izatnagar Bareilly, Izatnagar Uttar Pradesh 243122, Uttar Pradesh, India

Elephant endotheliotropic herpesvirus (EEHV) presents a significant threat to juvenile Asian (Elephas maximus) and African elephants (Loxodonta africana), often resulting in fatal acute hemorrhagic symptoms due to vascular endothelial damage. While the virus remains latent in adult elephants, reactivation is linked to stress or immune suppression. Genetic heterogeneity among EEHV subtypes, including EEHV1A and EEHV1B, contributes to variations in disease severity and host susceptibility. EEHV's large genome, encompassing over 115 open reading frames, underpins its mechanisms for replication and immune evasion. Determining complete genome sequences is critical for accurate genotype identification. However, research on EEHV is hindered by the inability to culture the virus in vitro, limiting the study of its life cycle and pathogenesis. Additionally, the variable viral loads in infected tissues challenge direct DNA sequencing approaches.

To overcome these limitations, various DNA and viral enrichment strategies were evaluated. Ultracentrifugation emerged as the optimal method for concentrating viral particles, significantly enhancing the yield of viral DNA for genomic analyses. This technique mitigates challenges associated with low viral loads and host DNA contamination, enabling improved detection and characterization of EEHV. By facilitating more comprehensive diagnostics and fostering advancements in therapeutic and vaccine development, ultracentrifugation addresses key obstacles in EEHV research, paving the way for innovative strategies to combat this critical threat to elephant conservation.

Keywords: *EEHV, virus enrichment, ultracentrifugation, next generation sequence*

IHASE-2025/263

One health approach for prevention and control of Zoonotic diseases: Role of Animal Shelters in North Goa and their Challenges, Opportunities, and Future Directions

Suman V. Tari
Assistant Professor in Zoology
Government College of Arts, Science and Commerce, Sanquelim Goa, 403505.
Mobile no: 8007680737
E mail ID: suman.tari@gcsanquelim.ac.in

The present study explores the crucial role of animal shelters in North Goa in managing stray populations and controlling zoonotic diseases. The present study also aims to address the operational challenges animal shelters face in North Goa. This research highlighted the importance of community involvement in supporting shelter initiatives and ensuring a sustainable approach to animal welfare. The study was undertaken in North Goa district comprising of five talukas. Data collection was done by conducting on-site visits at selected shelters. A pre-designed questionnaire comprising of 22 questions were given to the animal shelters employees to gather data. Altogether 4 animal shelters and 2 Gaushalas (Cow shelters) were considered for the present study.

100 % of animal shelters studied provide sterilization programs to control the stray animal population, vaccinations to prevent the spread of diseases, and awareness campaigns to promote responsible pet ownership. PAWS, WVS, AFA, and Gaushalas at Shikeri and Valpoi play a significant role in providing shelter, medical care, and adoption services.

100 % shelters reported overcrowding in shelters, PAWS Panaji being a city hub was the most overcrowded. The staff in Indian shelters tackled different kinds of problems, such as care of free-ranging dogs. Participants also reported inadequate funding, community conflict, and too many animals in need created a challenge for animal shelter work. Future directions include increased government support, community awareness and engagement, collaboration with veterinary clinics and improving adoption strategies.

Key words: *Zoonotic diseases**,** Animal shelters, stray population, North Goa, community engagement.*

IHASE-2025/264

Multi Epitopic Based Subunit Vaccine Design Against Emerging Tilapia Parvovirus: A Computational Approach

Isha kumari[1], K Thangadurai[1], M Supradhnya Namdeo[1], Gayatri Tripathi[1], Bharathi Rathinam[1], Dhwani Jhala[2], Ritik Thumar[2], Amrutlal Patel[2], Megha K Bedakar[1]*

[1]ICAR- Central Institute of Fisheries Education, Mumbai, India
[2]Gujrat Biotechnology Research Centre, Gandhinagar, Gujarat, India

Tilapia parvovirus (TiPV) is an emerging viral pathogen and responsible for severe economic loss in tilapia culture production. Parvoviruses are a diverse group of viruses that are capable of infecting a wide range of animals. the discovery of a novel parvovirus, tilapia parvovirus HMU-HKU, in the fecal samples of crocodiles and intestines of tilapia in Hainan Province, China. TiPV virions are spherical in shape, non-enveloped and approximately 30nm in diameter. Therefore, a vaccine based on epitopes developed using immunoinformatics methods was developed against TiPV in fish. The Viral protein 1 (VP1) gene was used to identify immunodominant T- and B-cell epitopes. Three probable epitopes were used to design the vaccine: CTL, HTL, and LBL. Testing of the final vaccine revealed that it was antigenic, non-allergenic, and has improved solubility. Molecular dynamics simulation revealed significant structural compactness and binding stability. Furthermore, the computer-generated immunological simulation indicated that immunization might stimulate real-life immune responses following injection. Overall, the findings of the study imply that the designed epitope vaccine might be a good option for prophylaxis for TiPV.

Keywords: *TiPV; B-Cell epitopes; T-cell epitopes; Multiepitope based Vaccine; immunoinformatics; molecular docking; Desmond tool (Schrödinger) simulation*

IHASE-2025/265

Synergistic Effects of GA_3, NAA and Growth Retardants on Growth Dynamics, Seed germination, Yield Attributes and Fruit Quality of Okra

***Mrs. Pushpanjali Pankaj[1], Dr. Toran Lal Sahu[2] and Mr. Suresh Kumar[1]**

[1]Assistant Professor, College of Horticulture & Research Station, Hathini, Bilaspur (C.G.)

[2]Dean, College of Horticulture & Research Station, Hathini, Bilaspur (C.G.)

Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg (C.G.)

*****Author for correspondence: email:- *pushpanjalipankaj@gmail.com,* Mobile No. 6263558552

A review on plant growth regulators (PGRs) clearly influences the growth, yield and nutritional quality of okra (*Abelmoschus esculentus* L.). GA_3 consistently promotes vegetative vigor, with applications of 150–200 ppm producing the tallest plants (up to 253.3 cm) and the highest yields, reaching 324.87 g plant^{-1}. NAA at 20–50 ppm improves reproductive efficiency by increasing flowers per plant, fruit set, fruit length (up to 16.58 cm), fruit weight (16.47 g) and advancing 50% flowering to as early as 40.40 days. Growth retardants such as cycocel, ethrel, and cultar effectively restrict plant height (as low as 132.33 cm), reduce internodal length (4.64 cm) and increase leaf production (up to 41.71 leaves per plant), while also enhancing yield (e.g., 0.250 kg per plot with CCC at 300 ppm). Combined PGR treatments exhibit synergistic effects, with GA_3 + NAA at 50–75 ppm producing higher pod numbers, increased pod length (12.37 cm) and superior fruit yield (up to 215.55 q ha^{-1}). GA_3 (150 ppm) + NAA (150 ppm) significantly increased vitamin C content by 19.31–22.83%, total soluble solids (TSS) by 50.57–81.20%, magnesium by 18.07–22.73% and zinc by 21.43–33.33% compared to untreated controls. Growth retardants, particularly ethrel and CCC, improved chlorophyll content, while ethrel at 300 ppm also increased ascorbic acid levels. Gibberellic acid (GA_3) at 75 ppm resulted in the earliest germination (6.00 days) and highest germination percentage, 92.38%. This same treatment (GA_3 75 ppm) also showed maximum plant height, branches, and yield (158.18 q/ha), almost double the control (71.05 q/ha). GA_3 50 ppm as a foliar spray (also 50 ppm) showed minimal days to start germination (2.07 days) and achieved 100% germination by 9.35 days. Also, this treatment gave the highest test weight (7.84 g) and good seedling shoot length (16.24 cm). A long-term field trial found that foliar spray of GA_3 + NAA (200 + 200 ppm) significantly increased germination percentage of harvested seed and the 1000-seed weight.

Key word: *plant growth regulators (PGRs), growth, yield, nutritional quality, okra*

IHASE-2025/266

Diversity and Characterization of *Fusarium* Species Associated with Pokkah Boeng Disease in Maize from Karnataka

Supriya B K[1]*, S. I. Harlapur[2], Gurupada B. Balol[2], Basavaraj Bagewadi[3], S C Talekar[4], Prema G U[4], S R Salakinakoppa[4] and R M Kachapur[4]

[1] Junior Research Fellow IARI's Regional Research Centre, Dharwad 580005

[2]Department of Plant Pathology, College of Agriculture, UASD, Dharwad 580005

[3] Institute of Agri-Biotechnology (IABT), UASD, Dharwad 580005

[4] AICRP on Maize UAS Dharwad 580005, Karnataka

*Email: supriyakusnoore46@gmail.com

Pokkah boeng disease, an emerging threat to maize and a major concern for sugarcane and sorghum cultivation, has been reported in several countries, including India, China, Malaysia, and Brazil. The disease is mainly caused by a complex of *Fusarium* species, notably *F. verticillioides*, *F. proliferatum*, *F. sacchari*, *F. equiseti*, *F. incarnatum*, *F. brachygibbosum*, and *F. acutatum*. Affected maize plants typically exhibit foliar chlorosis, leaf twisting and wrinkling and the characteristic top rot symptom, which often results in stunted growth and yield loss. In the present study, maize samples showing Pokkah boeng symptoms were collected from various locations and subjected to morphological and molecular characterization at the Department of Plant Pathology, Dharwad, during the *Kharif* 2022–24. Morphological examination revealed considerable variation in conidial shape and size among the isolates. Notably, the Basavana Bagewadi isolate produced chlamydospores, whereas other isolates did not. Genomic DNA was extracted from pure cultures using the CTAB method for molecular identification. The ITS region was amplified using ITS1/ITS4 primers and sequenced. BLAST analysis of the resulting sequences showed high similarity with known *Fusarium* species: the Basavana Bagewadi isolate displayed 99.80% homology with *F. brachygibbosum* (MH368604), the Bailhongal isolate matched *F. proliferatum* (OQ422696) at 99.80%, the Dharwad isolate showed 99.76% similarity with *F. verticillioides* (ON949921), and the Belagavi isolate exhibited 99.60% homology with *F. equiseti* (OQ421745). These results confirm that Pokkah boeng disease in maize is incited by a species complex rather than a single *Fusarium* species, highlighting significant pathogen diversity and adaptability across geographic regions and host crops. The presence of multiple *Fusarium* species emphasizes the importance of integrated disease management approaches, including the deployment of resistant cultivars, adoption of crop rotation, and implementation of precise pathogen detection through molecular diagnostics.

Keywords*: Fusarium, Pokkah boeng, characterization and Maize*

IHASE-2025/267

Impacts of Climate Change on Marine Ecosystem

B. Sureandiran[1*], Shivani Tandel[2]
[1]Faculty of Fisheries Science, Kerala University of Fisheries and Ocean Studies, Kochi 682 506, India
[2]Department of Fisheries Resource Management, College of Fisheries Science, Kamdhenu University, Veraval, Gujarat-362265
*Corresponding author mail Id: sureandiranbfsc@gmail.com
*Phone no.: +91-9600900511

Climate change is driving profound changes in marine ecosystems, altering their structure, functioning, and productivity. Rising sea surface temperatures, ocean acidification, sea-level rise, and increasing frequency of extreme weather events are reshaping species distribution, community composition, and trophic interactions. Many commercially important marine species are shifting poleward or moving to deeper waters, leading to changes in catch patterns, altered spawning grounds, and mismatches in food availability. Coral bleaching, habitat degradation, and loss of coastal ecosystems such as mangroves and seagrass beds further reduce marine biodiversity and ecosystem resilience. For fisheries, these changes translate into uncertain stock availability, reduced recruitment, and higher vulnerability of dependent coastal communities. Climate-driven alterations in monsoon patterns and upwelling intensity also affect primary productivity and fishery yields in tropical regions. Small-scale fishers, particularly in developing nations, face increasing risks due to declining fish stocks, weather unpredictability, and reduced livelihood security. Effective adaptation strategies require integrating climate models with fisheries management, strengthening ecosystem-based approaches, enhancing early warning systems, and promoting climate-resilient livelihoods. Overall, understanding and responding to climate-induced impacts is essential for conserving marine ecosystems and ensuring long-term sustainability of global and regional fisheries.

Keywords *Coral Bleaching, Fisheries, Marine Biodiversity, Ocean Acidification, Ocean Warming.*

IHASE-2025/268

Role of Artificial Intelligence in Fisheries Sector

Shivani Tandel
Department of Fisheries Resource Management, College of Fisheries Science, Kamdhenu University, Veraval, Gujarat-362265
Corresponding author email: shivanitandel201093@gmail.com

Artificial Intelligence (AI) is emerging as a powerful tool for transforming fisheries by improving efficiency, accuracy, and sustainability. Globally, AI applications such as machine learning, computer vision, remote sensing, and automated data processing are increasingly used for fish stock assessment, species identification, bycatch reduction, habitat mapping, and forecasting climate-driven changes in marine ecosystems. AI-enabled systems support real-time monitoring of fishing vessels, improve compliance, detect illegal, unreported and unregulated (IUU) fishing activities, and enhance traceability across the seafood value chain. In the India, AI adoption is growing rapidly due to government initiatives, research support and digital innovations. Tools such as Potential Fishing Zone (PFZ) forecasts, satellite-based weather alerts, and predictive models for ocean conditions are already helping marine fishers enhance catch efficiency and safety. AI is also being integrated into inland fisheries and aquaculture through automated species recognition, plankton analysis, fish disease prediction models, smart feeding systems, and real-time water quality monitoring. These innovations contribute to better resource management, reduced operational costs, and improved productivity. AI-driven platforms are also strengthening governance through vessel tracking, fisheries data analytics, and monitoring of protected and sensitive ecosystems. While the opportunities are significant, challenges such as limited high-quality datasets, cost of advanced tools, and low digital literacy still constrain large-scale adoption. Strengthening capacity building, data-sharing frameworks, and partnerships between research institutions, industry and fishing communities will be essential for maximizing AI's role in sustainable fisheries development.

Keywords *Aquaculture, Capture fisheries, Machine Learning, Predictive Tool, Sustainability,*

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Agro-forestry and Smart Agri-Tech: A Pathway to Sustainable Environmental Management

***Dayanand Sai Painkra[1] and Vimal Ratre[1]**
[1] Govt. Kaktiya Post Graduate College Jagdalpur,
Corresponding author- Dayanand Sai Painkra, Govt. Kaktiya Post Graduate College Jagdalpur , 92daya@gmail.com and 9098131882

Sustainable environmental management has become essential amid growing challenges such as climate change, land degradation, food insecurity, and declining biodiversity. Agro-forestry, when combined with modern smart agri-tech solutions, provides an effective and holistic framework for building climate-resilient and productive agricultural systems. Agro-forestry enhances ecological stability by integrating trees with crops and livestock, which improves soil fertility, water conservation, biodiversity, and long-term carbon sequestration. This diversified system also strengthens food and nutritional security by supplying fruits, fodder, timber, and ecosystem services that support rural livelihoods.

Smart agri-tech innovations—such as remote sensing, GIS, drones, IoT sensors, automated irrigation, and AI-based decision tools—further enhance farm productivity through precise monitoring and optimized resource use. These technologies support efficient water management, targeted nutrient application, early pest detection, and real-time climate adaptation strategies. By reducing input wastage and production costs, smart farming strengthens economic viability for small and marginal farmers.

Digital agriculture platforms also play a critical supporting role by improving access to weather forecasts, market information, crop advisories, and financial services. The integration of traditional agro-forestry practices with modern digital tools leads to improved resilience, reduced environmental pollution, and long-term sustainability of agricultural landscapes.

Overall, combining agro-forestry with smart agri-tech provides a forward-looking pathway to sustainable environmental management, enhanced rural livelihoods, and resilient food systems.

Keywords: *Agro-forestry, Smart Agri-Tech, Environmental Management, Climate-Smart Agriculture*

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Organic Farming Practices for Sustainable Agricultural Development

Dr.M.Ganga Devi, Krishi Vigyan Kendra, Guntur, Andhra Pradesh

Organic farming is a cornerstone of sustainable agriculture, aiming to harmonize production with ecological principles by minimizing synthetic inputs and enhancing natural processes. This paper examines the key practices and benefits of organic farming in the context of agroecology, regenerative agriculture, and natural farming. Core practices, such as composting, green manuring, crop rotation, and the use of organic inputs like biofertilizers and neem-based pest controls, improve soil health, nutrient cycling, and biodiversity. These methods not only enhance soil structure and fertility but also reduce dependence on external chemical inputs, mitigating soil degradation, water pollution, and greenhouse gas emissions.

Incorporating organic farming with agroecological principles strengthens ecosystem services, such as pollination, pest control, and carbon sequestration, contributing to climate resilience. Regenerative practices such as minimal tillage and agroforestry enhance soil regeneration, increase water retention, and promote biodiversity. Case studies demonstrate that organic systems can yield comparable or higher productivity than conventional methods, particularly in regions transitioning to sustainable agriculture.

Although challenges such as higher labor intensity, market access, and certification costs remain, the economic, environmental, and social benefits of organic farming are substantial. Organic systems foster rural livelihoods, promote food security, and improve health outcomes by reducing exposure to harmful chemicals. By scaling up research, improving extension services, and enhancing market linkages, organic farming can play a pivotal role in achieving sustainable agricultural development, food sovereignty, and environmental sustainability.

Keywords: *Organic farming, sustainable agriculture, food security, climate resilience, regenerative agriculture*

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Antimicrobial Resistance Profile with Focus on Colistin-Resistant Enterobacteriaceae in Pet Dogs: A One Health Issue

Archana Saraf [1], Shiv Varan Singh [2*], Prasanna Vadhana[3], Monika Bhardwaj[4], Bhoj Raj Singh [5] Vinodhkumar O. Rajendran [6], Dharmendra K Sinha [7], B.S. Pruthvishree [8], Shikha Tamta [9], K R Nirupama [10]

1. Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
2. Assistant Professor, Department of Veterinary Microbiology, College of Veterinary and Animal Sciences, Kishanganj, BASU, Patna, Bihar, 855107
3. Assistant Professor, Department of Veterinary Microbiology, College of Veterinary and Animal Sciences, Datia, RLBCAU, Jhansi, 284003, Uttar Pradesh, India
4. Assistant Professor, Department of Veterinary Microbiology, DGCN COVAS, CSKHPKV, Palampur, Himachal Pradesh, India
5. Principal Scientist, Head, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
6. Principal Scientist, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
7. Principal Scientist, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
8. Division of Epidemiology, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
9. Division of Epidemiology, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
10. Division of Epidemiology, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India

*Corresponding Email id: shivvaransingh1988@gmail.com, Mob. No. 81718863896

The global rise of MDR gram-negative bacteria is persistently alarming and represents an increasing threat to health of animals as well as humans. Colistin (polymixin E) is a cationic, multicomponent lipopeptide antibacterial agent killing most of the gram-negative bacteria (including *Acinetobacter*, *Pseudomonas*, *Escherichia* and *Klebsiella* species) through disrupting the cell membrane. In view of importance of colistin in modern therapeutics and emergence of resistance to it, the present study was conducted to understand the occurrence of colistin resistant Enterobacteria and associated epidemiological factors in dogs. In the study, 216

perianal swabs of dogs and hand swabs from 58 dog owners were collected along with information of breed, age, sex, health status and antibiotic used in dog. Samples were collected from TVCC, Referral Veterinary Polyclinic, Indian Veterinary Research Institute as well as from Bareilly (Uttar Pradesh) and nearby localities. A total of 478 bacterial isolates were identified belonging to different species like *Escherichia coli* (336), *Enterobacter agglomerans* (14), *Citrobacter freundii* (1), *Proteus mirabilis* (56), *Proteus penneri* (4), *Klebsiella pneumoniae* (33) and *Pseudomonas aeruginosa* (34) (not included in Enterobacteriaceae). The bacterial isolates were tested for antibiotic sensitivity by disk diffusion assay against antimicrobials including amoxicillin and clavulanic acid (AMC, 30µg), ampicillin (AMP, 10µg), aztreonam (AT, 30µg), cefepime (FEP, 30µg), cefotaxime (CTX, 10µg), cefotaxime and clavulanic acid (CTX-CLA, 30/10µg), cefoxitin (FOX, 30µg), ceftazidime (CAZ, 30µg), ceftriaxone (CRO, 30µg), cephalexin (CN, 30µg), chloramphenicol (C, 30µg), ciprofloxacin (CIP, 5µg), colistin (CL, 10µg), cotrimoxazole (SXT, 23.75/1.25µg), erythromycin (E,10µg), gentamicin (GM, 10µg), imipenem (IPM, 10µg), meropenem (MRP, 10µg), moxalactam (MOX, 30µg), nalidixic acid (NA, 30µg), nitrofurantoin (N/F, 300µg), piperacillin (PIP, 100µg), piperacillin and tazobactam (TZP, 110µg), streptomycin (S, 10µg), tetracycline (TE, 30µg), tigecycline (TGC, 15µg), vancomycin (VA, 5µg), ajowan oil (2µL), carvacrol (2µL), cinnamon oil (2µL), guggal oil (2µL), lemon grass oil (2µL), patchouli oil (2µL) and thymol (2µL). The EDTA disk (~1900 µg) was put close to carbapenem disk to look for synergy as an indicator of metallo-β-lactamase production. Out of the 478 isolates of bacteria tested, 64 were resistant to colistin (5 *E. coli*; 1 *C. freundii*; 52 *P. mirabilis*; 4 *P. penneri* and 2 *P. aeruginosa*). However, using MIC methods to determine colistin resistance only 61 isolates (56 *P. mirabilis*, 4 *P. penneri* and 1 *C. freundii*) were found to be resistant. The statistical analysis revealed that resistance to colistin was significantly more often in *Proteus* (93.33%) strains than in of *Pseudomonas* (p= 5.263E-17; 5.88%) and *E. coli* (p= 1.20E-73; 1.49%) isolates. Despite repeated attempts mcr-1 gene could not be detected either in chromosomal DNA or plasmid DNA preparations of any of the isolates in the study using PCR. The bacterial isolates from dogs were significantly more often resistant (15.63%) to colistin (p= 0.001) than those from their owners (1.33%). *Escherichia coli* could be isolated both from dogs and their owners respectively in case of 67 pairs, similarly *P. aeruginosa* from 3 pairs, and *K. pneumoniae* from 2 pairs. Although *P. aeruginosa*, *K. pneumoniae* and *E. coli* strains isolated from dogs and their owners were apparently similar but could be the paired isolates of from a dogs and their owner. Distribution of colistin resistant isolates in dogs was independent of their sex or age and health status. However, breed of dog appeared as an important determinant to affect carriage of colistin resistant bacteria by dogs. Colistin resistant bacteria were more commonly isolated

from Great Dane (21.43%; p= 0.002), Labrador (17.42%; p= 0.002), German Shepherd (14.29%; p= 0.01), Pug (14.29%; p= 0.02), Mongrel (13.77%; p= 0.01) and Rottweiler (13.04%; p= 0.03) than from Indian Spitz (1.59%). There was a positive correlation between sensitivity of bacteria to colistin and tigecycline (p= 0.0005), imipenem (p= 0.005), nalidixic acid (p= 0.025), gentamicin (p= 0.05), chloramphenicol (p= 0.005), nitrofurantoin (p= 0.0005), tetracycline (p= 0.025), erythromycin (p= 0.0005) and patchouli oil (p= 0.05) but had negative correlation with sensitivity of bacteria to piperacillin (p= 0.05), ceftriaxone (p= 0.005), piperacillin + tazobactam (p= 0.005), and carvacrol (p= 0.01). Most of the screened dogs were previously treated with antibiotics and ceftriaxone and its combination was the drug of choice. Resistance to ceftriaxone in bacteria isolated from ceftriaxone treated dogs was higher (83.65%) than in bacteria isolated from non-ceftriaxone treated dogs (80.21%). The study revealed that out of all members of Enterobacteriaceae family isolated from dogs and their owner only Proteus spp. (93.33%) and *C. freundii* strains had resistance to colistin. Though phenotypically 61 strains were confirmed colistin resistant, mcr-1 gene responsible for transferable colistin resistance could not be detected in any of the strains. Colistin resistance was more common in bacterial isolates from dogs (15.63%) than from their owners (1.33%). Indian Spitz was identified as the least prone breed of dogs to carry colistin resistant bacteria and Great Dane (21.43%) as the most prone breed for colonization of colistin resistant bacteria on perianal region followed by Labrador (17.42%), German Shepherd (14.29%), Pug (14.29%), Mongrel (13.77%) and Rottweiler (13.04%). Ceftriaxone resistance in isolates from dogs previously treated with the same drug was more common (83.65%) than in isolates from dogs not-treated with ceftriaxone (80.21%). The study indicated that transferrable colistin resistance is not common in bacteria isolated from perianal region of pet dogs and from hands of their owners in and around Bareilly.

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Evaluation of fenugreek (*Trigonella foenum-graecum* L.) collections for growth and seed yield

Rajeshwari S. Durgad, Vishwanath Y C, Vijayakumar B Narayanapur, Rekha B Chittapur, Venkateshalu and Lokesh M S
Department of Plantation, Spices, Medicinal and Aromatic Crops
College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India
*Email I.D: rajeshwari.durgad@gmail.com

Fenugreek (*Trigonella foenum-graecum* L.) is an important seed spice crop cultivated worldwide for multiple purposes, including seed production, green leafy vegetable consumption, and forage. The seeds are extensively used as a spice and condiment in both oriental and occidental cuisines. Beyond its culinary significance, fenugreek is a rich source of bioactive compounds such as galactomannan, sapogenins (e.g., diosgenin), 4-hydroxyisoleucine and trigonelline, all of which confer notable health benefits. An investigation was conducted during 2023-24 at the College of Horticulture, Bagalkot, to evaluate the performance of different fenugreek collections under the northern dry zone of Karnataka. A total of 55 genotypes were assessed for growth and yield attributes. Among these, genotype DFC-24 recorded superior performance with the highest plant spread (621.55 cm^2), number of branches per plant (12.20), number of pods per plant (55.50), pod length (12.23 cm), number of seeds per pod (14.23), test weight (16.69 g), and seed yield per plant (7.57 g). In contrast, the maximum plant height (65.85 cm) was observed in DFC-5. Based on these findings, DFC-24 may be considered a promising genotype for cultivation under the northern dry zone of Karnataka, owing to its superior growth and yield performance.

Keywords: *Fenugreek, genotype evaluation, seed yield and northern dry zone of Karnataka*

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Ecological Weed Management: A Sustainable Approach for Modern Agriculture

Gaurav[1]*, K. B. Anand[2], D.N. Singh[3], A.K. Singh[4] and Rahul Kumar[5]
[1,2,3,4]Department of Agronomy, Faculty of Agriculture, Udai Pratap College, Varanasi-221002
[5]Department of Agronomy, Institute of Agricultural Sciences, BHU, Varanasi-221005
*gauraviasbhu@gmail.com

Ecological weed management represents a holistic approach that differs fundamentally from conventional weed control methods. Instead of relying on any single practice, ecological strategies emphasize the integration of multiple tools to make crops and cropping systems inherently unfavorable for weed establishment and growth. Crop rotations that involve both legumes and non-legumes, along with the use of cover crops, contribute to effective weed suppression through smothering and allelopathic interactions. The adoption of competitive cultivars, adjustments in sowing methods and planting schedules, mulching with organic residues, green and brown manuring, and the use of reduced or zero tillage create conditions that inhibit weed seed germination and emergence. Such practices also enhance soil organic matter by slowing mineralization, thereby reducing energy requirements and carbon dioxide emissions. Although herbicides continue to play a significant role in modern agriculture, their judicious application is crucial for achieving sustainable crop production by minimizing environmental risks and delaying the development of herbicide resistance. Continued research and refinement of alternative weed management practices, particularly those that can complement herbicide use, are crucial for the long-term sustainability and effectiveness of weed control strategies.

Key words: *ecological weed management, bioherbicides, crop rotation, cultural practices, sustainable agriculture, weed suppression*

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Influence of tillage practices and weed control strategies on weed dynamics and yield of direct-seeded rice in the east and south-eastern coastal plains of Odisha.

S. Samantaray*[1], G. C. Malik[1], R. Dash[2] and M. Banerjee[1]
[1]Palli Siksha Bhavana (Institute of Agriculture), Visva Bharati, Sriniketan, West Bengal, India -731236.
[2]Odisha University of Agriculture & Technology (OUAT), Bhubaneswar, India - 751003
Email: subhashree.samantaray43@gmail.com
Contact No: 8908194393, 9348545236

A field experiment was undertaken during kharif 2022–2023 at the Agronomy Main Research Farm, Odisha University of Agriculture & Technology, Bhubaneswar to quantify the interactive effects of tillage regimes and weed management strategies on weed dynamics and yield performance of direct-seeded rice. The experiment was structured in a split-plot design with four tillage practices assigned to main plots: tillage methods: conventional tillage (CT), conventional tillage with residue mulching at 5 t/ha (CT+R), zero tillage (ZT) and zero tillage with residue mulching at 5 t/ha (ZT+R) and three weed management treatments in sub-plots: W_1 (Pendimethalin 678 g/ha at 2 DAS *fb* bispyribac sodium 25 g/ha at 20 DAS), W_2 (Pendimethalin 678 g/ha at 2 DAS *fb* bispyribac sodium 25 g/ha at 20 DAS and one hand weeding at 40 DAS) and W_3 (weedy check). Conventional tillage with residue mulching at 5 t/ha resulted in the greatest reduction in weed density and dry matter among all tillage treatments. Application of pendimethalin at 2 DAS *fb* bispyribac sodium at 20 DAS and one hand weeding at 40 DAS proved most effective in minimizing weed population and biomass, outperforming all other evaluated weed management strategies. In conclusion, the study establishes that conventional tillage with residue mulching at 5 t/ha *fb* pre-emergence application of pendimethalin 678 g/ha at 2 DAS + post-emergence application of bispyribac sodium 25 g/ha at 20 DAS + one hand weeding at 40 DAS provided optimal for achieving sustained weed suppression and maximizing productivity of direct-seeded rice in coastal Odisha.

Key words: *DSR, Tillage system, Integrated weed management.*

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New Trends in Production of Leafy Greens

E. Kavya and P. Anitha
Department of Horticulture, College of Agriculture, UAS, GKVK, Bengaluru-560065.
Department of Horticulture (Veg. and Flori.), Bihar Agricultural University, Sabour - 813 210, Bhagalpur, Bihar.
*Corresponding author email: kavya.padman.1@gmail.com
Mobile No : 9391301045

Green leafy vegetables are an important group of horticultural plants and an essential component of the human diet. For years, research has been carried out with the use of various growing media and soil substrates used in greenhouses as well as cultivation in hydroponics and aeroponics. The increasingly widespread use of LEDs in horticultural production has brought great opportunities, such that the production of leafy vegetables can be controlled to a large extent. During the different growth stages of leafy vegetables, different treatments can be applied to bring economic benefits in terms of reduced time, labour and increased yield or nutritional value. Today, in addition to conventional vegetable production, the sustainable production of leafy vegetables is also developing, using new technologies that address consumer health and minimize the environmental impact of horticultural production. The application of various substances to the leaves of cultivated plants, including not only fertilizers and plant protection products but also growth regulators and bio stimulants, is becoming increasingly popular worldwide. As more people cultivate their own leafy greens at home, whether in little gardens, on balconies, urban gardening has grown in popularity. Better farming practices, cold chain facilities, integrated pest management education, and creative packaging and shipping solutions are required to guarantee constant availability.

Keywords: *Hydroponics, Aeroponics, vertical farming, nutritional value, integrated pest management*

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Evaluation of Type II Functional Response of *Chrysoperla zastrowi sillemi* (Chrysopidae) Preying on *Lipaphis erysimi* Infesting *Brassica juncea*"

Ningaraj Belagalla[1*], Madhurima Vinod[2], Manjunath Chouraddy[3], Nagaraj H[4] and Ishwari G Hiremath[5]

1. Assistant Professor, Department of Entomology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to University of Agricultural Sciences Dharwad)
2. Assistant Professor, Department of Entomology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to University of Agricultural Sciences Dharwad)
3. Senior Scientist and Head, ICAR KLE Krushi Vigynana Kedra, Mattikoppa
4. Assistant Professor, Department of Plant Pathology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to University of Agricultural Sciences Dharwad)
5. Assistant Professor, Department of Plant Pathology, KLE College of Agricultural Sciences, Tenikolla (Affiliated to University of Agricultural Sciences Dharwad)

*belagallraj@gmail.com

The biological control of insect pests is contingent upon the predation capabilities of natural enemies, a phenomenon referred to as the functional response. This concept is pivotal in the selection of suitable species for biological control initiatives. In the present study, the researchers sought to assess the functional response of the third instar grub of *C. zastrowi sillemi*, a lacewing species within the Chrysopidae family, towards the aphid *Lipaphis erysimi*, which infests Raya plants (*Brassica juncea*). To this end, five distinct aphid densities were employed as predator-prey ratios (1:50, 1:100, 1:150, 1:200, and 1:250). The findings revealed a type II functional response curve, as determined through logistic regression analysis, of *C. zastrowi sillemi* towards *L. erysimi*. The Holling's Type II functional response indicates that the predator's consumption rate increases with prey density but eventually plateaus despite further increases in prey density. The observed consumption, search rate (a`), and maximum predation rate (1/Th) of the aphids were lower (19.68, 0.97, and 0.55, respectively) compared to when the grubs were fed an artificial diet, where these values were higher (20.16, 0.20, and 0.59, respectively). However, the handling time required by third-instar grubs was longer (2.58) on a natural diet and shorter (2.42) on an artificial diet.

***Key Words**: Functional Response, Chrysoperla, Biocontrol and Lipaphis erysimi*

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Unveiling Genetic Diversity and Yield Relationships in Brinjal

Ninitha Nath C
Department of Genetics and Plant breeding, College of Agriculture, Vellayani,
Kerala Agricultural University
ninithanath.c@kau.in

Brinjal (*Solanum melongena* L.) commonly known as eggplant or aubergine, is an important warm season vegetable crop belonging to the Solanaceae family. It is primarily cultivated in subtropical and tropical parts of the world. To evaluate the potential of genetically diverse lines and cultivars, breeders have to analyze various traits that influence yield. The heritability estimates and genetic advance are the key parameters that determine the success of selection in breeding programme. The present study was conducted at the College of Agriculture, Vellayani during summer 2023-24. The experimental material consists of fourteen genotypes. The experiment was conducted in a Randomized Block Design with three replications and data was recorded. Phenotypic and genotypic variabilities, broad sense heritability, genetic advance as percentage of mean and simple correlation coefficients were calculated. Analysis of variance revealed highly significant differences among all the observed characters. Wide range of variation was observed for almost all the characters except for plant height and number of branches. The GCV values indicated the existence of high magnitude of genetic variability for weight per fruit followed by seed weight per fruit, number of fruits per plant, number of seeds per fruit and percent fruit set. Low variability was found for number of days to 50% flowering and days to first harvest. High heritability values were observed for almost all the characters which reflects its high degree of correspondence between phenotypic and genotypic values. The characters like weight per fruit, number of fruits per plant and seed weight per fruit exhibited high heritability coupled with high genetic advance as percentage of mean which indicates that these characters must be given emphasis during breeding programme for high yielding varieties of brinjal. Hence characters showing high to moderate values of PCV, GCV and high estimates of heritability and genetic advance as per cent mean were considered as the most important characteristics and these are expected to play a vital role in enhancing fruit yield per plant through effective breeding strategies.

Keywords: *Variability, Heritability, Genetic advance, Brinjal*

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Postharvest Strategies for Improving the Vase Life of Cut Gerbera (*Gerbera jamesonii* L.) Flowers

Nikita Rathore[*1] , Eshu Sahu[2], G. P. Nag[3] and Reema Lautre[4]
[*1]M.Sc Student, Department of Floriculture and Landscaping K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.
[2]Assistant Professor, Department of Vegetable Science College of Horticulture and Research Station, Chapka-Sonarpal, MGUVV, Durg (C.G.) India.
[3]Dean, K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.
[4] Ph.D. Scholar , Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India.
Corresponding author: Email: nikitarathore041999@gmail.com

The vase life of cut Gerbera (*Gerbera jamesonii* L.) flowers is a key factor influencing their commercial acceptance in the floriculture industry yet their market potential is often constrained by stem bending, microbial blockage, rapid moisture loss, and early senescence. To address these limiting factors, the work highlights integrated, science-driven approaches designed to enhance the postharvest longevity and overall quality of cut gerbera. Emphasis is placed on optimizing pre-harvest nutrition and harvesting at the most suitable floral stage, ensuring rapid removal of field heat to stabilize metabolic activity and maintaining hydration through pulsing and holding solutions fortified with sucrose, acidifiers, germicides and eco-friendly bio-stimulants. These interventions collectively improve water uptake, minimize vascular occlusion and slow physiological deterioration. Strengthened cold-chain management, low-temperature storage, and moisture-retentive packaging further contribute to preserving turgidity and reducing postharvest stress. This contribution underscores that the integration of conventional handling practices with sustainable postharvest technologies can effectively extend vase life, reduce postharvest losses and ensure superior market quality, thereby supporting greater consumer satisfaction in both domestic and international floriculture markets.

Keywords: *diameter, flower, gerbera, post harvest, vase life.*

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"Assessment of Production Constraints and Nutritional Variability in *Basella spp.*: A Roadmap for Enhancing Utilization of an Underexplored Leafy Vegetable"

Reema Lautre[*1], Pravin Kumar Sharma[2] and Nikita Rathore [3]

[*1] Ph.D. Scholar, Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India 492012.

[2]Principal Scientist, Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India 492012.

[3] M.Sc. Student, Department of Floriculture and Landscaping K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.

Corresponding author: Email: nikitarathore041999@gmail.com

Basella spp. (commonly known as Poi Bhaji or Malabar Spinach) is one of the most nutrient-rich yet underutilized leafy vegetables in India. Despite its high potential in terms of bioactive compounds, iron, calcium, and antioxidant properties, the crop remains largely neglected in mainstream horticultural research. The present study aims to identify and analyze the major production, post-harvest, and commercialization constraints associated with basella cultivation, while also assessing the nutritional variability across local germplasm lines. Field surveys and farmer-interaction data indicated that lack of improved varieties, absence of standardized agronomic practices and high perishability are the primary limitations restricting its wider adoption. Laboratory analyses revealed significant variation in chlorophyll content, ascorbic acid levels, and total phenolic concentration among different local accessions, suggesting considerable scope for varietal improvement. The findings highlight the need for systematic breeding programs, development of low-cost post-harvest technologies, and promotion of value-added products to enhance the utilization of Basella as a climate-resilient, nutrition-rich crop. This study provides a comprehensive framework for future research and policy support aimed at mainstreaming underutilized vegetables in sustainable food systems.

Keywords: *Basella spp., climate-resilient, nutritional variability, post-harvest handling, value addition.*

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Roses: Nature's Fragrant Treasure for Beauty, Health and Industry

Nagajyothi G N[1]., Dr. Amreen Taj[1*]. and Chaithali H B[1]**

[1]Ph. D scholar., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1*]Assistant Professor, Dept. of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka.

[1**]M.Sc., Dept. of Floriculture and Landscaping, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka.

Roses (*Rosa spp.*) are among the most economically and aesthetically significant flowering plants, valued for their ornamental, nutritional, medicinal and industrial importance. Beyond their decorative use, roses offer vast potential for value addition through the production of essential oils, natural pigments, food products and bioactive compounds. The petals contain 0.02–0.05% essential oil, mainly composed of citronellol, geraniol, nerol and phenylethyl alcohol**,** which impart fragrance and therapeutic properties. Species such as *Rosa damascena*, *R. centifolia*, *R. gallica* and *R. bourboniana* are widely cultivated for oil extraction being most suitable for perfume preparations and in aromatherapy. Roses are rich in anthocyanins, carotenoids, flavonoids and phenolic acids, contributing to their vibrant colours and high antioxidant activity. Rose hips, the fruit, are an excellent source of vitamin C (300–2000 mg/100 g)**,** carotenoids, minerals and dietary fiber, making them valuable in functional foods, herbal teas, jams and nutraceuticals. Roses exhibit anti-inflammatory, antidiabetic, hepatoprotective, cardioprotective and anti-aging effects. Extracts from petals and hips have been shown to improve skin health**,** delay aging and enhance collagen synthesis due to their vitamin C and phenolic content. Rose petal extracts are used in functional beverages, energy drinks and herbal infusions that promote digestion, relaxation and detoxification. The antimicrobial and antispasmodic properties of rose bioactive compounds also support gut health and immunity. Edible petals are used to prepare *gulkand*, rose syrup, essence and flavoured beverages, while extracts are incorporated in cosmetics and pharmaceuticals. Nutritionally, roses provide carbohydrates, vitamins, minerals and antioxidants that promote immunity, digestion and skin health. In landscape horticulture, roses are extensively used for borders, hedges, climbers, ground covers and container gardens due to their wide adaptability, fragrance and long blooming period. Their ecological role in attracting pollinators and enhancing aesthetic and psychological well-being makes them indispensable in both traditional and modern landscaping. Thus, roses represent a multifaceted crop linking beauty, health and industry through sustainable value addition.

Keywords: *Antioxidants; Bioactive compounds, Medicinal properties, Rosa spp., Rose hips,* Value addition

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Sustainable Agriculture Growth through Robotics and Automation in Gujarat.

Mr. Mittal Zarkhandi
Ph.D. Scholar
Sarvajanik University, Surat.
Email ID: mittaljharkhandi@gmail.com
Mobile No: 7096159961

In Gujarat, farming has always been central to people's lives, yet the sector now faces growing pressures: more mouths to feed, unpredictable weather, shrinking labour availability, and the urgent need to protect the land and water for future generations. To meet these challenges, robotics and automation are emerging as powerful tools for change. By introducing machines like autonomous sprayers, drones for crop-monitoring and smart irrigation systems, farmers in Gujarat can use resources more wisely less water, fewer chemicals, and more precise care for each plant. For example, modern robots and drones can map fields in real time, check soil health, spot crop stresses early and apply treatment exactly where needed. These technologies help farms run more efficiently and sustainably, reducing waste and protecting the environment. Yet, in Gujarat the transition isn't without hurdles: many farms are small and scattered, the cost of robotic tools can be high, and training and infrastructure are still catching up. This study examines how robotics and automation are being applied in Gujarat's agriculture how they support sustainability, what benefits they bring (better yields, lower labour burden, environmental gains), and what obstacles remain. As Gujarat embraces these innovations, the hope is to build a farming system that is not only productive, but also resilient and kind to nature so that today's farmers can pass a healthy land on to tomorrows.

Keywords: *Sustainable Agriculture, Robotics and Automation in Farming, Smart Irrigation System, Rural Innovation and Tech Adoption, and Agriculture Development Gujarat.*

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Improving Heat Stress Resilience in Winter Pulses through Breeding

Sajan Kumar[1], Anshuman Singh[2], Atul Kumar[3], Ashutosh Singh[4], Jitendra Kumar Tiwari[5], Rakesh Chaudhary[6], Susheel Kumar Singh[7], Meenakshi Arya[8] and S.K. Chaturvedi[9]

[14,5,6,9,] Department of Genetics and Plant Breeding, Rani Lakshmi Bai Central Agricultural University, Jhansi-284003, Uttar Pradesh

[2,] Division of Agricultural Bioinformatics ICAR- IASRI, New Delhi

[3,] Department of Genetics and Plant Breeding, Acharya Narendra Deva University of Agriculture and technology, Kumarganj, Ayodhya

[4,] Department of Molecular biology and Biotechnology, Rani Lakshmi Bai Central Agricultural University, Jhansi-284003, Uttar Pradesh

[7,] Department of Soil Science, Rani Lakshmi Bai Central Agricultural University, Jhansi-284003, Uttar Pradesh

[8,] Department of Plant Pathology, Rani Lakshmi Bai Central Agricultural University, Jhansi-284003, Uttar Pradesh

*Corresponding author email Id: asinghrlbcau@gmail.com

Grain legumes are prime source of protein contribute (33% of human protein) and minerals (Ca, Mg, Fe, P, Zn etc.) therefore referred as poor man's meat**.** Pulse crops reported huge losses due to abiotic (drought, high temperature *etc.*) stresses. The rise in temperature beyond a threshold level for a period of time which is sufficient to cause irreversible damage to plant growth and development is defined as heat stress**.** An elevation in temperature, usually 10-15 °C above ambient, is heat stress. The increasing global warming provokes the weather pattern, leading to an increase in global temperature by 2.0–3.5°C in all regions as reported in the AR_5 by IPCC, 2018 it will reach 2.5–5.8°C before the 2100. Heat tolerance (HT) is now a major concern for crop production and approaches for sustaining high yields of crop plants under HT stress are important agricultural goals. Plants possess a number of adaptive, avoidance, or acclimation mechanisms to cope with HT situations. Plant survival under HT stress depends on the ability to perceive the HT stimulus, generate and transmit the signal, and initiate appropriate physiological and biochemical changes. The physiological and biochemical responses to heat stress are active research areas, and the molecular approaches are being adopted for developing HT tolerance in plants. Breeding for heat tolerance in Rabi Legumes explores the crucial challenge of enhancing crop resilience to rising temperatures, particularly in rabi legumes, which face increasing vulnerability to heat stress. Current research on breeding strategies aimed at fortifying heat tolerance in these legumes, emphasizing the importance of genetic diversity and molecular markers. Ultimately, the integration of traditional breeding methods with cutting-edge biotechnological tools holds promise for empowering agriculture against the adverse impacts of climate change.

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Entomological survey of mosquito fauna of District Yamuna Nagar

Vijay Laxmi and Dr Parveen Kumar
[1.]BMU, Rohtak
[2.]Assistant Professor (Zoology), BMU, Rohtak

Mosquitoes play a crucial role as vectors in transmitting various diseases in North India, significantly impacting public health. The region's varied geography, encompassing the Indo- Gangetic plains, foothills of the Himalayas, and semi-arid areas, creates diverse breeding grounds for different mosquito species. The region's diverse climatic conditions, ranging from the humid plains of Uttar Pradesh to the semi-arid zones of Haryana and Rajasthan, provide an ideal breeding ground for mosquito populations. Several mosquito species, including Aedes, Anopheles, and Culex, act as carriers of deadly diseases such as malaria, dengue, chikungunya, and Japanese encephalitis. The transmission of these vector-borne diseases is influenced by factors like monsoon patterns, urbanization, and inadequate sanitation, leading to frequent outbreaks. Understanding the role of mosquitoes in disease transmission is essential for implementing effective control measures and reducing the burden of mosquito-borne illnesses in North India. The study was thus, designed to study theseasonal prevalence of mosquitoes in the Yamuna Nagar district of Haryana. Adult mosquitoes were collected using total catch method via UV light-based mosquito traps of CDC (Kenea et al.,2017) installed in the city houses.The adult mosquitoes were identified and the Anopheles, Aedes and Culex were recorded. The data was analysed and the results of the six-month analysis indicated that the Culex genus was the most dominant. The maximum number of mosquitoes were found in the August. The dominance of the mosquitoes in the area was primarily due to the prevalence of the Culex genera. The monthly distributions of the mosquitoes appeared to be influenced by high monsoon levels in the region.

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A Comprehensive Review on the Role of Rhizobium Consortia in Chickpea Cultivation

M. Prasanthi, S. Bharathi, Ch. Naga Jyothi and I. Usharani
Dept. of Agronomy, Advanced Post Graduate Center
Acharya N.G. Ranga Agricultural University
Lam, Guntur, Andhra Pradesh, India
Email: mekalaprashanthi0@gmail.com

Chickpea (Cicer arietinum L.) is a key legume crop that contributes significantly to global food security, soil fertility improvement, and sustainable agricultural systems, yet its productivity is often hindered by poor soil fertility, limited nitrogen availability, and the predominance of rainfed cultivation. Biological nitrogen fixation through the symbiotic association between Rhizobium and chickpea roots plays a crucial role in meeting the crop's nitrogen needs, but recent advancements highlight the greater potential of Rhizobium consortia, which combine Rhizobium with other beneficial microorganisms such as plant growth-promoting rhizobacteria (PGPR), phosphate-solubilizing bacteria, and arbuscular mycorrhizal fungi. These multi-microbial inoculants act synergistically to enhance nodulation, nitrogen fixation efficiency, phosphorus solubilization, nutrient uptake, root development, and overall plant vigor, while also improving soil microbial activity, soil structure, and stress tolerance under drought, salinity, and other adverse conditions. Numerous studies have demonstrated improved biomass accumulation, chlorophyll content, yield attributes, and grain yield in chickpea with the use of microbial consortia compared to single-strain inoculants. Despite these promising outcomes, large-scale adoption remains limited due to challenges such as microbial strain incompatibility, inconsistent performance across different agro-climatic regions, inadequate carrier materials, and limited farmer awareness. There is a clear need for region-specific, stable, and efficient microbial formulations supported by long-term field validation to ensure consistent results. Overall, integrating Rhizobium-based microbial consortia into chickpea nutrient management strategies offers a sustainable and eco-friendly approach to reduce dependence on chemical fertilizers, improve soil health, enhance crop productivity, and support climate-resilient agricultural practices.

Key words: *Rhizobium, Consortium, plant growth-promoting rhizobacteria (PGPR) and mycorrhizal fungi*

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Standardization and physico-chemical properties of blended beverage of beetroot (Beta vulgaris L.) along with lime and mint

Laxmi[*1], Rajeshwari Sahu[2] and Nutan Bhardwaj[3]

[1*]Research Scholar (Post Harvest Managment) Pt. KLS, College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (C.G.)

[2*]Assistant Professor (Floriculture and Landscape Architecture) College of Horticulture and Research Station, Arjunda, Balod, MGUVV. Durg (C.G.)

3*Research Scholar (Floriculture and Landscaping) Pt. KLS, College of Horticulture and Research Station, Rajnandgaon, MGUVV, Durg (C.G.)

A study titled "Standardization and physico-chemical properties of blended beverage of beetroot (Beta vulgaris L.) along with lime and mint" was conducted during 2024–25 at the Post-Harvest Management Laboratory, Department of Fruit Science, Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.). The primary objective was to standardize an optimal recipe for a beetroot-based blended beverage and evaluate its physico-chemical and sensory qualities over 90 days of storage at 15-day intervals under laboratory conditions. Seven formulations (T1–T7) with varying juice concentrations—ranging from 20% to 80%—were prepared while maintaining 15 °Brix TSS and 0.3% acidity. The experiment was laid out in a Completely Randomized Design (CRD) with three replications. Sensory evaluation revealed that T4 (50% juice: 40% beetroot + 5% lime + 5% mint) scored highest for colour, appearance, and overall acceptability. T3 (40% juice) and T5 (60% juice) achieved the best scores for flavour and taste, respectively. Physico-chemical analysis showed that T5 recorded the highest TSS and reducing sugars, T6 (70% juice) had maximum ascorbic acid, T1 (20% juice) exhibited the highest non-reducing sugars, and T7 (80% juice) contained the greatest acidity, total sugars, betacyanin, and betaxanthin content. During storage, sensory attributes, ascorbic acid, and pigment content declined, while TSS, acidity, and reducing sugars increased. Economic evaluation indicated that T4 had the highest benefit–cost ratio (3.00), making it the most economical and organoleptically superior formulation. The study provides a standardized, nutritionally valuable, and cost-effective beetroot-based blended beverage suitable for consumer acceptance and commercial production.

Keywords: *Beetroot beverage, Lime, Mint, Physico-chemical properties, Sensory evaluation*

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"Postharvest Strategies for Improving the Vase Life of Cut Gerbera (*Gerbera jamesonii* L.) Flowers"

Nikita Rathore[*1] , Eshu Sahu[2], G. P. Nag[3] and Reema Lautre[4]

[*1]M.Sc Student, Department of Floriculture and Landscaping K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.

[2]Assistant Professor, Department of Vegetable Science College of Horticulture and Research Station, Chapka-Sonarpal, MGUVV, Durg (C.G.) India.

[3]Dean, K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.

[4] Ph.D. Scholar , Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India.

Corresponding author: Email: nikitarathore041999@gmail.com

The vase life of cut Gerbera (*Gerbera jamesonii* L.) flowers is a key factor influencing their commercial acceptance in the floriculture industry yet their market potential is often constrained by stem bending, microbial blockage, rapid moisture loss, and early senescence. To address these limiting factors, the work highlights integrated, science-driven approaches designed to enhance the postharvest longevity and overall quality of cut gerbera. Emphasis is placed on optimizing pre-harvest nutrition and harvesting at the most suitable floral stage, ensuring rapid removal of field heat to stabilize metabolic activity and maintaining hydration through pulsing and holding solutions fortified with sucrose, acidifiers, germicides and eco-friendly bio-stimulants. These interventions collectively improve water uptake, minimize vascular occlusion and slow physiological deterioration. Strengthened cold-chain management, low-temperature storage, and moisture-retentive packaging further contribute to preserving turgidity and reducing postharvest stress. This contribution underscores that the integration of conventional handling practices with sustainable postharvest technologies can effectively extend vase life, reduce postharvest losses and ensure superior market quality, thereby supporting greater consumer satisfaction in both domestic and international floriculture markets.

Keywords: *diameter, flower, gerbera, post harvest, vase life.*

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Assessment of Production Constraints and Nutritional Variability in *Basella spp*.: A Roadmap for Enhancing Utilization of an Underexplored Leafy Vegetable

Reema Lautre[*1], Pravin Kumar Sharma[2] and Nikita Rathore [3]
[*1] Ph.D. Scholar, Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India 492012.
[2]Principal Scientist, Department of Vegetable Science College of Agriculture, IGKV, Raipur. (C.G.) India 492012.
[3] M.Sc. Student**,** Department of Floriculture and Landscaping K. D. College of Horticulture and Research Station, Jagdalpur, MGUVV, Durg (C.G.) India.
Corresponding author: Email: nikitarathore041999@gmail.com

Basella spp. (commonly known as Poi Bhaji or Malabar Spinach) is one of the most nutrient-rich yet underutilized leafy vegetables in India. Despite its high potential in terms of bioactive compounds, iron, calcium, and antioxidant properties, the crop remains largely neglected in mainstream horticultural research. The present study aims to identify and analyze the major production, post-harvest, and commercialization constraints associated with basella cultivation, while also assessing the nutritional variability across local germplasm lines. Field surveys and farmer-interaction data indicated that lack of improved varieties, absence of standardized agronomic practices and high perishability are the primary limitations restricting its wider adoption. Laboratory analyses revealed significant variation in chlorophyll content, ascorbic acid levels, and total phenolic concentration among different local accessions, suggesting considerable scope for varietal improvement. The findings highlight the need for systematic breeding programs, development of low-cost post-harvest technologies, and promotion of value-added products to enhance the utilization of Basella as a climate-resilient, nutrition-rich crop. This study provides a comprehensive framework for future research and policy support aimed at mainstreaming underutilized vegetables in sustainable food systems.

Keywords: *Basella spp., climate-resilient, nutritional variability, post-harvest handling, value addition.*

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Developing a Cellular Model: Culture and Characterization of Hepatopancreatic Cells of Mud Crab *Scylla olivacea*

Ms. Bhakti Dafale[1] and Dr.Shamshad Shaikh[2]
Zoology discipline, School of Biological Sciences and Biotechnology, Goa University
Taleigao plateau, Goa, India.
Email id: zoology.bhakti@unigoa.ac.in[1] and shamshad.shaikh@unigoa.ac.in[2]

The orange mud crab, Scylla olivacea, plays a vital role in coastal aquaculture and estuarine fisheries, underpinning both economic livelihoods and ecological resilience. Despite its importance, there remains a notable gap in our knowledge at the cellular level, limiting our ability to conduct in-vitro studies on environmental stress, pathogen interactions and sustainable management strategies. In this study, we present the development and characterization of cell cultures derived from Hepatopancreas of S. olivacea, designed to serve as in- vitro model for fisheries and ecological research. The tissue was collected aseptically from healthy S. olivacea, washed in crab saline, isolated the cells and cultured in L-15 medium, supplemented with FBS and antibiotic mixture. The cells were successfully sub cultured by 6-8days, the cells survived up to 12 months under optimized conditions. Microscopic examination revealed a heterogeneous population of cells. The doubling time of cells at 25°C was observed to be approximately 48 hours. The metaphase chromosome spreads depicted a diploid chromosome number of 2n=106. The established cell culture will offer promising applications in in-vitro bioassays for monitoring aquatic pollutants, studying host-pathogen interactions and reduces dependence on live animal for experiments, contributing to sustainable development and environmental protection.

Keywords: *Characterization, karyotype, metaphase, sub culture.*

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Accelerating Subcutaneous Wound Healing: Effectiveness of Rabbit Amniotic Membrane Contrasting With Mesenchymal Stem Cells

B. N. Likhitha[1*], Deshpande Aditya D.[1], Shukla Smriti[1], Emmanuel Rony S.[1], Singh Archita[1], T. Yasotha[1], Singh Vidya[2], Saikumar G.[2], Chandra Vikash[1], Sharma G. Taru[1,3]

[1]Division of Physiology and Climatology, ICAR-IVRI, Izatnagar, Bareilly, U.P. India.
[2]Division of Veterinary Pathology, ICAR-IVRI, Izatnagar, Bareilly, U.P. India.
[3]National Institute of Animal Biotechnology, Hyderabad, Telangana, India.
***Presenting Author**: likhithabn650@gmail.com

This study evaluated the therapeutic efficacy of rabbit amniotic membrane (r-AM) in both fresh and cryopreserved states, alongside its mesenchymal stem cells (MSCs), for promoting enhanced subcutaneous wound healing. Passage 3 r-AM MSCs were characterized using ICST guidelines and applied throughout the experiments. Cryopreservation of r-AM was performed using a slow-freezing protocol with 10% DMSO, DMEM, and 40% FBS. Twenty healthy rabbits of either sex were randomly assigned to four groups. Full-thickness excision wounds measuring 2 × 2 cm^2 were created on the dorsal midline. Group I served as an untreated control; Group II received fresh r-AM; Group III was treated with thawed cryopreserved r-AM; and Group IV received 1 × 10^6 r-AM MSCs suspended in 100 µL PBS. Wound healing progress was monitored weekly over 28 days by measuring wound area. Results showed significantly greater wound contraction ($p < 0.05$) in all treatment groups, with the highest contraction rate at day 14 observed in the r-AM MSC group (88.26%), followed by the cryopreserved r-AM group (80.42%), and the fresh r-AM group (78.7%). Histological analysis revealed that fresh r-AM promoted superior overall healing, whereas r-AM MSCs facilitated better epithelialization. Neovascularization was most pronounced in the fresh r-AM group, while collagen density did not differ significantly among groups. In conclusion, r-AM MSCs demonstrated effective wound healing properties, whereas fresh r- AM provided a more viable bioscaffold compared to cryopreserved r-AM, as cryopreservation compromises cell viability and, consequently, wound healing quality. Optimization of cryopreservation protocols for r-AM is necessary to develop a ready-to-use bioscaffold for clinical applications.

Keywords: *Rabbit amniotic membrane, rabbit amnion derived mesenchymal stem cells, cryopreserved amniotic membrane, subcutaneous wound*

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The Hidden World of Fish Fungal Pathogens: Isolation, Molecular Characterization and Phylogenetic Analysis

Nayan Chouhan and Himadri Saha
College of Fisheries, Central Agricultural University, Lembucherra, Tripura, India, 799210
Email: nayan101chouhan@gmail.com
Mob. no. 9214632240

Fungal infections are increasingly recognized as a major obstacle to sustainable aquaculture and aquatic ecosystem health. This study reveals, for the first time in Tripura, several novel fungal pathogens infecting key cultivable fishes, including *Labeo catla*, *Labeo rohita*, *Hypophthalmichthys molitrix*, and *Ompok bimaculatus*. The pathogenic fungi were associated with tissue necrosis, caudal fin erosion, and hemorrhagic lesions, identifying them as emerging threats to freshwater aquaculture in the region. Detailed morphological and microscopic analyses confirmed septate and aseptate hyphae in these pathogens. Molecular identification based on 18S rRNA sequences confirmed the presence of *Fusarium oxysporum*, *Saprolegnia parasitica*, *Phoma* spp., and *Rhizomucor* spp. Saprolegniasis, historically one of the most lethal fish fungal diseases, continues to cause substantial losses, while fusariosis is now recognized as a rising concern across multiple fish species. Molecular characterization and phylogenetic analyses highlight a high degree of genetic novelty among isolates, underscoring their ecological significance. Additionally, variable zoonotic potential was noted—*F. oxysporum* demonstrates high risk for opportunistic human infections, while *Saprolegnia*, *Phoma*, and *Rhizomucor* spp. are occasionally implicated but rarely reported in humans. Our study enhances our understanding of the diversity of fish fungal pathogens in Northeastern of India. These comprehensive findings offer essential insights into the impact of emerging fungal diseases in fish populations, laying the groundwork for targeted control measures to mitigate their effects on global aquaculture

Keywords*: Aquaculture, fungal pathogens, molecular characterization, zoonotic potential, phylogenetic analysis*

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Effect of different preservatives and edible dyes on tinting and vase life of Tuberose (*Polianthes tuberosa* L.)

Daneshwar Sahu*[1], Rajeshwari Sahu, Medha Saha
Department of Horticulture, Floriculture and Landscaping Mahatma Gandhi University of Horticulture and Forestry Durg-49111 (Chhattisgarh)
Corresponding author: Email: daneshwar654@gmail.com

The present investigation entitled "Effect of different preservatives and edible dyes on tinting and vase life of Tuberose (Polianthes tuberosa L.)" conducted during March, 2025 to April, 2025 in the laboratory, Department of Floriculture and Landscaping, Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.). in Completely Randomized Design (CRD) with 13 treatments. The spikes of tuberose cv. Prajwal were subjected to tinting using various combinations of food Colours and preservatives, four edible dyes, viz., orange-red, apple green, lemon-yellow, and royal-blue, were used along with different preservatives such as citric acid and aluminium sulphate. These studies evaluated the effect of different edible dye and preservative combinations on the post-harvest performance of tuberose (Polianthes tuberosa) flowers. Among the various treatments, T. (Lemon Yellow + 2% Sucrose + 300 ppm Citric Acid) showed the best results in several key parameters, such as dye absorption (14.05 mL.), duration for petal Colour change (9.88 hours), Colour intensity, floret diameter (47.23 mm), percentage of fully opened florets (70.45%), floret drop (7.38), and overall vase life (7.28 days). Flowers treated with Te also received higher sensory ratings, suggesting enhanced physiological stability and improved post-harvest quality. Additionally, Ts significantly minimized water loss and preserved flower freshness, contributing to both longevity and visual appeal. These findings indicate that Ts is a highly effective and cost-efficient treatment for cultivating vibrant and durable tuberose flowers, providing considerable advantages for commercial use and grower profitability.

Keywords: *Tuberose, Edible dyes, Preservatives, Tinting, Vase life*

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Assessment of the genotoxic potential of Mancozeb and Propiconazole Fungicides in the Freshwater Catfish Clarias batrachus

Tanya
Research Scholar, Department of Zoology, Swami Vivekanand Subharti University, Meerut

Mancozeb an ethylene-bis-dithiocarbamate and propiconazole a triazole are widely used fungicides that frequently reach surface waters via runoff. Fish are established sentinels for aquatic genotoxicity, with the alkaline comet assay and erythrocytic micronucleus test being the most common biomarkers. Evidence from laboratory and field studies indicates mancozeb can induce DNA strand breaks and chromosomal damage in fish, while propiconazole is highly toxic to fish and has emerging evidence of DNA damage and cytogenetic affects in teleosts, though results on mutagenicity per se are mixed. For *Clarias batrachus,* direct genotoxic data specific to these fungicides remain sparse; however, studies in related catfish and other teleosts, combined with general aquatic toxicology assessments, suggest plausible risk at environmentally relevant concentrations, especially under repeated or mixture exposures. Standardized protocols, mixture-toxicity designs, and tissue-specific omics-enabled endpoints are recommended to resolve current uncertainties and to support water-quality monitoring.

Keywords: *mancozeb, propiconazole, Clarias batrachus, comet assay, micronucleus test, genotoxicity, aquatic toxicology*

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Advancing Sustainability in the Dairy Sector: Climate, Resources, and Circularity.

BD Landge[*], RB Yedatkar[**]

[*]Research Schuler, Department of Dairy Science, Yeshwant Mahavidyalaya, Nanded. MS.

[**]Associate Professor, Department of Dairy Science, Chhatrapati ShivajiRaje Mahavidyalaya, Udgir.MS.

The dairy industry is at a critical crossroads, shaped by a complex interplay of factors including rising global consumption, and heightened consumer awareness about health and sustainability, and the escalating impacts of climate change. This paper aims to review these interconnected domains and argue that the future resilience and sustainability of the dairy industry depend on advances in biological sciences that are viewed through a collaborative, One Health lens. The methodology is structured as a comprehensive systematic review and synthesis of contemporary literature and market analyses. The identified literature was categorized into three primary thematic areas aligned with the One Health framework: Animal Health and Environmental Sustainability: Analyzing studies on the physiological impacts of heat stress, the efficacy of methane-reducing feed additives, and regenerative grazing practices. The results demonstrate that progress in one domain is inherently linked to outcomes in others. The literature synthesis reveals several key findings that highlight the interconnected nature of modern dairy science, highlighting synergies, trade-offs, emergent patterns, and emerging patterns, thereby constructing a unified perspective on the future of dairy industry.

Keywords*: One Health, Functional Dairy, Smart Dairy Technologies, Heat Stress, Milk Quality.*

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Constraint Analysis of Marine Fish Markets: A Case of Women Fish Vendors in Mumbai

Pradip Tulshiram Lanjile[1]*
Central Institute of Fisheries Education, Mumbai, Maharashtra, Indian Council of Agriculture Research, New Delhi
*Corresponding author address: - pradipofficial2001@gmail.com

The present study, *"Constraint Analysis of Marine Fish Markets: A Case of Women Fish Vendors in Mumbai,"* explores the multifaceted challenges faced by women engaged in the marine fish marketing sector in Mumbai, Maharashtra. The study aimed to identify and prioritize key infrastructural, economic, technical, occupational, and institutional constraints affecting women fish vendors using the Rank-Based Quotient (RBQ) method. Data were collected from various market intermediaries and analysed to quantify the severity of constraints based on respondents' rankings. The findings revealed that congested market spaces (RBQ = 69.17), inadequate storage facilities (52.67), and a lack of sanitation (45.56) were major infrastructural bottlenecks. Economically, women vendors faced low profit margins (76.45), fluctuating prices (76.07), and heavy dependence on middlemen (65.61), leading to income instability and limited financial security. Technically, poor adoption of modern tools (85), low awareness of digital platforms (70), and insufficient training in value addition (55) restricted modernization and competitiveness. Occupationally, exposure to unhygienic conditions (69), lack of protective gear (64), and musculoskeletal strain (59) were major health risks. Institutionally, poor grievance redressal mechanisms (80), weak cooperatives (78.40), and low awareness of government schemes (76) further constrained empowerment and policy access. The study concludes that women vendors, despite being vital links in the fisheries value chain, operate under vulnerable and inequitable conditions. Sustainable improvement requires integrated interventions focusing on market infrastructure modernization, economic empowerment through credit and collective marketing, technical skill enhancement, occupational safety, and strengthened institutional support. Gender-sensitive policy measures under schemes like PMMSY and NRLM are essential to ensure inclusive and resilient growth in the fisheries marketing sector.

Keywords: - *Constraint analysis, marine fish markets, women fish vendors*

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Comparative Analysis of Seed Storage Proteins in some Cultivated and Wild Rice

Vikram Singh Gaur[*], Prashant Sahu[#], Radheyshyam Sharma[#], Vivek Badhe[@]
[*]College of Agriculture, Balaghat, (JNKVV, Jabalpur), Balaghat, Madhya Pradesh #
Biotechnology Centre, JNKVV, Jabalpur
@Department of Computer Science, JNKVV, Jabalpur

In the present investigation, six wild and four cultivated rice species were analyzed to identify seed storage proteins (SSPs). Protein sequences of the wild species were retrieved directly from the NCBI database, while genes were predicted in the cultivated species using the eukaryotic gene-prediction tool AUGUSTUS.

In the aromatic genotype of *Oryza sativa*, AUGUSTUS predicted 57,081 genes, with the highest number on chromosome 1 (6,773) and the lowest on chromosome 9 (3,548). In *O. sativa* subsp. *indica* (long-grained), 58,684 genes were predicted, again with chromosome 1 showing the highest number (6,908) and chromosome 9 the lowest (3,604). Similarly, *O. sativa* subsp. *japonica* cv. Kittake had 57,265 predicted genes, with 6,876 genes on chromosome 1 and 3,373 on chromosome 9. Tropical *japonica* showed 56,835 predicted genes, with the same pattern of highest gene number on chromosome 1 (6,880) and lowest on chromosome 9 (3,484). Analysis of the predicted proteins revealed variable numbers of SSPs across species: 63 in *O. rufipogon*, 56 in *O. brachyantha*, 52 in *O. glaberrima*, 44 in *O. meridionalis*, and 51 in *O. barthii*. Among cultivated rices, 45 SSPs were identified in *indica*, 47 in *japonica* (Kittake), and 45 in tropical *japonica*.

Assessment of essential amino acid composition indicated that most SSPs were generally poor in lysine, methionine, and tryptophan. Lysine content was typically below 5%, although certain 2S albumins in wild species such as *O. brachyantha* reached up to 11%. However, due to the allergenic nature of 2S albumins, their application in crop improvement is limited. Methionine content ranged only between 1–7%, substantially lower than in high- methionine crops such as maize, foxtail millet, and sorghum. Tryptophan levels were similarly low (0–1%), with only a few albumins and globulins showing slightly higher levels (2–3%).

Key Words: *AUGUSTUS, Seed Storage Protein, Wild Rice*

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Integrated nutrient management as a strategy in alleviating salt stress for higher production of pearl millet

Asha Verma*, Parmod Kumar, Ram Prakash
Department of Soil Science, CCS Haryana Agricultural University,
Hisar-125004 (Haryana) India
Email: ashaverma8930@gmail.com

Poor- quality irrigation water is a major cause of soil salinity and reduced agricultural productivity in arid and semi-arid areas. Although, pearl millet is moderate salinity tolerant crops, but its productivity is affected by salinity to a large extent. A field experiment was conducted to evaluate the effect of integrated nutrient management on yield and yield attributes of pearl millet under saline water irrigation during 2022-23 and 2023-24. The experiment consisted of twelve treatments viz. T_1 [(75 % recommended dose of fertilizers (RDF)], T_2 (100 % RDF), T_3 [75% RDF+ ST-3 (*Azotobacter chroococcum*)], T_4 (100% RDF+ST-3), T_5 [75% RDF+2.5 t ha^{-1} biogas slurry (BGS)+ST-3], T_6 (100% RDF+2.5 t ha^{-1} BGS+ST-3), T_7 [75% RDF+2.5 t ha^{-1} Vermicompost (VC)+ST-3], T_8 (100% RDF+2.5 t ha^{-1} VC+ST-3), T_9 [75% RDF+10 t ha^{-1} farm yard manure (FYM)+Biomix], T_{10} (100% RDF+10 t ha^{-1} FYM+ Biomix), T_{11} (75% RDF+2.5 t ha^{-1} VC+ biomix) and T_{12} (100% RDF+2.5 t ha^{-1} VC+ biomix). Results revealed that the number of effective tillers per meter row length, earhead/spike length and the plant height increased with integrated nutrient management and maximum values of these parameters were observed under T_{10}. However, these parameters decreased under sole application of inorganic fertilizers under saline water irrigation in pearl millet. The highest grain and stover yield viz. 27.43 and 78.19 q ha^{-1} of pearl millet was also reported under treatment T_{10}. The grain yield of pearl millet was observed 29.9 % higher under T_{10} as compared to T_1.

Keywords*: biogas slurry; FYM; INM; salinity; vermicompost*

IHASE-2025/297

Variability, Heritability and genetic advance in F_3 generation of Ridge gourd

L. B Thulasiram[1], SA Ranpise[2] and MN Bhalekar[3]

[1]Teaching Associate (Vegetable science), PGIHS, SKLTGHU, Mulugu, Siddipet, Telangana

[2&3]Department of Horticulture. MPKV, Rahuri, Maharshtra

The research experiment was conducted at Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.). Studied that F3 progenies of cross-1 (P1x P2) Arka Sumeet (P1) x Konkan Harita (P2) and along with two parents in ridge gourd with randomized block design with two replications. The variability studied in eighteen characters for high GCV and PCV observed characters number of branches per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha indicating high variability these characters for further improvement for breeding programme and high heritability coupled with high genetic advance as percent of mean was observed for the characters node number at which first female flower appeared, number of branches per vine, number of pickings, weight of fruit, number of fruits per vine, fruit yield per vine, fruit yield per plot and fruit yield per ha these characters showed less influenced by the environment effects due to governed by additively gene effect. Consequently, there is greater scope for improvement through selection.

Key words: *F_3 progenies, Variability, Heritability, Genetic Advance*

IHASE-2025/298

Nitrogen Pools and Transformations Under Different Land-Uses of lower Brahmaputra valley of Assam

Juri Das[1]
College of Agriculture Sciences, Teerthanker Mahaveer University[1]
juri.das33@gmail.com 8011677531

Soil nitrogen pools and their transformation pathways are deeply shaped by the land-use systems they occur in, from untouched forests to intensively managed croplands. Each land use creates its own microclimatic and biological environment, influencing how nitrogen is stored, mineralized, or lost from the soil. Understanding these functional ecological processes is essential for predicting nutrient availability a research study was designed with the objective to determine nitrogen pools under different land uses and their dynamics. The present study examined different nitrogen (N) pools under seven land-uses—acacia (P1), bamboo (P2), coconut (P3), sisoo (P4), teak (P5), paddy (P6), and jackfruit (P7)—in Assam, Northeast India (Horticulture Research Station Kahikuchi), with emphasis on seasonal variability and depth distribution. Soil samples were collected from two depths, surface (0–15 cm) and sub-surface (15–30 cm), across three seasons: pre-monsoon, monsoon, and post-monsoon. Nitrogen fractions including available N, total N, microbial biomass nitrogen (MBN), total dissolved nitrogen (TDN), dissolved organic nitrogen (DON), NH_4^+-N, and NO_3^--N were estimated following standard protocols. Two-way analysis of variance (ANOVA) followed by DMRT test was performed to compare the different land uses. Soils under acacia, bamboo, coconut, sisoo, teak, and jackfruit were classified as *Typic Dystrudepts*, while paddy was identified as *Aeric Dystrudepts*. Results revealed distinct variations in nitrogen across land uses, with higher concentrations in surface horizons that declined with depth. Seasonal dynamics indicated that nitrogen fractions such as available N, microbial biomass nitrogen (MBN), total dissolved nitrogen (TDN), and dissolved organic nitrogen (DON) decreased markedly during the monsoon, with total nitrogen, NH_4^+-N, and NO_3^--N also reaching minimum levels, except under paddy soils. The findings highlight that land use and vegetation type significantly influence nitrogen dynamics, underscoring their importance in soil carbon sequestration and sustainable nutrient management. This study emphasizes the role of sustainable land-use planning and biomass management in enhancing SOC and nitrogen storage, thereby strengthening soil fertility and contributing to climate change mitigation in Assam and similar agro-ecological regions.

Keywords: *Nitrogen, nitrogen dynamics, land uses.*

IHASE-2025/299

Influence of Bunch Regulation, Foliar Application of Growth Regulators and Micronutrients on Growth, Yield and Quality of Grape Cv. Manik Chaman (*Vitis Vinifera* L.)

Sangeeta lakshmeshwara, S. N. Patil, Chandrasekhar, Anand G. Nanjappanavar and I. B. Biradar

Corresponding authour*:Sangeeta Lakshmeshwara
Gmail:sangeetml159@gmail.com
Sangeeta lakshmeshwara: Ph.D Scholar, Dept. of Fruit Science, COH, Bagalkot University of Horticulture Science, Bagalkot
S N. Patil:Professor and Head, Dept. of Fruit Science, COH, Bagalkot University of Horticultural Sciences, Bagalkot
Chandrasekhar:Assistant Horticulture Officer, Senior Assistant Director of Horticulture office, Sindhanur
Anand G. Nanjappanavar :Assistant professor, Dept. of Fruit Science, MHREC, CoH, Bagalkot
I B. Biradar:Professor and Head, Dept. of NRM, CoH, Bagalkot

A field experiment entitled "Influence of bunch regulation, foliar application of growth regulators and micronutrients on growth, yield and quality of grape cv. Manik Chaman (*Vitis vinifera* L.)" was carried out at Main Horticultural Research and Extension Centre, University of Horticultural Sciences, Bagalkot during 2023-24 and 2024-25. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with eight combination treatments replicated thrice. The foliar application as well as bunch dipping of growth regulators and micronutrients was carried out after October pruning. The retention of 35 bunches per vine and Module-3 comprised of GA_3 at 150 ppm+micronutrients spray ($ZnSO_4$ at 3g/L+$FeSO_4$ at 2g/L+$MnSO_4$ at 2g/L+ boric acid at 1 g/L) + CPPU (2 ppm) + BRs (0.5 and 1.0 ppm) applied at different berry growth stages improved the several important grape bunch traits like the highest bunch length (24.16 cm), width (15.05 cm), average bunch weight (521.89 g). Additionally, berry characteristics such as berry length (27.43 mm), berry diameter (16.13 mm) and berry weight (4.39 g) were all enhanced under this treatment. In terms of fruit quality, the treatment also led to higher colour scores (8.52) and taste scores (8.50) indicating improved visual appeal and sensory qualities of the grapes. Moreover, the shelf life of the fruit was extended to 10.53 days. The treatment also showed a reduction in postharvest losses, with the lowest percentage of postharvest loss (PLW) observed at 2.38 and 3.92 percent on the 2nd and 4th day after harvest, respectively. From these findings, it can be concluded that the integrated approach of bunch thinning (35 bunches per vine) combined with the foliar application of GA_3, micronutrients, CPPU and BRs had a positive and synergistic effect on grapevine performance.

Keywords: *Grape, Bunch regulation, Growth regulators and Micronutrients*

IHASE-2025/300

Ecological Symbolism in Regional Literature

By Mohita Prasad
Asso Prof (English)
SPC Govt College,Ajmer
Mob No 9929867287
Email: mohitaprasad@rediffmail.com

Ecological symbolism in regional literature offers a nuanced lens through which writers articulate the interdependence between human communities and their natural environments. Rooted in local landscapes, regional texts often transform elements such as rivers, forests, mountains, animals, and seasonal cycles into symbolic frameworks that reflect cultural identity, historical memory, and socio-ecological consciousness. This paper explores how such ecological symbols function not merely as descriptive devices but as dynamic agents that shape narrative structures, character developments, and thematic concerns. By examining select regional literary works, the study reveals how ecological motifs embody collective aspirations, anxieties, and ethical relationships with the environment. In many cases, natural elements serve as metaphors for resistance, continuity, and resilience, particularly in contexts facing environmental degradation, climate change, or rapid modernization. Furthermore, the symbolic use of ecology in regional literature contributes to the emerging discourse of eco-criticism, highlighting how local narratives can challenge anthropocentric perspectives and promote a more harmonious understanding of human–nature interactions. The paper argues that ecological symbolism becomes a powerful tool for environmental awareness, cultural preservation, and literary innovation. Ultimately, the study demonstrates that regional literature, through its rich ecological imagery, not only reflects environmental realities but also shapes ecological consciousness, offering pathways for reimagining sustainable futures grounded in indigenous wisdom and cultural rootedness.

Key words: *Ecology, environment, Eco-criticism, Symbolism, Preservation*

IHASE-2025/301

Nanotechnology at the Crossroads of Sustainability: Lessons from ZnO Nanoparticle Toxicity in Freshwater Algae

Aditi Venkatesh Naik [1]*, Prabhat Kumar Sharma [2] and Krishnan Sellappan [3]
School of Biological Sciences and Biotechnology, Goa University, Taleigao Plateau, Goa-403206, India.

The rapid advancement of nanotechnology has revolutionized multiple sectors, yet the uncontrolled release of nanoparticles into aquatic environments raises ecological concerns. Zinc oxide nanoparticles (nZnO), increasingly utilized in pharmaceuticals, cosmetics, and industrial formulations, have emerged as invisible yet potent contaminants in aquatic ecosystems. This study decodes the concentration-dependent physiological, biochemical, and structural responses of the freshwater cyanobacterium *Nostoc spongiaeforme* to nZnO exposure (10–1000 ppm) over 30 days. Growth inhibition reached near-complete arrest at 1000 ppm ($p < 0.001$), while chlorophyll *a* content declined by over 60%, paralleled by a ~70% reduction in photosynthetic oxygen evolution (from 13.816 to 4.05 nmol O_2 mL^{-1}). Lipid peroxidation increased sharply ($p < 0.001$), confirming oxidative membrane damage, while proline accumulation rose significantly as an osmoprotective response. Microscopy revealed filament fragmentation, loss of mucilage, and quenched chlorophyll fluorescence, corroborating functional impairment of PSII. TLC and HPLC analyses demonstrated degradation of thylakoid-associated lipids and accessory pigments, respectively, alongside the emergence of novel low-molecular-weight proteins on SDS-PAGE, indicating redox-driven proteomic remodeling. These findings establish a mechanistic framework linking nanoparticle-induced oxidative stress to cellular dysfunction in primary producers. Ongoing work extends these insights toward *Annona*-mediated green nanoparticle synthesis and its application in swamp ecosystem restoration, offering sustainable remediation alternatives.

Key words: *Zinc oxide nanoparticles; Nostoc spongiaeforme; Oxidative stress; Photosynthetic inhibition; Nanotoxicity; Environmental sustainability*

IHASE-2025/302

Elephant apple : Uses and therapeutic importance

Anamika Das[*], Shalu Giri[**] and Vinni K.Swarup[**]
[*]Associate Professor, SGIDT, BASU, Patna, [**]Research Scholars, WCDT, SHUATS, Prayagraj
Email ID: anamikandri06@gmail.com

Elephant apples are regarded as vital fruits because of its high nutritional content, which includes high quantities of vitamin C, carbohydrates, lipids, fibre, protein, minerals, and fatty acids. It has got a regional culinary appeal which is enhanced by its traditional use in the preparation of different dishes including juice, pickles, curries, jams, chutney, and jellies. It can be transformed into marketable goods by value addition such as squash and ready-to-serve drinks. Elephant apples have been proven to have potent medicinal properties for a variety of illnesses. Different components are utilised to treat illnesses and diseases in both conventional and pharmaceutical forms. It promotes virility and acts as an aphrodisiac for fever; its decoction can be used as a general remedy. Elephant apple stem bark is used to treat carbuncles, chronic sores, mercury poisoning sores, and as a preventative measure against cholera. Elephant apple fruit are used for diseases such as fever, dysentery, constipation, and stomach ailments . Juice, decoction, and the mucilage of elephant apples are used for the treatment of diarrhoea, diabetes, cancer, wounds, rheumatism, skin diseases, coughs, urinary problems, aches, hair loss, and fever. Elephant apple fruit is rich in carbohydrates (64.52 %), protein (6.81 %), fiber (1.38 %), phosphorus (0.026 %), and ascorbic acid (0.004 %). This fruit also contains different phytochemicals viz.alkaloids, anthraquinone,phenol, flavonoids, terpenoid s,and coumarin, except carotenoids and triterpenoids. There is an ample potential for the fruit to be used in the form of sauces, jam, jellies etc.

Key words: *Elephant apple, therapeutic benefits, composition, value addition*

IHASE-2025/303

Use of Enzymes and Probiotics Developed Through Biotechnology in Animal Feeding

Dr. Nisha Noor
MVSC scholar
Department of Animal Nutrition
College of Veterinary and Animal Sciences
GBPUAT Pantnagar
Department of Animal Nutrition, GBPUAT Pantnagar
Email Id- nishanoor2416@gmial.com

Biotechnology has revolutionized the development of feed additives, particularly enzymes and probiotics, which play a crucial role in improving nutrient utilization and animal performance. Feed enzymes such as microbial phytase (derived from Aspergillus niger and Escherichia coli), recombinant xylanase from Trichoderma , cellulase from genetically improved Bacillus subtilis, and protease produced through submerged fermentation of Bacillus licheniformis are widely used to enhance the digestibility of complex feed components. Recombinant phytase, such as the E. coli–derived 6-phytase, has significantly higher catalytic efficiency than conventional fungal phytase and increases phosphorus availability while reducing environmental phosphorus excretion. Similarly, thermo-stable recombinant xylanase and β-glucanase are used in poultry diets to degrade non-starch polysaccharides and improve energy utilization. Biotechnology has also advanced the development of next-generation probiotics. Strains such as Bacillus coagulans, Lactobacillus plantarum NCIMB 8826, and genetically enhanced Saccharomyces cerevisiae CNCM I-1077 show superior survivability, gut colonization, and immune-modulating properties. Micro-encapsulation and nano-delivery systems further improve probiotic viability under acidic gastrointestinal conditions. Numerous studies report that enzyme–probiotic combinations improve growth rate, feed conversion ratio, milk yield, egg production, gut health, and resistance to pathogens, while also reducing antibiotic usage and methane emissions. Although their benefits are well established, standardization, dose optimization, and safety evaluation remain essential for practical application. Overall, biotechnology-derived enzymes and probiotics represent sustainable tools for improving animal nutrition and supporting antibiotic-free, environmentally efficient livestock production.

Keywords: *Biotechnology, Recombinant enzymes, Probiotics, Feed efficiency, Livestock nutrition, Gut microbiota*

IHASE-2025/304

Artificial Intelligence for Smarter Forests: Monitoring, Managing, and Conserving Biodiversity

Dr.Mexudhan
Assistant Professor, Forestry and Wildlife, Shaheed Mahendra Karma Vishwavidyalaya, Bstar, Jagdalpur (C.G)

Forests play a crucial role in sustaining ecological balance, biodiversity, and climate regulation, yet they face increasing threats from deforestation, wildfires, illegal logging, and climate change. Traditional monitoring and management approaches, while valuable, are often limited by scale, speed, and accuracy. Recent advancements in Artificial Intelligence (AI) offer transformative solutions for sustainable forest management by enabling real-time monitoring, predictive modeling, and automated decision-making. This review synthesizes current applications of AI in forestry, focusing on three key areas: monitoring forest health and land-use change, optimizing management practices, and conserving biodiversity. Machine learning, deep learning, and computer vision have shown significant success in tasks such as wildfire prediction, illegal logging detection, species identification, invasive species control, and carbon stock estimation. AI-driven integration with remote sensing, drones, and Internet of Things (IoT) platforms has further enhanced forest monitoring and conservation efforts. Despite challenges such as high computational requirements, data scarcity, and ethical concerns, AI holds immense potential to revolutionize forestry by improving efficiency, accuracy, and sustainability. The paper concludes that AI, when combined with participatory approaches and global collaborations, can play a pivotal role in achieving climate-smart forestry and advancing the United Nations' Sustainable Development Goals (SDGs).

Keyword: *Artificial Inteligence, Machine learning, Climate change, Internet of Things*

IHASE-2025/305

Induction of Morphological Variants and Molecular Polymorphism in *Punica granatum* L. cv. Bhagwa via Mutagenesis

Mandeep Rawat [1,2], V. P .Singh[3], S.K Verma[4] and Ratna Rai[5]
[1,3,4] Department of Horticulture, [4]Department of Genetics and Plant Breeding G. B Pant University of Agriculture & Technology, Pantnagar. India. Uttarakhand, India and
[2]Teerthanker Mahaveer University, Moradabad Uttar Pradesh.
Email:- mandeeprawat107@gmail.com
Ph no: +91 7017090796

Mutation is defined as a sudden, heritable alteration at the genomic level that generates novel variability within a species. Mutation breeding exploits this principle to induce genetic variation in otherwise uniform germplasm, and has emerged as a powerful strategy for the improvement of perennial fruit crops. In the present investigation, hardwood cuttings of pomegranate cv. 'Bhagwa' were subjected to physical (gamma irradiation) and chemical (ethyl methanesulfonate, EMS) mutagenesis using twelve distinct treatments in addition to an untreated control. This study presents a comprehensive report on mutation breeding in pomegranate (*Punica granatum* L.), with particular emphasis on pre-bearing growth attributes. The experiment was executed at the Medicinal Plant Research and Development Center, G.B. Pant University of Agriculture and Technology, Pantnagar, with the dual objective of standardizing optimal mutagenic dosages and evaluating induced populations for phenotypic, biochemical, and molecular variability. Median lethal dose (LD_{50}) analyses revealed threshold values of 22.015 Gy for gamma rays and 51.28 mM for EMS. Pronounced morphological deviations were recorded among treated populations, including alterations in leaf morphology, internodal length, and overall plant height—traits closely associated with pre-bearing vigor and canopy development. Biochemical assays demonstrated significant dose dependent responses in key oxidative-stress indicators such as proline accumulation, superoxide dismutase (SOD) and catalase activity, malondialdehyde (MDA) content, and total soluble protein, collectively indicating enhanced physiological plasticity and stress resilience among putative mutants. Molecular characterization using ISSR markers further validated the induced genetic variability, wherein primers 812 and 827 produced the highest number of amplicons and the greatest extent of polymorphism, confirming effective mutagenic induction at the genomic level. Overall, the study establishes that both gamma rays and EMS are efficient mutagens for generating exploitable variability in pomegranate. The observed morphological, biochemical, and molecular variations underscore the potential of induced mutagenesis for developing superior mutants, particularly with respect to pre-bearing growth traits and prospective yield-enhancing attributes in perennial fruit crops.

Keywords: *induced mutagenesis, lethal dose (LD_{50}), superoxide dismutase (SOD) and ISSR.*

IHASE-2025/306

Effect of Monensin Sodium Supplementation on Production Performance in Lactating Cattle

Dhapse Sanket Rajkumar, Raju Kushwaha, Vinod kumar, Muneendra Kumar, Shalini Vaswani, Avinash Kumar, Ram Dev Yadav* and Mokshata Gupta
Department of Animal Nutrition, C.V.Sc. & A.H., DUVASU, Mathura, Uttar Pradesh 281001,
*Corresponding Author E-mail: vetrd2015@gmail.com

A 60-day feeding trial was conducted to evaluate the influence of monensin sodium supplementation on nutrient utilization, blood biochemical indices, and production performance of lactating Sahiwal cattle. Eighteen animals were allotted to three groups: Control (basal ration), T1 (basal ration + 150 mg monensin/day), and T2 (basal ration + 300 mg monensin/day). Monensin supplementation improved organic matter and crude protein digestibility, while plasma glucose showed a significant increase on day 60. Hematological parameters remained within physiological limits, indicating the safety of monensin. Overall, monensin improved nutrient utilization and metabolic efficiency without compromising health.

Keywords *Monensin sodium, lactating cattle, digestibility, blood metabolites, feed efficiency*

IHASE-2025/307

Optimizing Oyster Mushroom Cultivation: Exploring Low-Cost Local Substrates for Sustainable Farmer Livelihoods in Goa.

Pankaj Mapari, Aarti S Gauns[1], Deepashree Naik[2] and Govind V. Parab
Goa College of Agriculture, Ela Farm, Old-Goa.
aarti123gauns@gmail.com[1], deepashreenaik4@gmail.com[2]

Goa's warm and humid tropical climate provides ideal conditions for Oyster Mushroom cultivation, particularly for *Pleurotus florida*, a fast-growing and nutritious species well-suited to small-scale farming. In Goa, several agricultural residues such as sugarcane bagasse, sugarcane leaves, and cocopeat are readily available but remain largely underutilized. These lignocellulosic materials have great potential as low-cost substrates, contributing to sustainable waste recycling and income generation for farmers.

The present study (2023–24 and 2024–25) were undertaken to evaluate the efficacy of different locally available substrates and additives on the cultivation performance of *Pleurotus florida*. Substrates tested included sugarcane bagasse, sugarcane leaves, and cocopeat—both individually and in combination with paddy straw. Paddy straw substrate was maintained as the control. Additives such as besan (gram flour) and rice bran were incorporated to assess their influence on growth and production parameters. Observations were recorded for duration of spawn run, stipe length, pileus diameter, days to first harvest, biological efficiency, and cost of cultivation.

Results revealed that combinations of paddy straw with rice bran and besan significantly enhanced biological efficiency and reduced the spawn run period compared to the control. The findings highlight the potential of locally available agro-wastes as efficient, low-cost substrates for oyster mushroom cultivation, thereby promoting sustainable farmer livelihoods and resource recycling in Goa.

Keywords: *Pleurotus florida, biological efficiency, agro-waste, sugarcane bagasse, cocopeat, rice bran, besan, Goa, sustainable cultivation.*

IHASE-2025/308

Sugarcane Breeding for Disease Resistance

P.P. Patil[1*].; S.S. Nitave[2].; V.A. Atkari[3].; S.S. Jadhav[4] and G.V. Parab[5]
Goa College of Agriculture, Ela Farm, Old Goa, Goa 403 402, Goa

Sugarcane 2n=80 to 2n=128 (*Saccharum* spp.) belongs to the family Poaceae (Graminae). In India area, productivity and recovery is 55.83 lakhs hectares, 82.7 (t/ha) and 10.03 % respectively (Source: Co-operative Sugar, 2023). Considering area, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Bihar, Andhra Pradesh and Gujarat are the major sugarcane growing states. Every year in India, crores of rupees are lost annually on account of abiotic and biotic factors in sugarcane cultivation. Disease alone constitutes a serious economic drain of sugarcane production. In sugarcane 240 diseases (fungal, bacterial and viral) have been reported up till now globally. Of these, the most dreaded fungal disease like 'Red-rot' (*Colletotrichum falcatum* Went) followed by 'Smut' (*Ustilago scitaminea* Sydow) and 'Wilt' (*Cephalosporium sacchari* Butl and *Fusariun moniliforme* Sheld). These important diseases cause substantial economic losses by scaling down the cane yield and recoverable sugar. There is a continuous need to develop new varieties / clones with high cane yield potential and resistant to majority of the races of the pathogens of these major diseases. Breeding sugarcane for disease resistance includes expanded systematic screening and selection of the progenies of specifically planned crosses. Such programmes should involve various *Saccharum* spp in the crosses and exploitation of various known morphological and biochemical features of resistance. However, progress of such programme is expected to be slow due to the complex inheritance pattern which is still unknown. So such program should be complemented with marker technology by identifying marker for genes contributing to resistance.

Keywords:- *Sugarcane, Saccharum spp, diseases resistance, red rot, wilt, smut*

IHASE-2025/309

Studies on the therapeutic potential of haematopoietic stem cells in immunodeficient canine patients

Seema[1], N.S. Jadon[2]
[1]Veterinary Assistant Surgeon, Department of animal husbandry, Chhattisgarh
[2]Former, Professor and Head, Department of Veterinary Surgery and Radiology, GBPUAT, Pantnagar, Uttarakhand
E-mail- seesan15@gmail.com

Eighteen dogs of 7-12 years age group of either sex with naturally affected immune-deficiency disorders were used in this study. The animals were randomly divided into 3 groups viz. A, B and C of 6 animals each. Animals of group A were kept as control while treatment was followed in group B and C. Haematopoietic stem cells derived from peripheral blood were administered @ 10-15x10^6 cells/kg bwt intravenously at fortnightly intervals for one month in the animals of group B. Animals of group C were administered with the combination of haematopoietic stem cells @ 10- 15x10^6 cells/kg bwt. intravenously at fortnightly intervals for a month and levamisole @ 2mg/kg bwt. per os thrice a week for two weeks. The efficacy of the treatments was determined on the basis of physiological parameters (rectal temperature, respiratory rate, heart rate, mucous membrane), haematological (Hb, PCV, TEC, TLC, ESR, platelets count, neutrophils, eosinophils, monocytes, leucocytes) biochemical (total protein, albumin, globulin, albumin and globulin ratio, glucose, cholesterol, BUN, creatinine, ALT, AST, GGT) and percentage of CD4, CD8, CD34 and CD45 cells in blood. All the parameters were recorded at day 0, 3, 7, 15, 21 and 30 using the standard protocol. On the basis of these parameters in this study it was concluded that combination of haematopoietic stem cells and levamisole gave an early and better recovery in immunodeficient canine patients as compared to the haematopoietic stem cells alone. Haematopoietic stem cell therapy had no side effect on the animal body. Haematopoietic stem cells may be an effective tool in the battle against various immunological disorders.

IHASE-2025/310

Enhancing the late sown toria production with stress in north-eastern region

Dimpi Dutta[1] and Mahima Begum[1]
Dept of Agronomy, Assam Agricultural university
corresponding author email: dimpi.dutta9298@gmail.com

An experiment was conducted at instructional farm of Assam Agricultural University, Jorhat during *rabi* season of 2022-23 with the objective of mitigating the stress upon late sown toria in north eastern part of the country. The experiment was designed under split plot condition with three different microclimatic situations, which was setup on the basis of sowing dates i.e., 15th Nov, 30th Nov and 15th Dec and three different concentrations of jasmonic acid (50 µmol JA, 100 µmol JA and 150 µmol JA) and one control. The soil of the experimental site was sandy loam in texture, acidic in nature.

Favorable microclimatic conditions associated with the crop sown on 15th November led to superior growth performance, reflected in greater plant height, higher number of primary and secondary branches, and increased dry matter accumulation. In contrast, sowing on 15th December resulted in comparatively poorer growth. Yield-related traits, including siliqua development and seed formation, were also most favourable under the 15th November sowing regime. Correspondingly, this sowing date produced the highest seed, stover, and oil yields, while the 15th December sowing recorded the lowest productivity. With respect to jasmonic acid (JA) levels, the application of the highest concentration promoted notable increases in plant height and dry matter production at various growth stages. Physiological characteristics such as relative water content, proline accumulation, leaf area, leaf area index, leaf area duration and crop growth rate also showed maximum improvement under this treatment. Yield-attributing traits, along with seed and stover yields, were significantly enhanced when the highest concentration of JA was applied. The combined influence of microclimatic conditions and JA levels produced marked improvements in growth, physiological processes, and yield performance. The treatment involving a moderate JA concentration applied to the crop sown on 15th November resulted in the greatest enhancement in plant height, dry matter accumulation, leaf area and relative water content. This combination also recorded the highest values for yield-related characteristics and overall productivity. From an economic perspective, the most favorable returns and benefit–cost ratio were obtained from the crop sown on 15th November with the moderate JA application. This was closely followed by the same sowing date without JA treatment, which also produced comparatively high economic returns.

Keywords: *Jasmonic acid, microclimate, proline, relative water content*

IHASE-2025/311

Evaluation of processing techniques for reduction of phytic acid content in herbal powders

H.B. Rashmi[a*] and Manjesh M.[b]

[a]Associate Professor(PHT),Department of Postharvest Management, College of Horticulture, Bengaluru -560065.
(Affiliated to University of Horticultural Sciences, Bagalkot)
[b]Assistant Professor (Horticulture), Department of Life Sciences, CHRIST (Deemed to be University), Central campus, Hosur Road, Bengaluru – 560029.
Corresponding author:* rashmihb.1@gmail.com

Phytic acid (myo-inositol hexaphosphate) is an anti-nutritional factor that binds minerals such as iron, zinc, calcium, magnesium, reducing bioavailability. Reducing phytic acid content before consumption or product development improves mineral absorption and effective therapeutic value. Herbal powders such as moringa leaf powder, curry leaf powder, guava leaf powder and papaya leaf powders are consumed on day to day basis owing to their enormous health benefits and rich mineral nutrition. Phytic acid being present in such herbal powders can hinder in their mineral absorption and bioavailability. This initiates evaluation of different pre-treatments such as hydration method, fermentation, enzymatic treatment, roasting / heat treatment, acid treatment and combination methods to reduce phytic acid content. Soaking herbal leaves for 6–12 hours at the warm temperature 35–45°C in clean water before drying, activates natural phytase enzymes thus breaking down of phytic acid. Fermentation of leaves by microbial phytase for 12–24 hours under controlled temperature of 30–37°C, followed by drying and pulverising. Enzymatic treatment with commercial phytase enzyme at the pH 4.5–5.5 and temperature of 45–50°C under most accurate and controlled reduction method. Mild heat or roasting treatment at the roasting temperature of 60–80°C before further processing will also reduce phytic acid. Acid treatment using mild acids like lemon juice or tamarind extract during soaking as acidic pH enhances enzymatic breakdown of phytates. Among all the pretreatments, combination method such as soaking and germination, fermentation and mild heat, soaking and phytase enzyme gave best results.

IHASE-2025/312

Development of Battery Operated Onion Leaf Cutting Machine

Tarun Kumar Maheshwari[1], Deepali Mudgal[2], Khushboo Gupta[3]
[1]Associate Professor, in Farm Machinery and Power Engineering, [2] Assistant Professor, at SVPUA&T, [3] Teaching Associate in College of Agricultural Engineering and Technology, Etawah, UP. Paper to be presented at IHASE-2025 International Conference on Innovations in Horticulture, Agriculture, Veterinary, Fisheries and Allied Sciences for Sustainable Development & Environment on 20-22 November at Goa.

Onion is a major crop in India, but harvesting them is labor intensive and requires a significant number of workers and time. Trimming the roots and shoots of onions is a particularly tedious and manual part of the process. The lack of mechanization and technology use contributes to low productivity in onion harvesting. Currently, there are no machines available in India to automate onion root and shoot cutting. This lack of machinery leads to financial losses for farmers to difficulties finding enough workers. The goal of this project is to design and build a prototype machine that can cut both the root and shoot of an onion after it's fed into the system. The Battery-operated onion leaf cutting machine is developed and tested in the workshop of Department of farm machinery and power engineering, BRACAET, Etawah. Battery operated onion root and shoot cutting machine consists of blade, DC motor and plates assembly which is mounted on top side of stable platform on frame, switch, battery, a connector to connect machine from battery. The power operated onion leaf and root cutter is operated by 12 watt single phase DC motor having 2000 rated rpm. When power is supplied to the machine, the DC motor turns direct current into mechanical energy, which aids in the rotation of the blade. The blade is inserted b/w the plates, which include two slots for onion insertion, allowing the roots and leaves to be sliced independently. The onions are inserted in the slots manually, after that the cutting of root and shoot bulb moves downward. On a single machine, two people can cut the leaves and roots at the same time. The machine cutting blade is made up of high carbon steel material which provides strength to blade and maintains its sharpness, the frame of machine is made up of powdered coated metal material which decreases the possibility of corrosion, it can be easily operated by labor. The parameters calculated during the test includes: bulb mass, polar diameter, equatorial diameter, torque, width of cutting. The productivity of onion leaf cutting machine is approximately 8 Q/day. The study of cost of operation was conducted in an onion field, comparing the cutter performance with the manual cutting method commonly employed in the region. The cost of the machine is found as Rs. 2500 with breakeven point was calculated as 139.79 h/year and payback period was found to be 3-5 years taking profit as 20%. The newly developed machine saves 70.37% cost and 92.59% labor as compared to traditional sickle

Keywords: *Battery, DC motor, Onion, Root, Productivity.*

IHASE-2025/313

IoT-Integrated Biosensor Packaging for Real-Time Spoilage Detection and Post-Harvest Loss Prevention in Fresh Fruits and Vegetables

Kusum Farswan
Teerthanker Mahaveer University, Moradabad, Uttar Pradesh
Email ID: **kusumfarswan.14feb@gmail.com**
Contact no.: 9012475488

Post-harvest loss of fresh fruits and vegetables remains a major challenge in the supply chain due to rapid physiological deterioration and microbial spoilage. This study reviews the development and application of IoT-integrated biosensor packaging as an advanced strategy to monitor and preserve the quality of perishable produce.The integration of biosensors with Internet of Things (IoT) technologies is emerging as a promising approach to enhance food safety, quality monitoring, and traceability in fresh fruit and vegetable packaging. Biosensors embedded in packaging materials can detect biochemical changes associated with spoilage, ripening, or microbial activity. When connected to IoT networks, these sensors transmit real-time data on product condition, storage environments, and handling practices to cloud platforms or mobile devices. This continuous flow of information enables timely interventions and helps reduce post-harvest losses across the supply chain. Unlike conventional inspection methods that rely mainly on visual or physical attributes, IoT-enabled biosensor systems provide deeper insight into internal quality changes that are not easily detected. The incorporation of data analytics and artificial intelligence further strengthens these systems by supporting predictive assessments and informed decision-making. This review summarizes recent advancements, identifies existing limitations, and highlights future opportunities for integrating biosensors and IoT in smart packaging. Overall, such technologies have the potential to significantly improve the safety, efficiency, and sustainability of fruit and vegetable preservation in the modern food industry.

Keywords: *IoT, smart packaging, biosensor, fruit and vegetable preservation, sustainable development*

IHASE-2025/314

Use Of Automated Robotic Weeders To Reduce Herbicide Dependency

Dhruv N. Patel[1] and Het U. Patel[2]

[1]Ph.D. Scholar, BACA, AAU, Anand

[2]P.G. Student, BACA, AAU, Anand

Weed management remains a critical challenge in modern agriculture, often determining the overall productivity and profitability of farming systems. Conventional approaches rely extensively on chemical herbicides, which, though effective, have led to increasing environmental concerns, herbicide-resistant weed species, and negative impacts on soil biodiversity and human health. Automated robotic weeders offer a promising, sustainable alternative by integrating robotics, artificial intelligence, and precision agriculture technologies to perform non-chemical, site-specific weed control. This study examines the operational principles, technological components, and field efficiency of modern robotic weeding systems. These machines utilize advanced machine vision, deep learning algorithms, GPS navigation, and real-time weed-crop discrimination techniques to mechanically uproot or suppress weeds with high accuracy. Field trials and case studies indicate that automated weeders can achieve 80–95% weeding efficiency, significantly reducing herbicide use while ensuring minimal crop damage. Their ability to operate autonomously reduces labor dependency, a growing constraint in many agricultural regions, and offers consistent performance across diverse field conditions. Moreover, robotic weeders contribute to soil health preservation by reducing chemical load and preventing herbicide-resistant weed evolution. The adoption of automated robotics in weed management represents a crucial step toward sustainable, climate-smart, and eco-friendly farming systems.

Key words: *Automated robotic weeder; Precision agriculture; Weed control; Machine vision; Herbicide reduction.*

IHASE-2025/315

Innovative Approaches to Enhance Quality and Shelf Life in Food Processing

Dr. Premlata
Assistant Professor, Department of Home Science
Government Post Graduate College, Gopeshwar, Chamoli, Uttarakhand
Email id : 18ps.ext@gmail.com

The rapid growth of the global food industry has intensified the need for innovative and sustainable approaches to food processing and preservation. Traditional methods such as thermal processing, dehydration, and chemical preservation, though effective, often lead to nutritional loss, sensory changes, and reduced consumer acceptance. In response, modern technologies are emerging that aim to enhance food quality while ensuring safety, extending shelf life, and reducing environmental impact. This paper reviews recent advancements in non-thermal processing technologies such as High-Pressure Processing (HPP), Pulsed Electric Field (PEF) treatment, ultrasonication, and cold plasma, which have demonstrated the ability to inactivate microorganisms while preserving heat-sensitive nutrients and natural flavors. Additionally, the study explores innovative preservation strategies including edible coatings made from natural polymers, active and intelligent packaging systems, bio preservation using probiotics and bacteriocins, and the utilization of natural antimicrobial compounds derived from plants and microorganisms.

The role of digital technologies is also becoming significant in the food sector. Artificial intelligence, Internet of Things (IoT), and automation are enabling real-time monitoring of food quality, optimization of processing conditions, and predictive modelling for shelf-life assessment. These advancements contribute to minimizing post-harvest losses and ensuring higher efficiency throughout the supply chain. Furthermore, the growing focus on sustainability has encouraged the adoption of eco-friendly packaging materials, energy-efficient processes, and valorisation of food waste into value-added products.

Overall, the integration of cutting-edge technologies with traditional practices offers a promising pathway toward a safer, healthier, and more sustainable food processing and preservation system. This paper highlights the potential of these innovations to transform the food industry and address global challenges related to food security and consumer well-being.

Keywords: *Food Processing Innovations, Non-Thermal Technologies, Sustainable Preservation Methods*

IHASE-2025/316

Crop Innovation for Tomorrow: Advancing Agriculture via De Novo Domestication

J. J. Patel[*1]
[1, 3] Ph. D. Scholar, Department of Genetics and Plant Breeding, C. P. College of Agriculture, S. D. A. U., Sardarkrushinagar-385506
*Corresponding author. E-mail: jimitp344@gmail.com

De novo domestication is an innovative approach in modern crop improvement that introduces domestication-related genes directly into wild plant species while preserving their natural genetic diversity, environmental adaptability, and stress tolerance. Unlike classical breeding, which transfers beneficial alleles from wild relatives into cultivated crops, de novo domestication employs a "rewilding" or "back-to-nature" strategy, converting wild species into new, high-performing crops. Comparative genomic analyses between wild relatives and modern cultivars help identify key domestication genes and genomic regions suitable for targeted editing.

A successful *de novo* domestication program relies on selecting appropriate wild species, understanding domestication genes and loci, and having genome sequencing information of both the target crop and its relatives. Identification of orthologous genes and an efficient transformation system are also essential. The process involves selecting adaptable wild germplasm, identifying desirable traits, applying CRISPR/*Cas9* mediated genome editing, regenerating edited plants, and verifying both genotypic and phenotypic changes before integrating newly domesticated lines into crop breeding programs.

Genome editing, particularly CRISPR/*Cas9* has become the most efficient tool for *de novo* domestication, as it enables precise genetic modifications such as targeted mutations, SNP alterations, and large genomic insertions or deletions. This significantly accelerates crop improvement and increases accuracy compared to traditional breeding.

Recent studies highlight the success of this approach. In wild tomato (*Solanum pimpinellifolium*), CRISPR/*Cas9* editing of six domestication genes resulted in plants with a threefold increase in fruit size, tenfold increase in fruit number, improved fruit shape, and a 500% increase in lycopene content compared to the wild parent. Similarly, *de novo* domestication of wild allotetraploid rice (*Oryza alta*) was achieved by identifying a promising wild genotype (PPR1), generating a high-quality genome assembly, and efficiently editing key agronomic gene homologs. This resulted in rapid trait improvement and demonstrated the potential of polyploid wild rice as a new domesticated crop to support future global food security.

Key words: *De novo domestication, CRISPR/Cas9, Wild relatives, Genome editing, Crop improvement*

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Environment and Waste Management

Madhuri Hosamani[1]*, Vijaylaxmi[2]
Department of Floriculture and Landscaping, Sri Konda Laxman Telangana Horticultural University Post Graduate Institute for Horticultural Sciences, Mulugu, Siddipet, 502279
*Presenting author Email: madhurihosamani633@gmail.com

Rapid urbanization, improved living standards, and increasing resource consumption have led to excessive waste generation, surpassing the management capacities of many governments and organizations. In India, this challenge is particularly severe, with an estimated 68 million tonnes of food waste and nearly 350 million tonnes of agricultural waste produced annually. These waste streams contribute to environmental degradation, threaten forest ecosystems, and impact public health, highlighting the urgent need for sustainable and circular waste management strategies. The valorisation of agricultural and food residues into eco-friendly and value-added products offers a viable solution for mitigating waste-related issues while promoting environmental protection and resource efficiency.

Transforming agricultural residues into paper supports forest protection and afforestation by reducing dependence on wood-based raw materials. Similarly, the production of bioplastics from food waste mitigates land pollution and prevents the release of toxic emissions from conventional plastics. The extraction of essential oils from dry leaves further demonstrates how organic waste can be repurposed into economically valuable and environmentally beneficial products. Collectively, these innovative approaches exemplify the principles of the circular economy, integrating waste reduction, resource recovery, and sustainable production. This review emphasizes the importance of technological innovation, policy support, and public awareness in advancing eco-friendly waste utilization. By linking waste valorisation with forest conservation, pollution control, and sustainable industrial practices, these initiatives contribute to the global vision of a greener, low-waste, and resilient future.

Keywords: *Sustainable waste management, circular economy, forest protection, agricultural waste, food waste, bioplastics, essential oils, eco-friendly production, resource recovery, afforestation.*

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Assessment of the Nutritional Profiling and Feeding Value of *Spirulina platensis* rich diet for *Ompok bimaculatus*

Swati Sharma and Nisha Rana
e-mail: nisharana.zoology@gmail.com
Swami Vivekanand Subharti University, Meerut
U.P., India, 250005
Corresponding Author: Dr. Nisha Rana
Swati Sharma- Orcid Id: 0009-0008-8519-337X
Dr. Nisha Rana- Orcid Id: 0000-0001-9896-8674

The present study was conducted to evaluate the nutritional profile of *Spirulina platensis*–rich diets formulated with conventional feed ingredients for *Ompok bimaculatus* (Butter catfish). Four experimental diets were prepared by supplementing *Spirulina platensis* at different inclusion levels of 10%, 15%, 20%, and 25%, along with other feed ingredients such as corn flour, soybean meal, mustard oil cake, and rice bran.

Proximate composition analysis of the formulated diets was carried out following standard AOAC (2005) methods to determine crude protein, crude lipid, ash, moisture and fibre content. The results indicated that *Spirulina platensis* incorporation significantly improved the overall nutritional quality of the feed. The diets containing 15–20% *Spirulina* showed higher crude protein levels (up to 45–48%), moderate lipid content (6–8%), and lower crude fibre (1–2%), while maintaining optimal levels of ash and carbohydrates.

The incorporation of *Spirulina* with complementary plant-based protein sources such as soybean meal, mustard oil cake, and rice bran resulted in a nutritionally balanced formulation that provided optimal levels of macronutrients and micronutrients. This synergistic composition likely enhanced nutrient bioavailability, improved feed conversion efficiency, and stimulated immune modulation in *Ompok bimaculatus*. Such integration of *Spirulina* within composite feed formulations has been widely recognized for promoting fish growth performance, physiological health, and overall aquaculture sustainability.

In conclusion, the inclusion of *Spirulina platensis* at 15–20% in the formulated feed showed the most promising nutritional profile, suggesting its potential as a sustainable, high-quality protein source for aquafeed development in *Ompok bimaculatus* culture systems.

Keywords- *Spirulina platensis; Ompok bimaculatus, proximate composition, Spirulina-rich diet, soybean meal, corn flour, mustard oil cake, rice bran.*

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Assessment of Parasitic Infection in Dark Mahseer (*Naziritor chelynoides*) from the Alaknanda River, Uttarakhand

Shikha Thapliyal[1], Prof. Shashi Kiran Solanki[2]

[1]Research scholar Department of Zoology D.A.V.(P.G.) College Dehradun (H.N.B.G.U. Srinagar Uttarakhand)

[2]Department of Zoology D.A.V.(P.G.) College Dehradun (H.N.B.G.U. Srinagar Uttarakhand)

The Dark Mahasheer (*Naziritor chelynoides*) is one of the most valued hill-stream cyprinids, inhabiting the Alaknanda River system of the Central Himalaya (Uttarakhand). The present work forms an initial phase of a broader effort to examine the parasitic infection in Dark Mahseer inhabiting the Alaknanda River. 16 *Schizothorax* spp. and 20 *Naziritor chelynoides* individuals were selected from the Alaknanda river of Garhwal region, (30.251499° N, 78.894510° E). Even though the objective of the study was to evaluate parasites in *Naziritor chelynoides*, the same analysis was conducted on *Schizothorax* spp. to correlate the findings. Both fish species were tested for parasite infections using standard parasitological and microscopic techniques.

In *Naziritor chelynoides*, parasitic infection was detected in a large proportion of individuals, with an observed prevalence of around 80%. In contrast, none of the examined *Schizothorax* spp. were found to carry any parasite.

Scanning Electron Microscopy (SEM) confirmed the parasite to be a nematode. The notable contrast in infection status between the two genus of fish points toward differences in feeding habit, habitat use or susceptibility. As limited scientific information is currently available on the parasitic profile of *Naziritor chelynoides* in Uttarakhand, the findings of this preliminary study provide a useful baseline for long-term monitoring of fish health management and conservation planning in Himalayan river systems.

Keywords*: Naziritor chelynoides, Parasite, Alaknanda, Uttarakhand, Prevalence.*

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Design and Implementation of a Comprehensive Farmer Profiling System for Digital AgriHub

Shravan Kumar Singh[1], Abhijeet Kaushik[1], Ravi R Saxena[1], Kalpana Banjare[2], Santosh Biswas[3], Vishnu Vaibhav Dwivedi[3] and Pratibha Dongre[3] Avhinav Kaushik[1]

1. Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg & NIC
2. Indira Gandhi Krishi Vishwavidyalaya, Raipur
3. Indian Institute of Technology, Bhilai

Corresponding Author: Shravan Kumar Singh, Contact No 8889231365

This research paper provides a comprehensive documentation of the conceptualization, design, development, and strategic implementation of a centralized and standardized digital farmer database, which constitutes the foundational cornerstone of the ambitious "Precision AgriHub" project. The project is a pioneering initiative spearheaded by Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg funded under the auspices of the IBITF, IIT Bhilai. It is strategically designed to bridge the profound and long-standing data gap that has persistently hampered the efficacy of agricultural support systems. The meticulously structured database systematically captures and consolidates a holistic 360-degree profile for each individual farmer, encompassing critical data points such as land records and cadastral details, comprehensive soil health metrics and historical trends, detailed crop history and cultivation patterns, precise irrigation sources and water management practices, and inventory of livestock and other ancillary assets. Developed upon a robust, secure, and highly scalable technological architecture, the platform is engineered to facilitate seamless processes for data collection, validation, encrypted storage, and efficient retrieval. The overarching objective of this endeavor is to transcend mere data aggregation and to transform this rich, aggregated information into actionable intelligence, thereby enabling the delivery of highly personalized and location-specific agro-advisory services, ensuring precise linkage of farmers to resources, subsidies, and credit facilities, and empowering government bodies with evidence-based insights for targeted policy intervention and strategic planning. This paper meticulously outlines the intricate database schema, the multi-faceted data collection methodology involving field surveys and existing record integration, and the stringent security protocols implemented to guarantee data integrity, confidentiality, and farmer privacy. The successful creation and deployment of this unified database is posited as an indispensable and fundamental step towards achieving true data-driven agricultural governance.

Keywords: *Digital Agriculture, Farmer Database, Precision Farming, Farmer Profiling.*

IHASE-2025/321

Effect of Microbial Inoculation and Tillage Practices on Soil Health and Productivity in Pulse–Cereal Cropping Systems

Abhishali
Ph.D. Scholar, Department of Agronomy, Lovely Professional University, Punjab, India
Email: abhishalithakur777@gmail.com | **Mobile**: 8580622617

Enhancing soil fertility and maintaining sustainable crop productivity are critical priorities for modern agriculture. The present study conceptually examines the combined influence of microbial inoculation and various tillage practices on soil health and productivity in pulse–cereal cropping systems. Different tillage systems—zero, minimum, and conventional—play a significant role in regulating soil physical, chemical, and biological properties. They directly affect soil structure, water infiltration, organic matter decomposition, and nutrient availability. Microbial inoculation, including beneficial strains of Rhizobium, phosphate-solubilizing bacteria, and plant growth-promoting rhizobacteria, complements these systems by improving nutrient cycling, root architecture, and soil enzymatic activities. Recent evidence highlights that reduced and conservation tillage, when integrated with microbial inoculants, enhances soil organic carbon, microbial biomass, and aggregate stability while minimizing nutrient losses and greenhouse gas emissions. In contrast, continuous intensive tillage tends to degrade soil quality, leading to compaction and reduced productivity over time. Pulse–cereal rotations supported by microbial management not only sustain higher yield stability but also strengthen soil resilience against climate variability. Overall, the integration of microbial inoculation with appropriate tillage intensity offers a practical, resource-efficient, and eco-friendly approach to achieve long-term soil sustainability and crop productivity. This synergistic strategy provides a pathway toward sustainable intensification and improved system efficiency in pulse–cereal-based production systems.

Keywords: *Microbial inoculation, tillage systems, soil health, sustainability, pulse–cereal cropping system.*

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A Regional Study on the Prevalence of Antimicrobial Resistance in Fish-Pathogenic *Aeromonas* Strains from Tripura, India

Kunal Samadhan Tayde[1], Narayanaprasad Dash [1], Ramanuj Chakraborty[2], Suraj Kumar[1], Gaurav Rathore[3], Tanmoy Gon Choudhury[1]

[1]Department of Aquatic Health and Environment, College of Fisheries, Central Agricultural University, Lembucherra, Agartala, Tripura, 799210, India

[2]Krishi Vigyan Kendra, Central Agricultural University (Imphal), Sepahijala, Tripura, 799103, India

[3]Fish Health Management & Exotics Division, NBFGR, Lucknow, UP, 226 001, India

*Email: taydekunal108@gmail.com

Mobile No.: 9623046741

Disease outbreaks in aquaculture present significant challenges to fish health and farm productivity. This study investigated the prevalence, isolation, and antimicrobial resistance patterns of *Aeromonas* species associated with diseased fish and pond water in the districts of West Tripura and Sepahijala, Tripura. A total of 25 bacterial isolates from the kidney tissues of diseased fish and 17 isolates from pond water were obtained from active outbreak sites. The isolates were identified and coded according to their geographic source and sample type. Molecular identification confirmed all isolates as *Aeromonas* spp. through PCR amplification of aerolysin gene and 16S rRNA sequencing. Antibiotic susceptibility was assessed using the Kirby-Bauer disk diffusion method against 11 antibiotics. Results revealed that *Aeromonas* isolates exhibited the highest resistance to cefoxitin (CX), with 24% of isolates classified as resistant. Additional resistance was observed to co-trimoxazole (COT) and tetracycline (TE), while smaller proportions demonstrated resistance to chloramphenicol (C), imipenem (IPM), and amikacin (AK). The Multiple Antibiotic Resistance (MAR) index was calculated, with select isolates demonstrating values as high as 0.27, indicating significant antibiotic exposure and resistance risk. Phenotypic detection also identified the presence of AmpC β-lactamases among several resistant isolates. Environmental parameters of the sampling sites, such as temperature, pH, dissolved oxygen, alkalinity ammonia, nitrite, nitrate and hardness were documented and found to potentially contribute to disease dynamics. Overall, this research highlights the widespread occurrence of multi-drug-resistant *Aeromonas* spp. in aquaculture settings of Tripura, emphasizing the need for continual monitoring and prudent antibiotic use to mitigate the spread of resistance and safeguard fish health.

Keywords: *Aeromonas, Antimicrobial resistance, AmpC β-lactamase, ESBL, Molecular characterization.*

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Identification of candidate genes for wheat rust resistance from GWAS-identified QTNs in a *durum* wheat genetic diversity panel and their *in silico* expression analysis

Shruti Sinha, Amit Kumar Singh*
Division of Genomic Resources, ICAR-NBPGR, New Delhi-110012

Reliable and stringent 22 Quantitative Trait Nucleotides (QTNs) associated with leaf rust response in durum wheat *Triticum turgidum* has been identified. Since durum wheat genotypes display resistance to the pathogen better than bread wheat and are potential harbinger of novel rust resistance genes. It is thus lucrative to identify new rust-resistance genes as candidates for future wheat breeding for rust resistance. For this, SNP probe sequence corresponding to these reliable QTNs was searched against the genome assembly Svevo.v1 on Ensembl plant database and genes present in the Linkage Disequilibrium region of 1 Mb was manually inspected and critically analysed to be selected as candidates for rust resistance. For total 22 QTNs, over 300 annotated candidate genes were identified based on literature search and functional category. These included 63 R genes (15% of total genes), 34% were enzymatic, 10% had nucleic acid binding function and 4% has signalling role with 3% as structural functions and 29% are unannotated genes which can also be potential candidates. For analysing the expression levels, an RNASeq data from study of wheat leaves at 6h and 24h post inoculation from rust pathogen available in the public database was utilized. Raw reads were trimmed, cleaned and processed to identify the fold change of expression levels in all samples. Of the 63 R genes identified, 50 showed differential expression post inoculation. Expression of a NBS-LRR family gene, TRITD6Bv1G224600 located in the vicinity of the QTN RAC875_c35430_373, and TRITD6Av1G225060 which is in proximity to the QTN Excalibur_c77841_224 was found to be upregulated in response to infection with leaf rust pathotypes, suggesting their potential involvement in conferring resistance to leaf rust.

Keywords: *QTNs, Linkage Disequilibrium, RNASeq, R genes*

IHASE-2025/324

Pesticide Diminution in Paddy Grown in Cow Dung-Enriched Soil for Sustainable Agriculture

Subhas Adak
Agricultural Training Centre & SAMETI-West Bengal,
Ramakrishna Mission Ashrama,
Narendrapur, Kolkata-700103, India.

Sustainable agriculture is entrusted with the organic inputs utilized for crop production. Decomposed cow dung is one of the easiest available form of manures and having rich sources of plant nutrients and anti-pathogenic properties for plant protection. The study was conducted in paddy field (var. Satabdi) during boro season (2024-25) with six treatments and three replications using chemical fertilizers and decomposed cow dung at the different level to evaluate the effect of cow dung enrichment on pesticide requirements, yield, and economic efficiency in rice plants. Increase in cow dung content along with decrease in chemical fertilizers, the rate of the cost was diminishing. It was reduced from T1 to T5 (2475.333). But T6 showed it little bit higher (3338.33) because of that for the first time, only the cow dung was not sufficient to provide adequate nutrients to the plant. The pesticide quantity decreased with increase in cow dung content because cow dung has the pesticidal properties. The highest yield was observed in case of T1 (5.241267) whereas the lowest produce was obtained from the T6 (3.622667) because the paddy required high quantity of nutrients which could not be provided by only the source of 10ton cow dung. Benefit-Cost Ratio was higher for the T4 (1.814) whereas it was the lowest for the T6 (1.171237). The ensured the cow dung enriched soil was having high productivity and anti-pathogenic properties that promote sustainable agriculture.

Keywords: *Cow Dung; Pesticide Diminution; Sustainable Agriculture.*

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Bridging Climate-Smart Agriculture with Extension Education and Communication in Community Science

Diksha Srivastava
Research Scholar, Department of Extension Education and Communication Management,
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, U.P.
Corresponding email id: dikshasrivastava999@gmail.com

Climate-smart agriculture (CSA) closely aligns with extension education and communication management in community science by promoting sustainable farming, resource management, and resilience to climate change through educational and outreach initiatives tailored for household and community contexts. Community science integrates CSA by leveraging experiential learning, participatory techniques, and advisory services to empower women, families, and rural populations in adopting climate-resilient food production, nutrition practices, and livelihood strategies. Extension education in community science utilizes tools such as farmer field schools, mobile advisories, community demonstrations, and peer learning to disseminate practical CSA knowledge ranging from climate-resilient cooking methods and safe food storage to water conservation and smart gardening. Communication management further amplifies these impacts by ensuring that locally relevant information and adaptive technologies reach diverse stakeholders, fostering inclusive and equitable climate action at the grassroots level. By embedding CSA principles within community science curricula and extension programs, extension education and communication management help catalyse community-led adaptation, improved household food security, and long-term sustainability for rural and urban families facing climate threats.

Keywords: *Community Science, Climate-smart agriculture, Extension education, Knowledge transfer*

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Comparative Analysis of The Treated and Untreated Vegetable oil Mill Effluents

Durga Lal Regar[1], Poonam Jaiswal[2]
[1]Assistant Professor, Dept. of Botany, govt girls College (Raj.),
E-mail: regardurgalal1982@gmail.com
[2]Poonam Jaiswal, Professor, Dept. of Botany, JDB Govt. Girls Collage Kota (Raj.)

Vegetable oil mill in Bundi district cover almost 80% part of the industrial scenario of the district. There are two major oil mills that extracts and refine soybean and mustard oil. Industrial effluent related pollution has become a serious concern in recent years. Because in most of the cases effluents are discharged without treatment into nearby agricultural fields or water bodies causing serious contamination of soil and water. The treated and untreated effluent sample from oil mill were collected and analyzed for Physico-chemical parameters like Color, temperature, pH, DO, BOD, COD, TDS, TS, TSS, and Oil & grease. Untreated oil mill effluent is found to have high contents of COD, BOD, TSS, TDS, and low contents of DO. The untreated (crude) effluent samples show highly acidic conditions with pH range from 2.0-4.0 for soybean OME and 1.5-3.0 for mustard OME whereas treated OME shows a pH range of 6.85-6.95 for both the OME. Untreated OME have very high total dissolved solids (TDS) and total suspended solids (TSS) which are reduced to 120 and 140 after treatment for soybean and mustard OME respectively. Untreated OME has a very high range of Oil and greases and COD which are reduced after treatment to 100ppm and 90ppm for Oil and greases and COD to 110ppm and 98ppm for soybean and mustard OME respectively. The results reflect that the treated effluents of oil industry are not highly polluted and they satisfy the BIS Indian standards values and therefore can be used for irrigation purposes.

Key words: *Oil mill effluent, Physico-chemical parameters, pH.*

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A study of bacterial evaluation of calf diarrhea in the geographical area of Jalore

Jayesh Dhoral *, S. Solanki, R. Singathia, D.K. Sharma
Department of Veterinary Microbiology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, INDIA
(Rajasthan University and Animal Sciences, Bikaner)
***Corresponding Author Email:** jayeshdhoral21@gmail.com

The research was carried out to isolate, identify, and characterize the bacterial pathogens responsible for calf diarrhea in the Jalore district of Rajasthan. The study involved 30 faecal samples obtained directly from the rectum of calves suffering from diarrhea, which were then brought to the Microbiology laboratory of the Department of Microbiology at CVAS, Navania, Udaipur, for bacteriological analysis. The isolation and identification of the microorganisms were verified based on their morphology, staining properties, cultural characteristics, and biochemical tests. Out of the 30 faecal samples, 20 tested positive for a single isolate, indicating that 14 samples (46.67%) contained *Escherichia coli*, while 6 samples (20%) were identified as *Salmonella* spp. The other 10 (33.33%) faecal samples tested positive for a mixed *Salmonella* spp. and *E.coli* infection. Therefore, E. coli, following Salmonella spp., are the most prevalent in calf diarrhea.

Keywords*: Escherichia (E. coli), Salmonella species.*

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The role of the GSTT1 gene in head and neck cancer.

Lavkesh D*, Manjulata Kumawat, Ashok Chauhan***, Dhara B****, Amandeep***** and Pooja*.**
* Zoology Department, Baba Mastnath University, Rohtak.
**Biochemistry Department, UHS, Rohtak.
***Department of Radiation Oncology, UHS, Rohtak.
****Department of biotechnology and molecular medicine, UHSR.
*****Orthopaedics Department UHSR.

The studies recommended the relationship between Glutathione S-transferase T1 (GSTT1) gene polymorphisms and the risk of head and neck cancers (HNCs). The Glutathione S-transferases (GSTs) are necessary carcinogen-metabolising enzymes. Polymorphisms involved in these enzymes can modulate the development and treatment of head and neck cancer. Expression of these enzymes may be one reason why people's risk of head and neck cancer differs. In this study, 100 patients with HNC are observed. The main aim of the current study is first to evaluate the expression of the GST gene polymorphism and, second, to examine its relationship with the stages of head and neck cancer in the Indian population.
As a Result, the GST T1 gene was found in 83 patients and 3 controls, whereas the null gene was found in 97 controls and 17 patients.

CONCLUSION
Our review of the literature revealed that GST T1 genes are downregulated in head and neck cancer. These downregulations were more marked in advanced stages of head and neck cancer. Therefore, GSTT1 genes may be an essential mechanism involved in carcinogenesis, but the mechanisms underlying these regulatory changes in expression deserve further investigation.

Keywords *GST gene expression, mRNA, Head and neck cancers, and polymorphic DNA forms.*

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Environment and Waste Management

Madhuri Hosamani[1]*, Vijaylaxmi[2]
Department of Floriculture and Landscaping, Sri Konda Laxman
Telangana Horticultural University
Post Graduate Institute for Horticultural Sciences, Mulugu,
Siddipet, 502279
*Presenting author Email: madhurihosamani633@gmail.com

Rapid urbanization, improved living standards, and increasing resource consumption have led to excessive waste generation, surpassing the management capacities of many governments and organizations. In India, this challenge is particularly severe, with an estimated 68 million tonnes of food waste and nearly 350 million tonnes of agricultural waste produced annually. These waste streams contribute to environmental degradation, threaten forest ecosystems, and impact public health, highlighting the urgent need for sustainable and circular waste management strategies. The valorisation of agricultural and food residues into eco-friendly and value-added products offers a viable solution for mitigating waste-related issues while promoting environmental protection and resource efficiency.

Transforming agricultural residues into paper supports forest protection and afforestation by reducing dependence on wood-based raw materials. Similarly, the production of bioplastics from food waste mitigates land pollution and prevents the release of toxic emissions from conventional plastics. The extraction of essential oils from dry leaves further demonstrates how organic waste can be repurposed into economically valuable and environmentally beneficial products. Collectively, these innovative approaches exemplify the principles of the circular economy, integrating waste reduction, resource recovery, and sustainable production. This review emphasizes the importance of technological innovation, policy support, and public awareness in advancing eco-friendly waste utilization. By linking waste valorisation with forest conservation, pollution control, and sustainable industrial practices, these initiatives contribute to the global vision of a greener, low-waste, and resilient future.

Keywords: *Sustainable waste management, circular economy, forest protection, agricultural waste, food waste, bioplastics, essential oils, eco-friendly production, resource recovery, afforestation.*

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Evaluation of Indigenous Herbal Feed Additives on the Nonspecific Immunity of Common Carp (*Cyprinus carpio*) Infected with *Aeromonas hydrophila*

Shivam Pandey[1*], Gajender Singh[2], Tejpal Dahiya[2], RK Gupta[2], Nitish Bansal[3]
[1]Department of Aquatic Animal Health Management, COFS, CCS Haryana Agricultural University, Hisar, 125004
[2]Department of Zoology, COBS& H, CCS Haryana Agricultural University, Hisar, 125004
[3]Department of Fisheries Resource Management, COFS, CCS Haryana Agricultural University, Hisar, 125004
Corresponding author:- karateshivam97@gmail.com

This 90-day investigation assessed the effects of dietary supplementation with neem (*Azadirachta indica*) and tulsi (*Ocimum sanctum*) leaf extracts on growth performance and haematological responses in common carp (*Cyprinus carpio*) challenged with *Aeromonas hydrophila* infection. Fish were fed experimental diets for 30 days, which included T1 (control diet), T2 (basal diet + 5% neem leaf extract), T3 (basal diet + 5% tulsi leaf extract), and T4 (basal diet + 5% combined neem and tulsi leaf extracts). Haematological analysis of Common Carp revealed significant differences across treatments and sampling periods ($p < 0.05$), with Treatment T-4 consistently showing superior values across all parameters. Haemoglobin concentrations in T-4 increased from 6.28 g/dL at day 0 to 8.47 g/dL at day 90, significantly higher than other treatments, while T-1 showed the lowest Hb values. Similarly, red blood cell (RBC) counts peaked in T-4 at day 90 (1.88 million/mm³), indicating enhanced erythropoietic activity, whereas T-1 showed a decline at day 60. Total leucocyte count was significantly higher in T-4 (84.83 $\times 10^3$ cells/mm³ at day 90), reflecting stronger immune response, while T-1 recorded the lowest TLC. Packed cell volume was also highest in T-4 (25.10%) and lowest in T-1 (17.93%), indicating better oxygen-carrying capacity in the former. Mean corpuscular haemoglobin was highest in T-3 (45.42 pg), whereas T-1 and T-2 had comparatively lower values. MCH concentration peaked in T-4 at day 30 (34.22 g/dL), and was lowest in T-1. Mean corpuscular volume was highest in T-3 (137.44 fL), with an overall decreasing trend observed across the culture period. Overall, T-4 promoted optimal haematological responses, suggesting improved physiological and immunological status of fish, while T-1 consistently underperformed, indicating stress or poor adaptation under that treatment.

Keywords:- *Aeromonas hydrophila, Fish disease, Antimicrobial activity, Neem and Tulsi leaf extracts*

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Phytochemical Analysis and Computational Evaluation of Plant-Derived Compounds for Vitiligo Treatment

Sadiya Irfan Khan
Botany Discipline, School of Biological Sciences & Biotechnology, Goa University, Taleigao Plateau, Goa, 403206, India

Vitiligo is a multifaceted depigmenting skin disorder characterized by the loss of functional melanocytes due to oxidative stress, immune dysregulation, and genetic causes. Current treatments show variable efficacy and have limitations such as adverse effects and high recurrence rates. This study investigates the therapeutic potential of phytochemicals present in *Ficus religiosa* and *Moringa oleifera*, recognized for their dermatological benefits and focuses on elucidating their application in vitiligo management through in-silico and phytochemical analysis.

Phytochemicals were identified through literature screening, followed by structural similarity analysis and ADMET profiling to evaluate pharmacokinetic properties and drug-likeness. Prominent compounds like rutin, myricetin, psoralen, etc., were chosen due to their biological activities and presence in locally available plants. Qualitative and quantitative phytochemical analyses were performed on leaf extracts using, including Total Phenolic Content (TPC), Total Flavonoid Content (TFC), Thin Layer Chromatography (TLC), and Fourier Transform Infrared Spectroscopy (FTIR). Methanolic extracts of *F. religiosa* showed the highest phenolic (90.93 mg GAE/g) and flavonoid content (224.75 mg QE/g). TLC confirmed the presence of flavonoids and coumarins with characteristic Rf values comparable to quercetin and rutin standards.

Antioxidant potential of extracts was assessed using DPPH radical scavenging assays, with IC_{50} values indicating higher free radical scavenging potential in extracts of *Moringa oleifera* as compared to *Ficus religiosa*. Furthermore, molecular docking studies demonstrated strong binding affinities of selected phytochemicals to vitiligo-associated protein targets (JAK1/2, MAO-A, CXCL10, STAT3, ELAVL1), supporting their potential role as multi-target inhibitors.

This integrative approach combining ethnobotanical knowledge, phytochemical profiling, and in silico pharmacology highlights the promising role of *Ficus religiosa* and *Moringa oleifera* in developing plant-based therapies for vitiligo. These findings lay the foundation for future clinical validation and formulation-based interventions.

Keywords *Vitiligo, Phytochemicals, Ficus religiosa, Moringa oleifera, Melanogenesis, Oxidative Stress, JAK/STAT Pathway, CXCL10, MAO-A, ADMET, Molecular Docking, TLC, FTIR, Phytochemical analysis.*

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Antimicrobial Resistance Profile with Focus on Colistin-Resistant Enterobacteriaceae in Pet Dogs: A One Health Issue

Archana Saraf[1], Bhoj Raj Singh[2*], Shiv Varan Singh[3], Prasanna Vadhana[4], Monika Bhardwaj[5], Vinodhkumar O. Rajendran [6], Dharmendra K Sinha[7], B.S. Pruthvishree[8], Shikha Tamta[9], K R Nirupama[10]

1. Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
2. Principal Scientist, Head, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
3. Assistant Professor, Department of Veterinary Microbiology, College of Veterinary and Animal Sciences, Kishanganj, BASU, Patna, Bihar, 855107
4. Assistant Professor, Department of Veterinary Microbiology, College of Veterinary and Animal Sciences, Datia, RLBCAU, Jhansi, 284003, Uttar Pradesh, India
5. Assistant Professor, Department of Veterinary Microbiology, DGCN COVAS, CSKHPKV, Palampur, Himachal Pradesh, India
6. Principal Scientist, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
7. Principal Scientist, Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
8. Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
9. Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India
10. Division of Epidemiology, ICAR-Indian Veterinary Research Institute, Izatnagar-243 122, Uttar Pradesh, India

*Corresponding Email id: shivvaransingh1988@gmail.com**,** Mob. No. 81718863896

The global rise of MDR gram-negative bacteria is persistently alarming and represents an increasing threat to health of animals as well as humans. Colistin (polymixin E) is a cationic, multicomponent lipopeptide antibacterial agent killing most of the gram-negative bacteria (including *Acinetobacter*, *Pseudomonas*, *Escherichia* and *Klebsiella* species) through disrupting the cell membrane. In view of importance of colistin in modern therapeutics and emergence of resistance to it, the present study was conducted to understand the occurrence of colistin resistant Enterobacteria and associated epidemiological factors in dogs. In the study, 216 perianal swabs of dogs and hand swabs from 58 dog owners were collected along with information of breed, age, sex, health status and antibiotic used in dog. A total of 478 bacterial isolates were identified belonging to different species like *Escherichia coli* (336), *Enterobacter agglomerans* (14), *Citrobacter freundii* (1), *Proteus mirabilis* (56), *Proteus penneri* (4), *Klebsiella pneumoniae* (33) and *Pseudomonas aeruginosa* (34) (not included in Enterobacteriaceae).

Out of the 478 isolates of bacteria tested, 64 were resistant to colistin (5 *E. coli*; 1 *C. freundii*; 52 *P. mirabilis*; 4 *P. penneri* and 2 *P. aeruginosa*). However, using MIC methods to determine colistin resistance only 61 isolates (56 *P. mirabilis*, 4 *P.*

penneri and 1 *C. freundii*) were found to be resistant. The statistical analysis revealed that resistance to colistin was significantly more often in *Proteus* (93.33%) strains than in of *Pseudomonas* (p= 5.263E-17; 5.88%) and *E. coli* (p= 1.20E-73; 1.49%) isolates. Despite repeated attempts mcr-1 gene could not be detected either in chromosomal DNA or plasmid DNA preparations of any of the isolates in the study using PCR. The bacterial isolates from dogs were significantly more often resistant (15.63%) to colistin (p= 0.001) than those from their owners (1.33%). *Escherichia coli* could be isolated both from dogs and their owners respectively in case of 67 pairs, similarly *P. aeruginosa* from 3 pairs, and *K. pneumoniae* from 2 pairs. Although *P. aeruginosa*, *K. pneumoniae* and *E. coli* strains isolated from dogs and their owners were apparently similar but could be the paired isolates of from a dogs and their owner. Distribution of colistin resistant isolates in dogs was independent of their sex or age and health status. However, breed of dog appeared as an important determinant to affect carriage of colistin resistant bacteria by dogs. Colistin resistant bacteria were more commonly isolated from Great Dane (21.43%; p= 0.002), Labrador (17.42%; p= 0.002), German Shepherd (14.29%; p= 0.01), Pug (14.29%; p= 0.02), Mongrel (13.77%; p= 0.01) and Rottweiler (13.04%; p= 0.03) than from Indian Spitz (1.59%). There was a positive correlation between sensitivity of bacteria to colistin and tigecycline (p= 0.0005), imipenem (p= 0.005), nalidixic acid (p= 0.025), gentamicin (p= 0.05), chloramphenicol (p= 0.005), nitrofurantoin (p= 0.0005), tetracycline (p= 0.025), erythromycin (p= 0.0005) and patchouli oil (p= 0.05) but had negative correlation with sensitivity of bacteria to piperacillin (p= 0.05), ceftriaxone (p= 0.005), piperacillin + tazobactam (p= 0.005), and carvacrol (p= 0.01). The study revealed that out of all members of Enterobacteriaceae family isolated from dogs and their owner only Proteus spp. (93.33%) and *C. freundii* strains had resistance to colistin. Though phenotypically 61 strains were confirmed colistin resistant, mcr-1 gene responsible for transferable colistin resistance could not be detected in any of the strains. Colistin resistance was more common in bacterial isolates from dogs (15.63%) than from their owners (1.33%). Indian Spitz was identified as the least prone breed of dogs to carry colistin resistant bacteria and Great Dane (21.43%) as the most prone breed for colonization of colistin resistant bacteria on perianal region followed by Labrador (17.42%), German Shepherd (14.29%), Pug (14.29%), Mongrel (13.77%) and Rottweiler (13.04%). Ceftriaxone resistance in isolates from dogs previously treated with the same drug was more common (83.65%) than in isolates from dogs not-treated with ceftriaxone (80.21%). The study indicated that transferrable colistin resistance is not common in bacteria isolated from perianal region of pet dogs and from hands of their owners in and around Bareilly.

KeyWord: *Colistin, Breed, AMR, Pet dogs*

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Genetic variability, heritability, genetic advance as percent of mean and correlation in sesame (*Sesamum indicum* L.)

D.Padmaja[*1], N.Balram[2], Rajini Bisen[3] Anand Kumar Vishwa karma[3] and Gupta

[1]AICRP on Forage Crops unit, ARI, Rajendranagar, Professor Jayashankar Telangana Agricultural University, Telangana (505529), India,

[2]SRTC, Rajendranagar, Professor Jayashankar Telangana Agricultural University, Telangana (505529), India,

[3]Jawharlal Nehru Krishi Vishwa Vidyalay, Jabalpur, All India Coordinated Research Project on Sesame and Niger, Madhya Pradesh (482 004), India.

*Corresponding author: E-mail: suhanigpb@yahoo.com

Sesame is an important oilseed crop used in food industries, cosmetics, and pharmaceuticals. Sesame grown in India over an area of 15.31 lakh hectares with production of 8.47 lakh tonnes and productivity of 553 kg ha-1. In Telangana contributed significantly, producing 0.10 lakh tonnes with a productivity of 740 kg ha^{-1} from 0.14 lakh hectares (Indiastat, 2024). The objective of this study was to estimate the extent of genetic variability in genotypes of sesame. during summer 2024. Fifteen genotypes were evaluated at Regional Agricultural Research Station, Polasa Jagtial. The experiment was laid out in a randomized block design with three replications. The highest phenotypic, genotypic coefficient of variation, heritability, and genetic advance as a percentage of the mean was observed for the number of capsules per plant. It indicates selection for this trait was effective for higher yield. It was influenced by additive gene action, which can be improved through a simple selection method. Similarly, the number of capsules per plant showed a positive significant correlation with seed yield per plant. Days to 50% flowering exhibited a positive significant correlation with days to maturity. Therefore, number of capsules per plant was the most contributing character to seed yield.

Key words: *Genetic variability, Broad sense heritability, Genetic advance as per cent of mean, Correlation and Sesame (Sesamum indicum L.).*

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Management of mulberry pest (Glyphodes pyloalis Walker) through the use of botanical insecticides and their safety period determination.

Ishrat Manzoor and Dr Syed Farhat Iqbal Qadri
College of Temperate Sericulture Mirgund SKUAST-K

The mulberry pest, *Glyphodes pyloalis* Walker is a significant threat to sericulture industry, causing substantial damage to mulberry crops and resulting in economic losses. In recent years, botanicals have emerged as promising approach for managing agricultural pests, including *G. pyloalis* which is a significant threat to sericulture. This study evaluated the efficacy of four botanicals namely *Artemisia absinthium*, *Datura stramonium*, *Capsicum frutescens* and *Chrysanthemum cinerariifolium* against mulberry pest *Glyphodes pyloalis* Walker. The extract of these botanicals was prepared in the solvent acetone with 10% W/V stock solution. The research was conducted at the Division of Cocoon Crop Production, College of Temperate Sericulture, Mirgund. The effect of the test botanicals was screened at different concentrations (5%, 10% and 15%) on the reduction percentage of *G. pyloalis*, safety period of silkworm (*Bombyx mori* L.), larval parameters and post cocoon parameters. Results showed that *Chrysanthemum cinerariifolium* exhibited the highest toxicity, causing 88.31% larval mortality on 15 days after treatment, followed by *Artemisia absinthium* (81.80%), *Datura stramonium* (80.89%) and *Capsicum frutescens* (79.10%). All the four botanicals were safe to silkworm on 8th day onwards. All the botanicals exhibited significant increase in 3rd, 4th instar, 5th instar larval duration, 5th age and total larval duration before safe waiting period. However, at 15% Conc. of *Chrysanthemum cinerariifolium* all the worms died during the 5th instar in the silkworm batches fed with the botanical treated mulberry leaves after 2nd and 4th day of spray. Significantly higher larval weight i.e., (48.77 g) was recorded in control followed by *Capsicum frutescens* (37.29 g), *Datura stramonium* (37.13 g), *Artemisia absinthium* (37.06 g) and *Chrysanthemum cinerariifolium* (37.02 g) at lowest Conc. i.e., 5% before safe waiting period. Significantly the highest ERR by number and by weight/ 10,000 larvae were recorded in the control group of silkworms i.e., (8900.33 and 15.11 Kg) / 10,000 larvae respectively, followed by *Capsicum frutescens* (4600, 4566.66 and 4466.66) and (7.74 Kg, 7.71 Kg and 7.49 Kg) / 10,000 larvae respectively at 5%, 10% and 15% concentration before safe waiting period. Significantly the highest mean single cocoon weight was recorded in control batches of silkworms i.e., (2.01 g) at 2nd day after spray followed by *Capsicum frutescens* (1.79 g and 1.77 g) at 5% and 10% concentration respectively. The mean lowest single cocoon weight was recorded in *Chrysanthemum cinerariifolium* (1.52 g and 1.56 g) at 10% and 5% concentration respectively, followed by, *Artemisia absinthium* (1.59 g, 1.61g and 1.63g) at 15%, 10% and 5% concentration respectively. The same trend with regard to single cocoon weight was also observed in single shell weight and shell ratio. The highest

average filament length was recorded in the cocoons spun by the control group of silkworms (1175.33 m) followed by 5% *Capsicum frutescens (*965 m). The *Chrysanthemum cinerariifolium* showed the lowest cocoon filament length even at 5% concentration followed by *Artemisia absinthium* and *Datura stramonium*.

In all the parameters i.e., larval survival, ERR, pre and post cocoon parameters did not differ significantly with untreated control after safe waiting period i.e., 8th day onwards.

Key words: *Mulberry pest Glyphodes pyloalis Walker, botanicals, silkworm (Bombyx mori L.), safety period*

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Silica from Agricultural Residues for Eco-Friendly Water Purification

Sweety Monga
Department of Chemistry, GGJ Govt. College, Hisar, Haryana, India
E-mail: sw.chemistry@gmail.com; Ph. No. 8053370946

The shift toward sustainable material development has highlighted agricultural residues as an abundant and renewable source for value-added products. Agricultural by-products such as rice husk, wheat husk, sugarcane bagasse, and corn cob etc. contain a substantial amount of silica that can be converted into a useful material for water purification. The silica obtained from these residues is rich in amorphous SiO_2 and possesses a large surface area, high porosity, and reactive silanol groups, which makes it suitable for the adsorption of toxic metals, dyes, and organic pollutants from wastewater. Different preparation routes, including acid and alkali leaching, sol-gel processing, and thermal conversion, have been reported to influence the purity, morphology, and surface characteristics of the final silica product. Chemical modification through amine grafting, metal oxide loading, or composite formation further improves adsorption selectivity and capacity. The adsorption mechanisms mainly involve surface complexation, ion exchange, hydrogen bonding, and electrostatic attraction, which depend on the surface functional groups and pH of the medium. Recent studies have shown that the silica derived from agricultural residues performs comparably to commercial adsorbents while offering the advantage of renewability and cost efficiency. Although variation in feedstock composition and regeneration challenges still exists, the utilization of waste-derived silica presents a practical and sustainable approach for clean water production and environmental protection.

Keywords *Agricultural waste; biomass, biosilica; rice husk ash; silica; adsorbent; water purification*

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Influence of Bunch Regulation, Foliar Application of Growth Regulators and Micronutrients on Growth, Yield and Quality of Grape Cv. Manik Chaman (*Vitis Vinifera* L.)

Sangeeta lakshmeshwara, S. N. Patil, Chandrasekhar, Anand G. Nanjappanavar and I. B. Biradar

Corresponding authour*:Sangeeta Lakshmeshwara
Gmail:sangeetml159@gmail.com
Sangeeta lakshmeshwara: Ph.D Scholar, Dept. of Fruit Science, COH, Bagalkot University of Horticulture Science, Bagalkot
S N. Patil:Professor and Head, Dept. of Fruit Science, COH, Bagalkot University of Horticultural Sciences, Bagalkot
Chandrasekhar:Assistant Horticulture Officer, Senior Assistant Director of Horticulture office, Sindhanur
Anand G. Nanjappanavar :Assistant professor, Dept. of Fruit Science, MHREC, CoH, Bagalkot
I B. Biradar:Professor and Head, Dept. of NRM, CoH, Bagalkot

A field experiment entitled "Influence of bunch regulation, foliar application of growth regulators and micronutrients on growth, yield and quality of grape cv. Manik Chaman (*Vitis vinifera* L.)" was carried out at Main Horticultural Research and Extension Centre, University of Horticultural Sciences, Bagalkot during 2023-24 and 2024-25. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with eight combination treatments replicated thrice. The foliar application as well as bunch dipping of growth regulators and micronutrients was carried out after October pruning. The retention of 35 bunches per vine and Module-3 comprised of GA_3 at 150 ppm+micronutrients spray ($ZnSO_4$ at 3g/L+$FeSO_4$ at 2g/L+$MnSO_4$ at 2g/L+ boric acid at 1 g/L) + CPPU (2 ppm) + BRs (0.5 and 1.0 ppm) applied at different berry growth stages improved the several important grape bunch traits like the highest bunch length (24.16 cm), width (15.05 cm), average bunch weight (521.89 g). Additionally, berry characteristics such as berry length (27.43 mm), berry diameter (16.13 mm) and berry weight (4.39 g) were all enhanced under this treatment. In terms of fruit quality, the treatment also led to higher colour scores (8.52) and taste scores (8.50) indicating improved visual appeal and sensory qualities of the grapes. Moreover, the shelf life of the fruit was extended to 10.53 days. The treatment also showed a reduction in postharvest losses, with the lowest percentage of postharvest loss (PLW) observed at 2.38 and 3.92 percent on the 2nd and 4th day after harvest, respectively. From these findings, it can be concluded that the integrated approach of bunch thinning (35 bunches per vine) combined with the foliar application of GA_3, micronutrients, CPPU and BRs had a positive and synergistic effect on grapevine performance.

Keywords: *Grape, Bunch regulation, Growth regulators and Micronutrients*

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Biocontrol and Eco-Friendly Management of Major Fruit Diseases

Shiv Kumar Ahirwar[1*],
[1*]PhD Research Scholar, Department of Horticulture (Fruit Science),
College of Agriculture, JNKVV, Jabalpur, MP-482004, India
Corresponding Mail- shivahirwar5991@gmail.com

Eco-friendly management of fruit diseases has gained significant attention as growers seek alternatives to synthetic fungicides due to residue concerns, environmental risks, and pathogen resistance. Biological control agents (BCAs)—including Bacillus subtilis, Trichoderma harzianum, Pseudomonas fluorescens, and antagonistic yeasts such as Candida oleophila—demonstrate strong potential for reducing pre- and postharvest diseases across citrus, mango, apple, grape, and pome fruits. Meta-analyses reported in some journals indicate that Bacillus-based formulations can suppress major fungal pathogens like Penicillium, Colletotrichum, and Alternaria by 55–80%, while antagonistic yeasts reduce postharvest decay by 40–70% under commercial storage conditions. Field-scale trials show that combining BCAs with cultural practices—sanitation, canopy pruning, mulching, and irrigation optimization—further enhances efficacy, achieving up to 85% disease reduction in citrus canker and fruit rot complexes. Studies in mango orchards demonstrated that Trichoderma-treated trees exhibited 32–48% fewer anthracnose lesions and 15–22% higher marketable fruit yield compared to untreated controls. Eco-friendly adjuncts such as plant extract formulations (e.g., neem, thyme, clove oil) have shown 20–50% additional suppression when applied with compatible BCAs. Recent advances include nano-encapsulated BCA formulations that improve survival and field stability, increasing antagonist viability by 2.5–3.2× during storage and transport. Integration with physical treatments—UV-C exposure, hot-water dipping, and modified-atmosphere packaging—has resulted in decay reduction of 60–90% in grape, apple, and banana supply chains. Despite strong potential, challenges remain. Field efficacy is sometimes inconsistent due to temperature fluctuations, UV exposure, and pathogen diversity. Additionally, cost of BCA production, limited shelf life (typically 3–6 months for many formulations), and regulatory hurdles restrict widespread adoption. Research emphasizes future strategies: developing multi-strain consortia, understanding orchard microbiome interactions, and optimizing delivery systems for smallholder farmers. Overall, evidence supports that biocontrol integrated with eco-friendly cultural, botanical, and physical strategies offers a sustainable, residue-free pathway for managing fruit diseases while maintaining high-quality yields.

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To evaluate the knowledge of farmers about IPM practices in cauliflower

Sita Ram Bijarnia and I.M. Khan
Department of Extension Education, Sri Karan Narendra Agriculture University, Jobner
* Corresponding author Email*:* sitarambijarnia7@gmail.com

The present study was conducted in the selected Chomu and Bassi tehsils of Jaipur district of Rajasthan. Four villages from each selected tehsil were taken on the basis of maximum area under cauliflower cultivation. Thus, total eight villages were selected for the study. For selection of respondents, comprehensive list of cauliflower growers was prepared and 15 respondents were selected on the basis of maximum area from each selected village. Thus, in all 120 farmers were included in the sample of the study. The result found that majority of cauliflower growers were observed in medium level knowledge group, the cauliflower growers of the study area had highest knowledge about "Chemical practices" and there is significant difference in the knowledge between the respondents of Chomu tehsil and Bassi tehsils about IPM practices in cauliflower cultivation.

Key words: *Cauliflower, knowledge, farmers, evaluate*

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Effect of spacing and *jeevamrut* application on growth of groundnut in Western Rajasthan

Devi Lal Kikraliya and P. S. Chauhan
Department of Agronomy, Swami Keshwanand Rajasthan Agricultural University, Bikaner
* Corresponding author Email*:* devilalkikraliya1997@gmail.com

An experiment was conducted to study the production and quality of groundnut as influenced by different plant spacing and *jeevamrut* application for nutrient management in groundnut at experimental site, college of agriculture, Bikaner (Rajasthan) India. Among the crop geometries, 40 x 20 cm crop geometry significantly increased growth attributes *viz*., accumulation of drey matter, crop growth rate, relative growth rate and net assimilation rate at different growth stages as compared to other crop geometries. Among the *jeevamrut* application, soil application and two foliar sprays of *jeevamrut* was significantly increased dry matter accumulation, crop growth rate, relative growth rate and net assimilation rate at different growth stages as over rest of other treatments and it was at par on soil application of *jeevamrut* with three foliar.

Key words: *Jeevamrut, spacing, groundnut, soil and foliar*

IHASE-2025/340

Short-term Impact of Pesticides on Human Health

Anurag Kumar Singh[1]*, Ankit Singh[2], K B Anand[3] ,Gaurav[1]
[1]Assistant Professor,Department of Agronomy, Udai Pratap college, Varanasi, Uttar Pradesh-221003
[2]Assistant Professor, Department of Horticulture, Udai Pratap college, Varanasi, Uttar Pradesh-221003
[3]Associate Professor, Department of Agronomy, Udai Pratap college, Varanasi, Uttar Pradesh-221003
*Email:anuragrau@gmail.com

Pesticides have many short-term adverse health effects, called acute effects, as well as chronic hazardous effects that can occur months or years after exposure. Examples of acute health effects include stinging eyes, rashes, blisters, blindness, nausea, dizziness, diarrhoea and death. Examples of known long-lasting effects are cancers, birth defects, reproductive harm, immunotoxicity, neurological and developmental toxicity, and disruption of the endocrine and exocrine systems. Some people are more vulnerable than others to pesticide impacts. For example, infants and young children are known to be more susceptible than adults to the toxic effects of pesticides. Farm workers and pesticide applicators are also more susceptible because they receive greater exposures. Short-term contact with pesticides can cause direct and indirect effects, such as skin, eye, and respiratory irritation, along with symptoms like headaches, nausea, and vomiting. In severe cases, exposure or direct contact with toxic pesticides can lead to more serious outcomes, including seizures, loss of consciousness, or even death. Skin and eye irritation. This can include burning, stinging, itching, redness, rashes, blisters, and excessive tearing.In case of Respiratory problems, Symptoms can range from a sore throat and coughing to more severe issues like shortness of breath and difficulty breathing. In case of Gastrointestinal issues, Nausea, vomiting, and diarrhoea are common short-term reactions. In case of Neurological symptoms, these include headaches, dizziness, and confusion. More severe short-term effects: Seizures: In cases of high exposure, seizures can occur. Loss of consciousness: This is a serious symptom that can result from acute poisoning. Death:

Keywords: *Pesticide, Hazardous, Toxicity, Respiratory.*

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Sustainable Intensification Through Resource-Conserving Technologies for Global Food and Environmental Security

K. B. Anand[1*], Gaurav[2], D.N. Singh[3], and A.K. Singh[4]
[1,2,3,4]Department of Agronomy, Faculty of Agriculture, Udai Pratap College, Varanasi-221002
*anand.agronomy@gmail.com

The global population today stands at approximately 8.2 billion and is projected by the United Nations to grow to around 9–10 billion by mid-century, far lower than the earlier estimate of 11.0 billion for 2035. Despite efforts, a staggering ≈ approximately 673 million people were undernourished in 2024, and roughly 2.3 billion people — about 28% of the global population suffered from moderate to severe food insecurity, underscoring the severe and persistent challenge of food access globally. The burden remains overwhelmingly borne by developing and low-income countries in Asia and Africa. The call by the United Nations Millennium Development Goals and its successor frameworks to ensure food and environmental security for all remains as urgent as ever. Achieving this goal requires increasing crop productivity per unit of input (seed, fertilizer, water, land, and energy) while addressing the rising scarcity of energy. Tillage, historically accounting for approximately 25–30% of the energy required for crop production, remains a significant input. Thus, exploring resource-conserving technologies (RCTs) such as zero-tillage, bed planting, mechanical rice transplanting, and laser land levelling, along with practices like green manuring, remains critically important. For instance, in rice-based cropping systems, green manuring alone has recently been shown to increase rice grain yield by ~~8–10% and mitigate the negative effects of puddling, thereby improving yields of subsequent rabi crops. These technologies and practices need to be tested on a larger scale on farmers' fields. Their broad adoption could help reduce production costs, enhance input-use efficiency, boost overall output, thereby contributing meaningfully to food and nutritional security, better livelihoods, and employment generation.

Key words: *zero-tillage, resource-conserving technologies*

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Genetic variability, heritability, genetic advance as percent of mean and correlation in sesame (*Sesamum indicum* L.)

D.Padmaja[*1], N.Balram [2], Rajini Bisen[3] Anand Kumar Vishwa karma [3] and Gupta

[1]AICRP on Forage Crops unit, ARI, Rajendranagar, Professor Jayashankar Telangana Agricultural University, Telangana (505529), India,

[2]SRTC, Rajendranagar, Professor Jayashankar Telangana Agricultural University, Telangana (505529), India,

[3]Jawharlal Nehru Krishi Vishwa Vidyalay, Jabalpur, All India Coordinated Research Project on Sesame and Niger, Madhya Pradesh (482 004), India.

*Corresponding author: E-mail: suhanigpb@yahoo.com

Sesame is an important oilseed crop used in food industries, cosmetics, and pharmaceuticals. Sesame grown in India over an area of 15.31 lakh hectares with production of 8.47 lakh tonnes and productivity of 553 kg ha-1. In Telangana contributed significantly, producing 0.10 lakh tonnes with a productivity of 740 kg ha^{-1} from 0.14 lakh hectares (Indiastat, 2024). The objective of this study was to estimate the extent of genetic variability in genotypes of sesame. during summer 2024. Fifteen genotypes were evaluated at Regional Agricultural Research Station, Polasa Jagtial. The experiment was laid out in a randomized block design with three replications. The highest phenotypic, genotypic coefficient of variation, heritability, and genetic advance as a percentage of the mean was observed for the number of capsules per plant. It indicates selection for this trait was effective for higher yield. It was influenced by additive gene action, which can be improved through a simple selection method. Similarly, the number of capsules per plant showed a positive significant correlation with seed yield per plant. Days to 50% flowering exhibited a positive significant correlation with days to maturity. Therefore, number of capsules per plant was the most contributing character to seed yield.

Key words: *Genetic variability, Broad sense heritability, Genetic advance as per cent of mean, Correlation and Sesame (Sesamum indicum L.).*

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Expression Patterns of Key Reproductive Genes in Clarias magur Fed Fishmeal and BSFL Meal Based Diets

Saiprasad Bhusare[1,2], Chandan G. M[1]., Selvaraju S[3], Muralidhar P. Ande[4], Krupesh Sawant[1], Kedar Nath Mohanta[1] and Shamna N1,[2*]**

[1]ICAR-Central Institute of Fisheries Education, Versova, Mumbai, Maharashtra, India

[2]FWFF, Balabhadrapuram, Kakinada Centre, ICAR-Central Institute of Fisheries Education, Kakinada, India

[3]ICAR-National Institute of Animal Nutrition and Physiology, Bengaluru, India

[4]Kakinada Centre, ICAR-Central Institute of Fisheries Education, Kakinada, India

**Presenting author: spbhusare97@gmail.com (9405031233);

*Corresponding author: shamna@cife.edu.in

Sustainable alternatives to fishmeal (FM) are critical in aquaculture, particularly for broodstock nutrition, where diet quality directly influences reproductive success. Black Soldier Fly Larvae (BSFL, Hermetia illucens) meal is a promising substitute due to its high-quality protein and balanced nutrient profile. However, its impact on reproductive performance remains underexplored. This study evaluated the effects of BSFL meal on the expression of reproduction-related genes in two stocks of Clarias magur, natural stock (NS) and genetic stock (GS). A 120-day feeding trial was conducted with two iso-nitrogenous diets (36.14% crude protein) and iso-lipidic diets (8.58%), where FM protein was used for control and replaced with 20% BSFL meal for treatment. A total of 168 brooders (male-to-female ratio 1:1) were assigned to four treatment groups (NS-Control, NS-BSFL, GS-Control, GS-BSFL) in triplicate, following a 2×2 factorial design. The expression of reproduction-related genes (FSHR, LHR, CYP19a1, VTG, and 11βHSD) was analyzed via quantitative PCR (qPCR). The results showed that in females, FSHR, CYP19a1, and VTG expression were upregulated in GS, correlating with higher estradiol levels, while LHR expression was higher in NS, aligning with increased 17α20βDHP. In males, expression of 11βHSD was significantly higher in GS.

Importantly, 20% BSFL meal inclusion in the diet yielded reproductive performance comparable to FM-based diets. This suggests that BSFL meal can be a viable, sustainable alternative to FM without compromising reproductive performance or gene expression. Overall, the study demonstrated that NS brooders showed superior reproductive performance, highlighting the potential of BSFL meal as an alternative in Clarias magur aquaculture.

Keywords: *Fishmeal, Black Soldier Fly Larvae, Hermetia illucens, Clarias magur, Gene expression.*

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Soil Nutrient Dynamics (NPK) under Standardized Organic Cultivation of Bitter Gourd Var. Pusa Aushadhi.

M Queeny Amulya[1], M Padma[2], I V Srinivas Reddy[3] and B Naveen Kumar [4]

[1]PhD Scholar, Department of Vegetable Science, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad, Telangana, India.

[2]Former Dean of P.G Studies and Senior Professor (Hort.) Retd., SKLTGHU, Mulugu, Siddipet, Telangana, India.

[3]Professor and Head (Fruits and Horticulture Technology), Dept. of Horticulture, Agricultural College, PJTSAU, Aswaraopeta, Bhadradri Kothagudem, Telangana, India

[4]Vice Principal, Horticulture Polytechnic College, Ramagirikhilla, Peddapalli, Telangana, India.

Email: mqueenyamulya98@gmail.com

The demand for organic bitter gourd cultivation is surging as a sustainable and health-focused choice. This shift is primarily driven by the issue of excessive chemical use in conventional farming, which leaves residues that exceed safety limits (MRLs) in foods, especially quick-to-harvest vegetables. In place of chemical fertilizers, the organic approach utilizes natural inputs like FYM, vermicompost, neem cake, and biofertilizers (AMC/VAM) to enhance soil fertility, maximize growth, and boost nutritional quality. The current study titled "Soil Nutrient Dynamics (NPK) under Standardized Organic Cultivation of Bitter Gourd Var. Pusa Aushadhi" was conducted at Sri Konda Laxman Telangana Horticultural University, Rajendranagar, Hyderabad. The experiment was carried out with twenty (20) treatments in Randomized Block Design with three (3) replications. Different treatment combinations of RDF, organic manures, and bio fertilizers have a considerable impact on soil nutrient status. The results on soil nutrient status showed that among the treatments, T_{11}: Poultry manure (8 t/ha) + AMC (12.5 kg/ha) significantly recorded lowest soil pH after harvest (7.11) and lowest EC after harvest (0.232 dS/m) while, T_3: Farmyard Manure (30 t/ha) + AMC (12.5 kg/ha) recorded the highest organic carbon content after harvest (0.77 %). Significantly maximum availability of nitrogen after harvest (251.15 kg/ ha), maximum availability of phosphorous after harvest (35.25 kg/ha) and maximum availability of potassium content after harvest (324.56 kg/ha) was recorded by the treatment T_{17}: RDF (40: 80: 50 NPK kg/ha) + AMC (12.5 kg/ha) compared to the other treatments.

Keywords: *Bitter gourd, Farmyard manure, Vermicompost, Poultry manure, Neem cake, AMC, VAM, Pusa Ausadhi.*

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The Effect of First Generation Seed Tuberlets Produced From True Potato Seed (Tps) on Quality of Potato Under Southern Telangana Agro Climatic Conditions

Chandragiri Sai kiran*[1], V. Suchitra[2], B. Neeraja Prabhakar[3], Veera Suresh[4], L. Saravanan[5].

*[1]PG Scholar, Department of vegetable science, College of Horticulture, SKLTGHU, Rajendranagar, Hyderabad, Telangana, India.

Corresponding author: Mail: saikiranch145@gmail.com

Mobile:9515935495

[2]Senior Scientist & (Head), Fruit Research Station, SKLTGHU Sangareddy.

[3]Senior Professor (Horticulture Department) College of Agriculture,PJTAU Rajendranagr,

[4]Scientist (Plant Pathology), Vegetable research station, SKLTGHU,Rajndranagr, Hyderabad Telangana, India.

[5]Senior Scientist (Entomolgy), National Bureau of Plant Genetic Resources, RS- Hyderabad.

Aim: Asses the effect of first-generation seed tuberlets produced from True Potato Seed (TPS) on quality of potato under Southern Telangana Agro-climatic conditions

Study Design: The experiment was laid out in Randomized block design with two factors (FRBD). First factor was 3 different entries (V_1: PRT-17A X D-150, V_2: PSL/76-6 X D-150, V_3: KP-15C3 X D-150) and second factor was 3 different tuber sizes (S_1: Large size (64 g-226 g) S_2: Medium size (50 g-63g) S_3: Small size (22 g-49 g)) and replicated thrice.

Place and duration of study: The present investigation was carried out during the *rabi* season of 2022-23 at the PG Research Block, College of Horticulture, Rajendranagar, Hyderabad

Results: The results revealed that treatment combination V_1S_1 (PRT-17A X D-150 x large size tubers (64 g-226 g) has recorded significantly the highest starch content with 23.35 %, ascorbic acid (18.28 %), total sugars (0.77 %), reducing sugars (0.44 %) and TSS for (5.15 °Brix) when compared to the other treatments.

Keywords: *Starch, Ascorbic acid, TSS, reducing sugars, true potato seed and tuber lets.*

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Use of Flower Waste in Composting, Bio-Enzymes and Eco-Friendly Products

Bowdu Kavya, Painam LasyaPriya, Syed Ayesha, Manda Queeny amulya
Dr. YSR Horticultural University, COH - Venkataramannagudem, Andhra Pradesh, India.
Email: kavya.bowdu418@gmail.com

The generation of flower waste has increased significantly due to the rapid growth of the floriculture industry, religious activities, urban landscaping, and ceremonial uses of flowers. A substantial proportion of this waste—often left untreated—is disposed of in landfills or water bodies, contributing to environmental pollution, foul odour, and greenhouse gas emissions. This study explores sustainable and value-added pathways for utilizing flower waste through composting, bio-enzyme production, and the development of eco-friendly products. Flower waste composting is an effective bioconversion process that transforms nutrient-rich floral residues into high-quality organic manure. The compost derived from marigold, rose, chrysanthemum, and temple waste flowers has been found to improve soil structure, enhance microbial activity, and increase nutrient availability, thereby promoting sustainable horticultural practices. The process is low-cost, scalable, and suitable for both community-level and farm-level operations. The production of bio-enzymes from flower waste offers an additional opportunity for converting discarded petals into useful biological solutions. Fermenting flower waste with jaggery and citrus substrates generates enzymes rich in beneficial microorganisms and organic acids, which can be used as natural cleaners, plant growth promoters, and pest-repelling formulations. These bio-enzymes exhibit promising potential for reducing chemical input use in horticulture and household cleaning systems.

Furthermore, flower waste forms the basis for developing a range of eco-friendly value-added products, including natural dyes, incense sticks, aromatic candles, essential oil substitutes, handmade paper, and biodegradable packaging materials. Such products not only support circularity and resource efficiency but also offer livelihood opportunities for local communities, women's groups, and micro-enterprises. Overall, the utilization of flower waste through composting, bio-enzyme production, and eco-friendly product development presents a sustainable model for waste management. It contributes to environmental conservation, enhances soil health, reduces dependence on synthetic chemicals, and promotes rural entrepreneurship. This approach aligns with sustainable development goals and supports a circular bio-economy by transforming floral waste from an environmental burden into an economically valuable resource.

Keywords: *Flower Waste Management, Composting, Bio-Enzymes, Eco-Friendly Products*

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Gene pyramiding in vegetable crops for disease resistance

Matam Jayanth Kumar[1*], Dr. Vijayakumar Rathod[2] Dr. Vilas D Gasti[3], Dr. Sandhyarani Nishani[4] and Dr. Prashantha A.[5]

[1-]PhD scholar, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural sciences, Bagalkot

[2 -]Associate professor, College of Horticulture Bagalkot, University of Horticultural sciences, Bagalkot

[3-]Professor, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural sciences, Bagalkot

[4-]Associate Professor, College of Horticulture Bagalkot, University of Horticultural sciences, Bagalkot

[5-]Assistant Professor, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural sciences, Bagalkot

Gene pyramiding is a breeding strategy used to combine multiple desirable genes into a single elite genotype, mainly to enhance durable disease resistance and improve key agronomic traits. Traditional methods are slow and limited by the difficulty of phenotypically identifying several genes at once. Molecular markers have significantly improved pyramiding efficiency by enabling accurate tracking of target genes through foreground, recombinant and background selection. Marker-assisted backcrossing allows faster recovery of the recurrent parent genome and minimizes linkage drag, making pyramiding more precise and time-efficient. This approach has been successfully applied in several crops for resistance against major diseases and pests. Transgenic and advanced genomic techniques further enable stacking of genes involved in pathogen recognition and defense responses to achieve broad-spectrum and long-lasting resistance. Overall, gene pyramiding using molecular tools is a rapid, reliable and cost-effective strategy for developing improved, stress-resilient crop varieties.

Keywords: *Gene pyramiding, Marker-assisted selection, Disease resistance, Backcross breeding*

IHASE-2025/348

Modern Horticultural Technology: A Successful Business Opportunity for Farmers

P. Anitha And E. Kavya
Department of Horticulture, College of Agriculture, UAS, GKVK,
Bengaluru-560065.
E-mail: anithapathlavath@gmail.com

Food and nutritional security are closely linked to horticulture. It is a vital part of the stakeholder's economic security. High-tech horticulture is a modern technique that can increase productivity and farmers' incomes while requiring less capital and less environmental impact. High-tech horticulture has become essential in the current era of climate change in order to maintain Indian farmers' economic stability and production. Hi-tech horticulture is useful not only for production of fruits, vegetables and flowers but also for conservation plant protection, post-harvest management including value addition.

In warmer areas, vertical greening can have a cooling effect on the building's exterior, which is crucial during the summer months. Micro greens are perfect when time and space becomes a barrier. Growing micro greens in vertical gardening is the best idea as it won't consume much of our time and space and also micro greens are extremely easy to grow. Micro greens are the super healthy foods as they do not include any chemical spraying activities during their growth. The various forms of landscape gardening, including indoor, outdoor, vertical, terrace, and commercial park management, are in high demand and create jobs for young people without jobs, making them crucial for climate change adaptation and mitigation. In order to create a useful and visually appealing outside extension of inside living, landscaping blends aspects of art and science.

Keywords: *Hi-tech, horticulture, fruits, vegetables, flowers, value addition*

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Synergizing Indigenous Knowledge and Biotechnology: Anticancer Potential of *Gloriosa superba L.*

Bhawana Paliwal; Neel Kamal Rathore*
Department of Biotechnology, Government College, Kota, Rajasthan, India – 324001
*Department of Botany, Government College, Kota, Rajasthan, India – 324001
Email: Bhawanark16@gmail.com

Gloriosa superba L., a threatened medicinal plant, is highly valued for its diverse array of bioactive compounds, particularly the potent alkaloid colchicine, known for its strong anticancer activity. This research investigates the therapeutic potential of *G. superba* in cancer treatment by integrating traditional ethnomedicinal knowledge with modern biotechnological advancements. Traditionally, the plant has been utilized to treat inflammatory conditions, tumors, and various other ailments. However, such applications have often been limited by unsustainable harvesting practices and inconsistent dosage standards.

To address these limitations, the study employed sustainable strategies such as micropropagation for genetic fidelity and conservation, alongside advanced extraction techniques. Bioactive compounds were isolated and characterized using High-Performance Liquid Chromatography (HPLC) and Gas Chromatography–Mass Spectrometry (GC-MS), revealing high concentrations of colchicine and gloriosine. Furthermore, comparative cytotoxicity assays were conducted on human cancer cell lines to assess the therapeutic efficacy of the plant extracts.

The findings underscore the importance of merging indigenous wisdom with precise scientific methodologies. This integrated approach not only validates the anticancer potential of *G. superba* but also advocates for its conservation and sustainable utilization. Overall, the study highlights the dual need to preserve traditional knowledge systems and foster scientific innovation to fully realize the therapeutic promise of endangered medicinal species.

Keywords: *Gloriosa superba L., anticancer activity, colchicine, indigenous knowledge, biotechnology, micropropagation.*

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Gross Morphometric, Light and Electron Microscopic Studies on the Small Intestine of Zoar, the Indigenous Fowl of Mizoram

Manish Gautom
Ph.D Scholar
Department of Veterinary Anatomy & Histology, C.V.Sc & A.H,
Odisha University of Agriculture & Technology, Bhubaneswar - 751003, Odisha
Email: drmanishgautom@gmail.com **, Contact: 8473839296**

The small intestine of Zoar fowl revealed tunica mucosa, submucosa, muscularis and serosa. The mucosa, studded with villi projected into the lumen and was lined by simple columnar epithelium which was continuous with the crypts of Lieberkühn, located between the villi. Mucosa cosisted of intestinal absorptive cells (enterocytes), numerous goblet cells and enterochromaffin cells. Phloxine–tartrazine staining highlighted abundant paneth cells with basal nuclei at the crypt base, alongside intestinal stem cells. Masson-Fontana staining demonstrated argentaffin granules in the villous epithelium and apical regions of the glands, with greater concentration in the latter. Globular leukocytes with irregular nuclei and dense inclusions were located in the epithelial basement membrane. The lamina propria contained loose connective tissue rich in collagen fibers, reticular networks, blood vessels, and muscle fibers. Muscularis mucosae consisted of longitudinal smooth muscle extending into villi, while the submucosa was poorly developed. The tunica muscularis showed three smooth muscle layers: outer longitudinal, middle circular, and inner longitudinal. PAS staining revealed strong reactions in goblet cells, lamina propria, and submucosa, with weaker activity in muscularis and serosa. Ileal villi were longer and thinner than duodenal villi, while crypt depth was greatest in the duodenum. Ultrastructurally, the villous epithelium revealed enterocytes, with the most notable alteration being the apical striated border, consisting of numerous microvilli. Adjacent cells were tightly interconnected by tight junctions at the apex, and zonula adherens, immediately below it. Globule leukocytes (GL) and lymphocytes were observed among the lymphoid cells penetrating the intestinal epithelium and interspersed between epithelial cells throughout the intestine.

Keywords: *Globule leukocytes, Paneth cells, Small Intestine, Zoar*

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Vacuum Refrigeration as a Preservation Strategy for Enhancing Shelf Life of Rista

Snober Irshad[1], Sheikh Rafeh[1], Azmat Alam Khan[2], Shayista Akhter[3], Asif Rafiq Rather[4]

[1]Division of Livestock Products Technology, SKUAST-K
[2]Division of Livestock Production Management, SKUAST-K
[3]Division of Animal Genetics and Breeding, SKUAST-K
[4]Division of sericulture, SKUAST-K

Rista, a traditional emulsion-based meat delicacy of the renowned Kashmiri cuisine *Wazwan*, is conventionally prepared from pre-rigor, hot-boned lamb meat with incorporation of approximately 20–30% animal fat. In recent years, the demand for healthier variants of traditional meat products has increased among health-conscious consumers. Accordingly, dietary fibre-enriched and antioxidant-fortified variants of Rista were developed through the incorporation of wheat bran and grape seed extract, respectively. Despite its high sensory acceptability among the local population of the Kashmir valley, the commercialization of Rista at national and international levels remains limited due to inadequate standardized preservation and packaging strategies. Considering this, the present investigation was undertaken to evaluate the storage stability of Rista under vacuum refrigeration conditions. Three formulations of Rista were selected for the storage study, namely T_0 (control), T_1 (dietary fibre-enriched Rista containing 8% hydrated wheat bran at 1:1 ratio), and T_2 (antioxidant-enriched Rista fortified with 0.1% grape seed extract). The products were vacuum packaged in multilayer nylon barrier film pouches and stored under refrigerated conditions (4 ± 1 °C). Periodic evaluation of physico-chemical attributes, antioxidant activity, microbiological quality, sensory characteristics and ultrastructural changes was carried out to assess the effect of vacuum refrigeration on product quality. The results revealed that vacuum refrigerated storage significantly improved the shelf life of Rista compared to conventional aerobic refrigeration. Under vacuum refrigeration, T_0 and T_1 samples remained organoleptically acceptable and microbiologically safe for up to 20 days, while the antioxidant-enriched T_2 variant exhibited extended stability of up to 25 days. The incorporation of grape seed extract effectively retarded lipid oxidation and microbial proliferation, thereby contributing to enhanced storage stability. Overall, vacuum refrigeration proved to be an efficient preservation approach in maintaining product quality by minimizing oxidative and microbial spoilage.

Keywords: *Vacuum refrigeration; Vacuum packaging; Meat emulsion; Antioxidant enrichment; Dietary fibre*

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Influence of Bunch Regulation, Foliar Application of Growth Regulators and Micronutrients on Growth, Yield and Quality of Grape Cv. Manik Chaman (*Vitis Vinifera* L.)

Sangeeta lakshmeshwara, S. N. Patil, Chandrasekhar, Anand G. Nanjappanavar and I. B. Biradar

Corresponding authour*:Sangeeta Lakshmeshwara
Gmail:sangeetml159@gmail.com
Sangeeta lakshmeshwara: Ph.D Scholar, Dept. of Fruit Science, COH, Bagalkot University of Horticulture Science, Bagalkot
S N. Patil:Professor and Head, Dept. of Fruit Science, COH, Bagalkot University of Horticultural Sciences, Bagalkot
Chandrasekhar:Assistant Horticulture Officer, Senior Assistant Director of Horticulture office, Sindhanur
Anand G. Nanjappanavar :Assistant professor, Dept. of Fruit Science, MHREC, CoH, Bagalkot
I B. Biradar:Professor and Head, Dept. of NRM, CoH, Bagalkot

A field experiment entitled “Influence of bunch regulation, foliar application of growth regulators and micronutrients on growth, yield and quality of grape cv. Manik Chaman (*Vitis vinifera* L.)” was carried out at Main Horticultural Research and Extension Centre, University of Horticultural Sciences, Bagalkot during 2023-24 and 2024-25. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with eight combination treatments replicated thrice. The foliar application as well as bunch dipping of growth regulators and micronutrients was carried out after October pruning. The retention of 35 bunches per vine and Module-3 comprised of GA_3 at 150 ppm+micronutrients spray ($ZnSO_4$ at 3g/L+$FeSO_4$ at 2g/L+$MnSO_4$ at 2g/L+ boric acid at 1 g/L) + CPPU (2 ppm) + BRs (0.5 and 1.0 ppm) applied at different berry growth stages improved the several important grape bunch traits like the highest bunch length (24.16 cm), width (15.05 cm), average bunch weight (521.89 g). Additionally, berry characteristics such as berry length (27.43 mm), berry diameter (16.13 mm) and berry weight (4.39 g) were all enhanced under this treatment. In terms of fruit quality, the treatment also led to higher colour scores (8.52) and taste scores (8.50) indicating improved visual appeal and sensory qualities of the grapes. Moreover, the shelf life of the fruit was extended to 10.53 days. The treatment also showed a reduction in postharvest losses, with the lowest percentage of postharvest loss (PLW) observed at 2.38 and 3.92 percent on the 2nd and 4th day after harvest, respectively. From these findings, it can be concluded that the integrated approach of bunch thinning (35 bunches per vine) combined with the foliar application of GA_3, micronutrients, CPPU and BRs had a positive and synergistic effect on grapevine performance.

Keywords: *Grape, Bunch regulation, Growth regulators and Micronutrients*

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Agroforestry Systems For Sustainable Food Security

Manish Kumar Mankur
Department of Farm Forestry, UTD, Sant Gahira Guru Vishwavidyalaya,
Ambikapur, Chhattisgarh, India
Mail; manishmankur7@gmail.com

Agroforestry play a vital role in the soil water conservation through symbiotic relationship between soil micro-organism and tree crop. It creates both positive and negative aspects in the farming system. Current scenario focuses on how sustainable livelihood is serious challenge by policy and decision makers in India. At this context sustainable land use management play a key role in natural resource management as well as helps in climate change mitigation throughout increasing the tree outside forest in country. Agroforestry creates a multi-function role in food production and sustainable environment at the same time and same place at the particular region or in ecosystem. It improves the environment and social economic issues. It also helps in how this model provide physical stability and financial sustainability through adoption and increase the food availability in desired manner. This model are not only helps in the food availability but also helps in the climate smart agriculture, carbon storage, sequestration and improves the biodiversity conservation with soil fertility.

Keywords: *Agroforestry, Sustainable, Environment, Food, Agriculture*

IHASE-2025/354

Effect of different inorganic fertilizers on growth and development of *Philodendron scandens* grown under shade net condition

Kurakula Divya[1], P. Prasanth[2]

[1]Ph. D., Department of Floriculture and Landscape Architecture, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

[2]Associate Dean, COH, Rajendranagar, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Owing to the importance of foliage plants in indoor gardening, the experiment was carried out to determine the effect of different levels of NPK on growth and development of *Philodendron scandens* at College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University during *Kharif* season of the year 2019-20 in Completely Randomized Design with seven treatments T_1- N:P:K (1:1:1) – 2g/poly bag at 30 days interval, T_2- N:P:K (1:1:1) – 2g/poly bag at 45 days interval, T_3- N:P:K (1:1:1) – 2g/poly bag at 60 days interval, T_4- N:P:K (3:1:2) – 1g/poly bag at 30 days interval, T_5- N:P:K (3:1:2) – 1g/poly bag at 45 days interval, T_6- N:P:K (3:1:2) – 1g/poly bag at 60 days interval, T_7- Control (without fertilizers) and replicated thrice. There was an increase in growth parameters like plant height (44.00 cm), stem diameter (37.46 mm), number of leaves per plant (49.50) when *Philodendron* plants treated with N:P:K (1:1:1) – 2 g per poly bag at 30 days interval (T_1). Whereas, application of N:P:K (1:1:1) – 2 g per poly bag at 45 days interval - T_2 significantly resulted maximum plant spread (E-W) (49.67 cm), plant spread (N-S) (52.33 cm). Contrary to this among the treatments, T_7- Control (without fertilizers) plants showed shorter plant height (36.83 cm), lower plant spread (E-W) (36.33 cm), plant spread (N-S) (42.67 cm), stem diameter (30.33 mm), significantly minimum number of leaves per plant (42.00).

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Effect of different inorganic fertilizers on growth and development of *Dieffenbachia seguine* (Jacq.) Schott grown under shade net condition

Kurakula Divya[1], P. Prasanth[2]

[1]Ph. D., Department of Floriculture and Landscape Architecture, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

[2]Associate Dean, COH, Rajendranagar, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

A shade house (75 %) experiment was carried out to determine the effect of different levels of NPK on growth and development of *Dieffenbachia seguine* (Jacq.) Schott plants at College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University during *Kharif* season of the year 2019-20 in Completely randomized design with seven treatments T_1- N:P:K (1:1:1) – 2g/poly bag at 30 days interval, T_2- N:P:K (1:1:1) – 2g/poly bag at 45 days interval, T_3- N:P:K (1:1:1) – 2g/poly bag at 60 days interval, T_4- N:P:K (3:1:2) – 1g/poly bag at 30 days interval, T_5- N:P:K (3:1:2) – 1g/poly bag at 45 days interval, T_6- N:P:K (3:1:2) – 1g/poly bag at 60 days interval, T_7- Control (without fertilizers)and replicated thrice. The results revealed that different levels of NPK significantly influenced the *Dieffenbachia* plants growth and development. Among different inorganic fertilizer treatments, application of N:P:K (1:1:1) – 2 g per poly bag at 30 days interval (T1) significantly recorded maximum plant height (76.00 cm), growth rate in respect of plant height at 45, 90 and 135 days interval (2.01, 2.50 and 3.07 cm/day respectively), plant spread (E-W) (59.00 cm), stem diameter (37.63 mm) and number of leaves per plant (7.33).

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Design of a Battery-Operated Mirchi (Chilli) Planter

Kalluri Praveen*, Y. Anil Kumar Yadav
Department of Agricultural Engineering, SR University, Warangal 506371, Telangana, India
Corresponding Address: kalluripraveen876@gmail.com

Chilli (Capsicum annuum L.) is an important vegetable and spice crop cultivated extensively in India; however, its transplantation is largely carried out manually, resulting in high labor demand, increased cost, and severe drudgery. To overcome these constraints, a battery-operated mirchi planter was designed, developed, and evaluated to facilitate precise and efficient planting under small and medium farm conditions. The developed planter comprises a lightweight frame, a DC motor-driven planting mechanism powered by a rechargeable battery, a seedling tray, and soil covering unit. The machine was designed with ergonomic considerations to ensure ease of operation and reduced operator fatigue. The battery was good enough to provide about 2.2 hours of uninterrupted running at the maximum possible speed of 1.5km/h that enabled the machine to cover approximately 0.35ha in a single charge.

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Feasibility Study of Panzara Irrigation Project for PIN

Ajit B. Nirmale[1], Mahesh Kothari[2], P K Singh[3], S R Bhakar[4], K K Yadav[5] and N L Panwar[6]

[1]Ph D Scholar at Dept of SWE, CTAE, MPUAT, Udaipur, Rajasthan 313 001,
[2 to 6]All Professors College of Technology and Engineering (CTAE), MPUAT, Udaipur, Rajasthan 313 001, India
e-mail: ajitnirmale@gmail.com

The current scenario of water emphasises the efficient and optimum use of water which ultimately demands for Higher water use efficiency in the agricultural and irrigation fields. This Study Concludes About higher water conveyance efficiencies and saving of water up 30 to 40% by converting the Open canal system to pipe irrigation network in the command with cost effectiveness of Up 20 to 30% lower than CDN. The consideration of life cycle cost summed to 1.80 lakhs per hectare

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Unlocking Wild Genetic Diversity for Climate Resilient Agriculture

T. Soujanya
Department of Genetics & Plant Breeding, Agricultural College, Warangal, PJTAU, Telangana, India
Corresponding Author: thotasoujanya66@gmail.com

Climate change is a global agricultural problem, posing the greatest challenge by raising temperatures, changing rain patterns, and the increasing occurrence of both abiotic and biotic stresses. Crop resilience to these climatic extremes is essential for the sustainable agricultural development and the world long-term food security vision. The wild relatives of the crop plants are the most valuable and also underutilized genetic resources for climate adaptation. Over the period of evolution, wild species have developed traits that aid them survive in the unfavourable and varying environments. They have developed tolerance to drought, heat, salinity, flooding, and also resistance to pest and disease. The unlocking of wild genetic diversity will be through the systematic exploration, conservation, and effective use of wild germplasm in crop improvement programs. The pioneering works in pre-breeding, introgression breeding, and wide hybridization have made it possible to transfer the stress-adaptive traits from the wild relatives into the cultivated ones. Besides, the application of modern molecular tools such as marker-assisted selection, genomic selection, and high-throughput phenotyping has made it faster to identify and deploy the climate-resilient alleles from the wild gene pools. The integration of the omics technologies has made the precision and efficiency of utilizing wild genetic resource even better. The use of wild genetic diversity in the breeding pipelines not only expands the genetic base of crops but also helps to maintain the yield under the climate-induced stresses. On the other hand, the challenges like linkage drag, reproductive barriers, and limited characterization of wild germplasm remain the critical bottlenecks. To address these limitations, innovative breeding strategies and strengthened germplasm consortia are needed. On the whole unlocking wild genetic diversity offers a sustainable and climate-smart pathway for developing resilient crop varieties capable of supporting food security and agricultural sustainability in a changing climate

Keywords: *Genetic diversity, Wild relatives, Climate resilience, Crop improvement Sustainable agriculture*

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Use of IoT Devices in Horticulture and Its Applications

K. Madhusudhan Reddy[1]*, Sripada Sweta[2], Somraj Boda[3], Subash Verma[1], Randhir Kumar[1], Ajay Bhardwaj[1]

[1]Department of Horticulture (Vegetable and Floriculture), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India-813210.

[2]Department of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, Inida-587104

[3]Department of Horticulture, SR University, Ananthasagar, Hasanparthy, Warangal, Telangana, India-506371

*Corresponding authors email: kunreddy9@gmail.com

The application of Internet of Things (IoT) devices in horticulture is transforming traditional farming into a data-driven and technology-oriented system. IoT refers to a network of interconnected sensors, devices, and communication technologies that collect, transmit, and analyze real-time data from agricultural fields. In horticulture, IoT devices are used to monitor critical parameters such as soil moisture, temperature, humidity, light intensity, nutrient availability, and plant health, enabling precise and timely management decisions. One of the major applications of IoT in horticulture is smart irrigation systems, where sensors and weather-based data optimize water application according to crop requirements, improving water-use efficiency and reducing wastage. IoT-enabled greenhouse management systems regulate environmental conditions such as temperature, humidity, and ventilation, ensuring optimal growth conditions and improved yield and quality. Pest and disease management is enhanced through IoT-based imaging systems, drones, and automated alerts that allow early detection and timely control measures. IoT also supports precision nutrient management by monitoring soil and crop status, reducing excessive fertilizer use and minimizing environmental pollution. Automation through IoT reduces labor dependency, lowers operational costs, and improves overall productivity. In post-harvest management, IoT devices help monitor storage conditions, track produce during transportation, and maintain quality throughout the supply chain. Integration of IoT with cloud computing, data analytics, and decision-support systems enables predictive analysis and efficient farm planning. Overall, IoT technology enhances resource efficiency, productivity, and sustainability in horticulture, making it a vital tool for modern, climate-resilient, and profitable horticultural production systems.

Key words: *Internet of things (IoT), Temperature, Irrigation management, Enhanced productivity*

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Enhancing Quality and Vase Life of Cut Flowers: Practical Postharvest Tips

R. Krushnaiah[1*], B. Ravikumar[2], P. Prashanth[1]

[1]Department of Horticulture, Sri Konda Laxman Telangana State Horticultural University, Mulugu, Siddipet, Telangana, India-502279

[2]Department of Horticulture, Punjab Agricultural University, Ludhiana, Punjab, Inida-141004

*Corresponding authors email: 413690@gmail.com

Cut flowers are highly perishable commodities, and their aesthetic value largely depends on proper handling from harvest to consumer use. Enhancing the quality and vase life of cut flowers requires the integration of simple yet effective pre- and postharvest practices. Harvesting flowers at the correct stage of maturity is crucial, as overly immature or over-mature flowers exhibit reduced longevity. Immediate hydration after harvest using clean, sanitized water helps restore turgidity and prevents early wilting. The use of floral preservatives containing sugars, biocides, and acidifiers plays a significant role in maintaining carbohydrate supply, reducing microbial growth, and improving water uptake. Temperature management is another critical factor; prompt precooling and storage at optimal low temperatures slow down respiration and senescence processes. Maintaining high relative humidity during storage and transport minimizes moisture loss and preserves freshness. Proper cutting techniques, such as recutting stems underwater and removing lower leaves, further enhance water absorption and prevent bacterial blockage. Additionally, avoiding exposure to ethylene gas, either by using ethylene inhibitors or ensuring good ventilation, helps delay flower aging. Clean handling practices, including sterilized tools and containers, reduce postharvest diseases and extend shelf life. Collectively, these practical tips contribute to improved visual quality, extended vase life, and higher market value of cut flowers. Adoption of these low-cost, easy-to-implement techniques can benefit growers, florists, and consumers alike by ensuring longer-lasting and more attractive floral products.

Keywords: *Cut flowers, Vase life, Postharvest handling, Floral preservatives, Quality enhancement.*

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Enhancing Gerbera Production under Protected Cultivation: Key Management Strategies

R. Krushnaiah[1*], B. Ravikumar[2], P. Prashanth[1]

[1]Department of Horticulture, Sri Konda Laxman Telangana State Horticultural University, Mulugu, Siddipet, Telangana, India-502279

[2]Department of Horticulture, Punjab Agricultural University, Ludhiana, Punjab, Inida-141004

*Corresponding authors email: 413690@gmail.com

Gerbera (*Gerbera jamesonii*) is one of the most important cut flowers in the global floriculture industry due to its wide color range, long vase life, and high market demand. Protected cultivation offers significant advantages for achieving high and consistent gerbera production by minimizing environmental stress and enabling precise crop management. Successful cultivation begins with the selection of high-yielding, disease-resistant varieties and the use of healthy, well-rooted planting material. Maintaining an optimum growing environment is crucial; temperature ranging from 20-25°C during the day and 12-15°C at night, relative humidity of 60-70%, and adequate light intensity promote vigorous growth and quality flower production. Proper growing media with good drainage, aeration, and balanced pH enhances root development and nutrient uptake. Efficient fertigation practices, based on crop growth stage and nutrient demand, play a vital role in increasing flower yield and stalk quality. Regular monitoring and integrated pest and disease management help reduce losses caused by pests such as aphids, mites, and fungal diseases. Cultural practices like timely removal of old leaves, disbudding, and proper spacing improve air circulation and reduce disease incidence. Harvesting flowers at the correct stage ensures better vase life and market value. Overall, adopting scientific management practices under protected cultivation leads to improved productivity, superior flower quality, and higher economic returns in gerbera cultivation.

Keywords: *Gerbera, protected cultivation, fertigation, flower yield, greenhouse management*

IHASE-2025/362

Microgreens as Next Generation Nutraceuticals: Bridging Nutrition and Medicine

Dulam Shivaraj, Dr. Nagulapalli Snehalatha, Dr. M. Srinivas

[1]PhD Research Scholar, College of Horticulture, Rajendranagar, Hyderabad, Telangana, SKLTGHU, India, 500030, Email: shivarajdulam35@gmail.com, contact: 7702036037.

[2]SMS - Plant Protection, DDS-Krishi Vigyan Kendra, Zaheerabad, Sangareddy, Telangana, India, 502228, Email: snehalatha.ddskvk@ddsindia.org Ph.no: 8106071634.

[3]Assistant Professor, College of Horticulture, Rajendranagar, Hyderabad, SKLTGHU, Telangana, India, Emai: srinivasmajjiga45@gmail.com, Ph no: 8985721365.

Microgreens, the young, tender seedlings of vegetables and herbs harvested at the cotyledonary stage have emerged as potent nutraceuticals due to their dense concentration of bioactive compounds. Compared to their mature counterparts, microgreens exhibit significantly higher levels of vitamins (A, C, E, and K), minerals (iron, magnesium, zinc), antioxidants (phenolics, flavonoids and carotenoids), and essential amino acids. These phytonutrient rich greens possess remarkable health promoting potential, contributing to the prevention and management of chronic diseases such as cardiovascular disorders, Type -2 diabetes, obesity and certain cancers. Recent studies indicate that microgreens derived from cruciferous, leguminous and amaranthaceous families are particularly effective in modulating oxidative stress, inflammation and lipid metabolism. Additionally, their short cultivation period, low input requirements and adaptability to urban farming systems make them an ideal sustainable food source for enhancing dietary diversity and nutritional security. As functional foods, microgreens bridge the gap between nutrition and medicine, reinforcing their role as promising nutraceutical agents in the development of next-generation health-promoting diets.

Keywords: *Microgreens, Functional foods, Nutraceuticals, Antioxidants, Bioactive compounds, Chronic disease prevention.*

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Regenerative Agriculture and Entomology: Synergies for Sustainable Agroecosystems

Dulam Shivaraj, Nagulapalli Snehalatha

[1]PhD Research Scholar, College of Horticulture, Rajendranagar, Hyderabad, Telangana, SKLTGHU, India, 500030,

Email: shivarajdulam35@gmail.com, contact: 7702036037.

[2]SMS - Plant Protection, DDS-Krishi Vigyan Kendra, Zaheerabad, Sangareddy, Telangana, India, 502228,

Email : snehalatha.ddskvk@ddsindia.org Ph.no: 8106071634.

Regenerative agriculture integrates ecological principles to restore soil health, enhance biodiversity and create resilient farming systems. Entomology plays a pivotal role within this framework by elucidating the complex interactions between insects, plants and soil ecosystems. Beneficial insects such as pollinators, predators and decomposers contribute significantly to ecosystem services like pollination, natural pest control and nutrient cycling. Conversely, regenerative practices such as cover cropping, crop rotation, minimal tillage and agroforestry foster insect diversity and abundance, reducing dependence on synthetic pesticides. Recent studies demonstrate that regenerative systems host richer arthropod communities compared to conventional systems, thereby enhancing both ecological stability and agricultural productivity. Understanding insect mediated ecosystem functions is thus essential for advancing regenerative agriculture as a climate smart, biologically integrated approach to sustainable food production.

Keywords: *Regenerative agriculture, Arthropod diversity, Pest management, Agroecology, Sustainable food production.*

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Bioactive Components and Pest Management Potential of Indigenous Botanical Formulations Used in Organic Farming

Nagulapalli Snehalatha, Dulam Shivaraj

[1]SMS - Plant Protection, DDS-Krishi Vigyan Kendra, Zaheerabad, Sangareddy, Telangana, India, 502228, Email : snehalatha.ddskvk@ddsindia.org Ph.no: 8106071634.

[2]PhD Research Scholar, College of Horticulture, Rajendranagar, Hyderabad, Telangana, SKLTGHU, India, 500030, Email: shivarajdulam35@gmail.com, contact: 7702036037.

Traditional botanical formulations are integral to organic and natural farming systems as eco-friendly alternatives to synthetic pesticides. Dashaparni Kashayam, Neemastram, Brahmastram, and Agniastram are widely used indigenous plant-based preparations for pest management in diverse cropping systems. This abstract presents a scientific overview of the major bioactive components present in these formulations and their effects on different insect pests. Dashaparni Kashayam, prepared from a consortium of botanically active plant leaves, contains alkaloids, terpenoids, flavonoids, phenolics, saponins, and essential oils exhibiting antifeedant, repellent, ovicidal, and insect growth-regulating properties against sucking and chewing pests. Neemastram is rich in neem-derived limonoids such as azadirachtin, salannin, and nimbin, which disrupt insect feeding, molting, reproduction, and population development. Brahmastram, formulated using selected medicinal and aromatic plants, contains secondary metabolites including alkaloids, glycosides, and volatile compounds that act mainly as contact and stomach poisons against caterpillars and borers. Agniastram is characterized by pungent constituents such as capsaicinoids, sulfur-containing compounds, and phenolics, imparting strong repellent and insecticidal activity, particularly against defoliators and sap-feeding pests. Collectively, these formulations affect multiple physiological and behavioral processes in insect pests, reducing the risk of resistance development. Their integration into organic pest management supports environmentally safe, residue-free agricultural production. Further scientific validation and standardization are required to enhance their wider adoption in sustainable farming systems.

Keywords: *Indigenous botanical formulations, Dashaparni Kashayam, Brahmastram, bioactive compounds, organic pest management.*

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Analyzing and Predicting Bajra Price Movements in India

R. Srinivas, A. Sreenivas, B.V.S Kiran

Bajra (Pennisetum glaucum) is one of the most extensively cultivated cereals in the world, after rice, wheat, and sorghum, and particularly in arid to semi-arid regions. Pearl millet is a principal food cereal cultivated in drought prone semi-arid regions of Africa and Indian sub-continent. In USA, Australia, Southern Africa, and South America, pearl millet is grown most extensively as a forage crop for animal feed. This crop has a wide adaptability to local environments. Bajra is a hardy crop and can grow in areas very hot and dry and on soils too poor for sorghum. Bajra is considered more efficient in utilization of soil moisture and has a higher level of heat tolerance than even sorghum and maize. This small grain is highly nutritious, rich in carbohydrates, fiber, and essential minerals like magnesium, phosphorus, and potassium. Bajra is also a good source of proteins and essential amino acids. Its high fiber content helps in digestion and is known to lower the risk of heart diseases. It is gluten-free, making it an ideal food for those with gluten sensitivity. Bajra is a low-cost, drought-tolerant crop that plays a vital role in improving the livelihoods of farmers in water-scarce regions. It is widely consumed in various forms, such as flour for making bread, porridge, and other traditional dishes. The price forecasts are made by analyzing the prices of Agricultural Commodities concerned over 15 years using advanced statistical tools like ARIMA, ARCH and GARCH models. Model parameters were estimated using the R- software. The performance of fitted model was examined by computing various measures of goodness of fit viz., low AIC, BIC and MAPE values. Comparing the same with prices of futures markets and national and international reports of trade surveys besides conducting state level trade surveys. The ARIMA (112) model was the best model for the price forecast of bajra. Bajra price per quintal will be around Rs. 2260 – 2610 at the time of February to May 2026.

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Price Forecasting of Ragi in India

A. Sreenivas, R. Srinivas, N. Saichand

It is the most important small millet in the tropics covering 12% of global millet area. It is cultivated in more than 25 countries in Africa (Eastern and Southern) and Asia (from Near East to Far East), predominantly as a staple food grain. The major producers are Uganda, India, Nepal, and China. The specialty of these tiny deep red pearls is the abundance of nutrients present in them. Finger millet is a rich source of calcium, iron, protein, fiber and other minerals and is a gluten-free food. The cereal has low fat content and contains mainly unsaturated fat. It is easy to digest and does not contain gluten; people who are sensitive to gluten can easily consume finger millet. It is considered as one of the most nutritious cereals. The price forecasts are made by analyzing the prices of Agricultural Commodities concerned over 10 years using advanced statistical tools like ARIMA, ARCH and GARCH models. Model parameters were estimated using the R- software. The performance of fitted model was examined by computing various measures of goodness of fit viz., low AIC, BIC and MAPE values. Comparing the same with prices of futures markets and national and international reports of trade surveys besides conducting state level trade surveys. The ARIMA (111) model was the best model for the price forecast of ragi. Ragi price per quintal will be around Rs. 3020 – 3600 at the time of January to April 2026.

IHASE-2025/367

Assessment of yield gains and profitability under IPM-based groundnut cultivation in Warangal district

Agurla Raju[1], N Saichand[2] and R HarshaHarshavardhan Reddy[3]
[1, 2&3] Krishi Vigyan Kendra, Mamnoor Warangal, Telangana

A three-year on-farm study conducted during Rabi 2022–2024 in Warangal district, Telangana, evaluated the performance of an Integrated Pest Management (IPM) strategy against black thrips (Scirtothrips dorsalis Hood, 1919) in chilli (Capsicum annuum L.), a key pest responsible for significant yield losses under conventional farmer practices. The IPM package integrated black plastic mulching, neem oil (9,500 ppm at 1.2 ml L^{-1}), entomopathogenic fungi (Beauveria bassiana and Lecanicillium lecanii at 4.5 g L^{-1}), and selective insecticides (spinosad and thiacloprid) applied at 14-day intervals starting 28 days after transplanting, with three sprays per season. On-farm trials were conducted with 25 farmers, and results were compared with prevailing farmer practices. Over the study period, IPM effectively reduced thrips populations by 42–44% and enhanced green chilli yield by 22–23%. Economic analysis revealed higher net returns and benefit–cost ratios (2.65–2.70) under IPM compared with 1.70–1.78 in conventional practice. Technology, extension, and yield gaps were 1.5–1.9 q ha^{-1}, 3.5–4.0 q ha^{-1}, and 23–26%, respectively, indicating potential for further productivity improvement. These findings demonstrate that the adoption of IPM can substantially improve chilli production and profitability in Warangal, while highlighting the need for targeted extension efforts and localized refinement to achieve near-optimal yields under field conditions.

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Evaluation of Integrated Pest Management for Suppressing Sucking Pests and Enhancing Cotton Yield in Warangal District, Telangana (2023)

Agurla Raju[1], R HarshaHarshavardhan Reddy[2] and N Saichand[3]
[1, 2 &3] Krishi Vigyan Kendra, Mamnoor Warangal, Telangana

A field study was conducted in 2023 in Warangal district, Telangana, to evaluate the incidence, seasonal dynamics and management of major sucking pests in cotton (*Gossypium hirsutum* L.). The investigation focused on jassids (*Amrasca biguttula*), whiteflies (*Bemisia tabaci*), and aphids (Aphis gossypii), which are primary constraints to cotton productivity under conventional practices. An integrated pest management (IPM) strategy was implemented, combining resistant varieties, neem-based biopesticides, entomopathogenic fungi (*Beauveria bassiana* and *Lecanicillium lecanii*), and selective chemical insecticides applied when pest populations exceeded threshold levels. Weekly monitoring was carried out to record pest populations, leaf damage, yield, and economic performance. Results showed that IPM effectively reduced sucking pest densities by 43–46% compared to conventional farmer practices, resulting in a 21–23% increase in seed cotton yield. Economic evaluation indicated higher net returns and benefit–cost ratios under IPM (2.62–2.70) compared with farmer practice (1.68–1.75). Technology and yield gaps were recorded at 1.6–1.9 q ha^{-1} and 22–25%, respectively, reflecting the potential for improving productivity through wider IPM adoption. The study demonstrates that site-specific IPM approaches can substantially suppress cotton sucking pests, enhance yield, and improve profitability in Warangal, emphasizing the importance of extension support and targeted interventions for achieving optimal production.

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Digital Technologies As Enablers of Climate-Smart Agriculture

Sabyasachi Pradhan
Assistant Professor, Faculty of Agricultural Sciences, SOADU, Bhubaneswar
Sabyasachipradhan16@gmail.com

Climate change poses significant challenges to agricultural productivity, sustainability, and farmers' livelihoods through increased climate variability, extreme weather events, and degradation of natural resources. In this context, digital technologies have emerged as important enablers of climate-smart agriculture (CSA), supporting the objectives of productivity enhancement, climate adaptation, and mitigation. This abstract presents a thematic and conceptual articulation of how digital technologies contribute to the operationalization of climate-smart agriculture. Digital tools, including mobile-based agro-advisory services, weather forecasting and early warning systems, remote sensing, geographic information systems (GIS), Internet of Things (IoT) applications, and data-driven decision-support platforms, facilitate the provision of timely, location-specific, and actionable information for agricultural stakeholders. These technologies enable efficient management of inputs, improved soil and water conservation practices, climate-risk-informed crop planning, and dissemination of climate-resilient technologies and practices. By reducing uncertainty and enhancing responsiveness to climatic stresses, digital interventions strengthen the adaptive capacity and resilience of agricultural systems. The abstract also highlights key challenges associated with the adoption and scaling of digital technologies, including digital infrastructure gaps, limited digital literacy, affordability constraints, and unequal access among small and marginal farmers. Addressing these challenges requires inclusive design, institutional support, capacity-building initiatives, and policy convergence to ensure equitable benefits from digital transformation in the agricultural sector. Digital technologies, when strategically integrated into agricultural development and extension frameworks, can play a pivotal role in advancing climate-smart agriculture. Their effective deployment is crucial for developing resilient, sustainable, and climate-adaptive agricultural systems that can meet future food security and environmental sustainability objectives.

Keywords: *Climate-smart agriculture; Digital technologies; Climate resilience; Precision agriculture; Sustainable farming*

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Nanotechnology in Agriculture: Opportunities and Risks for Human Health

Mohit Yadav[1], Sudhir Kumar[2], Shikha Yashveer*[1]
[1]Department of Molecular Biology & Biotechnology, College of Biotechnology,
[2]Department of Bioinformatics, College of Biotechnology,
CCS Haryana Agricultural University, Hisar 125004, Haryana, India
Corresponding author: *shikhayashveer@gmail.com

Rapid population growth, accelerating climate change, and the continuous depletion of natural resources pose serious challenges to global agricultural food security, underscoring the urgent need for innovative and sustainable crop improvement strategies. In this context, nanotechnology has emerged as a transformative scientific advancement with significant potential to support eco-friendly and efficient agricultural practices. Nanotechnology offers diverse applications across agriculture, particularly in crop production, crop protection, and resource management. Compared with conventional fertilizers and pesticides, nanofertilizers and nanopesticides demonstrate superior performance due to their controlled, targeted, and sustained release mechanisms, which enhance nutrient use efficiency while minimizing environmental losses. Furthermore, nanotechnology enables precise nutrient delivery within plant systems, leading to improved uptake, reduced wastage, and enhanced crop productivity. Recent advances also highlight the role of nanomaterials in facilitating genetic material delivery for gene editing and crop improvement programs. In addition, nano-biosensors and nano-remediation technologies show considerable promise in detecting and mitigating environmental contaminants in agricultural ecosystems.

Despite these advantages, the deployment of nano-enabled agricultural technologies raises important concerns regarding environmental safety and potential health risks. Therefore, this chapter critically examines the emerging applications of nanotechnology in agriculture, with a primary focus on nutrient enhancement and crop protection, while also emphasizing the need for responsible and sustainable implementation.

Keywords: *Nanotechnology, sustainable, food industries, biotic stress*

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Evaluating Novel Product Diversification and Tech-Integrated Solutions in the Floriculture Market

Dr. Saidulu Yeluguri
Dept of Horticulture, Telangana State
Gmail: Saidulugowd08@gmail.com

The global floriculture industry is undergoing a radical transformation, moving away from traditional cut-flower production towards a multi-dimensional ecosystem of "smart" and value-added products. Driven by advancements in biotechnology, nanotechnology, and circular economy principles, the sector is redefining the utility of floral crops. The floriculture market blooms in new colors with emergence of novel products ranging from genetically engineered "living decor" to floral-based nutraceuticals that are reshaping consumer demand and industry standards. Breakthroughs such as the *Firefly Petunia* (bioluminescent flora) and CRISPR-edited varieties with extended "vase-life" or "climate-resilience" traits. These products serve as autonomous, self-sustaining light sources and environmental reporters. The "Waste-to-Wealth" movement has birthed high-value secondary products, including herbal cosmetics (gulal, sindur), essential oil extractions for the perfumery sector, and floral-based pigments used in the textile and food industries. The introduction of "Freshness Keeper Paper" and biodegradable, moisture-resistant wrapping materials that utilize nano-sensors to monitor floral health in real-time during transit. The "commercial segment" is projected to command over **40%** of the market share by 2030, fueled by luxury branded event florals and "architectural" floral sculptures. Over **60%** of high-end retailers are transitioning to single-material, recyclable packaging solutions to comply with global green initiatives. The shift towards novel, tech-integrated products is no longer optional but a necessity for the industry's resilience against climate volatility. By diversifying into pharmaceuticals, sustainable packaging, and genetically novel varieties, the floriculture industry is securing its role as a cornerstone of both the aesthetic and bio-based economies.

Keywords: *Floriculture, Bioluminescent Plants, Value-Added Products, Smart Packaging, Sustainable Horticulture, Bioactive Compounds.*

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The Role of Native Flora in Enhancing Climate Resilience and Biodiversity within India's Urban Landscapes

Dr. Saidulu Yeluguri
Dept of Horticulture, Telangana State
Gmail: Saidulugowd08@gmail.com

For decades, urban landscaping in India has been dominated by exotic, often invasive species (e.g., *Peltophorum pterocarpum* and *Spathodea campanulata*) prioritized for rapid growth and aesthetic uniformity. However, as Indian cities face escalating "Urban Heat Island" effects and water scarcity, the reliance on high-maintenance non-native flora has become unsustainable. This emphasizes the ecological shift toward native species and their integration into modern urban green infrastructure. The native Indian species including the *Neem* (*Azadirachta indica*), *Palash* (*Butea monosperma*), and *Amaltas* (*Cassia fistula*) have higher survival rate during extreme heatwaves and requires less supplemental irrigation once established compared to exotic counterparts as witnessed in rural ecosystems. Native trees support a significantly wider range of local fauna (bee and butterfly) and avian populations; for instance, *Ficus* species acted as "keystone hubs" for urban bird diversity. The canopy structures of native species have better dust-mitigation capabilities. Incorporating "Sacred Grove" concepts and medicinal native plants (e.g., *Tulsi*, *Ashoka*) increases community engagement and public "ownership" of urban green spaces. A "Native-First" policy in urban planning is essential for India's sustainability goals which needs a shift in the nursery industry and municipal bylaws to prioritize indigenous biodiversity. By moving beyond mere aesthetics, native landscaping offers a cost-effective, culturally resonant, and climate-proof solution for the future of Indian cities.

Keywords: *Native Flora, Urban Landscaping, India, Climate Resilience, Biodiversity, Sustainable Cities.*

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Feasibility Study of Panzara Irrigation Project for PIN

Ajit B. Nirmale[1], Mahesh Kothari[2], P K Singh[3], S R Bhakar[4], K K Yadav[5] and N L Panwar[6]

[1]Ph D Scholar at Dept of SWE, CTAE, MPUAT, Udaipur, Rajasthan 313 001,
[2 to 6] All Professors College of Technology and Engineering (CTAE), MPUAT, Udaipur, Rajasthan 313 001, India
e-mail: ajitnirmale@gmail.com Mobile: 9049998866

The current scenario of water emphasises the efficient and optimum use of water which ultimately demands for Higher water use efficiency in the agricultural and irrigation fields. This Study Concludes About higher water conveyance efficiencies and saving of water up 30 to 40% by converting the Open canal system to pipe irrigation network in the command with cost effectiveness of Up 20 to 30% lower than CDN. The consideration of life cycle cost summed to 1.80 lakhs per hectare

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Innovations in Food Processing and Preservation

P. Mamatha
Ph. D Scholar, Department of Floriculture and Landscape Architecture
Sri Konda Laxman Telangana Horticultural University, Rajendranagar, Hyderabad -500030.

Innovations in food processing and preservation play a vital role in ensuring the availability of safe, nutritious, and high-quality foods for a rapidly growing global population. Food processing not only improves safety by reducing harmful microorganisms but also adds value by improving taste, texture, and convenience. Preservation techniques help slow down spoilage, allowing foods to be stored and transported over long distances without losing quality.Traditional food preservation methods such as heating, drying, salting, and fermentation have been used for centuries and remain important today. However, these methods can sometimes reduce nutrient content and alter sensory properties. To overcome these limitations, modern food science has introduced advanced processing technologies that better preserve the natural quality of foods while ensuring safety. Non-thermal processing technologies, including high-pressure processing (HPP), pulsed electric fields (PEF), ultrasound, and cold plasma, have gained increasing attention. These methods effectively control bacteria, viruses, and spoilage organisms without the high temperatures that damage vitamins, proteins, and flavor compounds. As a result, foods processed using these techniques retain a fresh appearance, natural taste, and higher nutritional value. Innovations in food preservation also include biopreservation, which uses beneficial microorganisms or natural antimicrobial compounds to inhibit spoilage and pathogenic microbes. This approach aligns well with consumer demand for clean-label and chemical-free foods. Another important strategy is hurdle technology, which combines multiple preservation methods such as temperature control, pH adjustment, and packaging to enhance food safety while minimizing harsh treatments. Application of active and intelligent packaging systems play a crucial role in enhancing microbial stability and enabling quality monitoring across the food supply chain. Overall, innovations in food processing and preservation contribute to reducing food waste, improving sustainability, and strengthening food security. Continuous research and development are essential to create energy-efficient, environmentally friendly, and affordable technologies that can meet future food demands while maintaining safety and quality standards.

Keywords: *Food processing, Food preservation, Non-thermal technologies, Shelf-life extension*

IHASE-2025/375

Thrips Species Associated with Flowering Plants, with Special Reference to Rosa spp. in West Bengal

Nandita Kar[2], K Sneha Madhuri*[1], Bipadtaran Sutradar[3] and Dr. Aniruddha Pramanik[4]

Corresponding author: snehamadhuri11@gmail.com, PhD Scholar, Dept.of Agril. Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal

2.Dept.of Agril. Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal

3.PhD Scholar, Dept.of Agril. Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal

4.Professor & HOD, Dept.of Agril. Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West Bengal

The study was conducted to survey thrips species on flowering plants, with special emphasis on Rose (*Rosa* spp.), which belongs to the family Rosaceae during October 2024 to March 2025. In India, rose is cultivated as an important ornamental crop with a high economic value. A range of Pests attack rose. Thrips is one of them. Monitoring their population dynamics is crucial for developing effective integrated pest management strategies. Considering this scenario, a survey was carried out across 3 Districts of West Bengal, covering flowering ornamentals such as Rose, Tagetes, Dahlia, and Chrysanthemum. Both dip and tap methods were followed for collection of thrips from flowering plants. Adult thrips were used for slide preparation following standard protocol (given by Mound and Kibby,1998) for morphological study. Available literatures and standard key provided by Ananthakrishnan and Sen (1980), Bhatti (1980), Palmer et al., (1989), and Tyagi *et al*.(2025) were used for thrips identification. Following identification, the collected specimens were undergone morphometric analysis, which led to the identification of eight thrips species viz, *Frankliniella occidentalis, Thrips hawaiiensis, Megalurothrips usitatus, Microcephalothrips abdominalis, Haplothrip*s sp. *Retithrips syriacus, Thrips sp., Thrips parvispinus*. Five species of thrips viz., *Frankliniella occidentalis, Thrips hawaiiensis, Megalurothrips usitatus, Haplothrips* sp. *Retithrips syriacus,* were found to be associated with Rose at Modouri, West Bengal, India.

Key words: *Rosa spp., thrips, Frankliniella occidentalis, Haplothrips, population dynamics, Morphometrics, Thrips hawaiiensis, Microcephalothrips abdominalis, Tagetes, Chrysanthemum*

IHASE-2025/376

Performance Evaluation of High-Yielding Hybrid Watermelon Arka Shyama (S-25) through Front Line Demonstration in Karimnagar District Telangana

G Venu Gopal, N Venkateshwar Rao, L Mahesh, D Sreenivas Reddy, J Vijay G Prabhakar, A.Prashanthi
SMS, KVK Jammikunta Karimnagar-Pin:505122

A Front Line Demonstration (FLD) on high-yielding hybrid watermelon Arka Shyama (S-25) was conducted by Krishi Vigyan Kendra (KVK), Jammikunta in Karimnagar district during 2023–24 to evaluate its yield potential and economic performance in comparison with a commonly cultivated private hybrid Sugar Queen under farmers' field conditions. The demonstration was implemented by following recommended production practices, with a uniform seed rate of 2000 g/ha for both hybrids.

The results indicated that the cost of cultivation was considerably lower for Arka Shyama (₹76,500/ha) compared to the private hybrid Sugar Queen (₹1,17,800/ha), mainly due to the high seed cost and increased expenditure on fertilizers and plant protection chemicals in the private hybrid. Arka Shyama produced uniform fruits with an average weight of 3.0–3.2 kg, while Sugar Queen recorded fruit weights ranging from 2.5–3.5 kg. The yield of Arka Shyama was significantly higher (356 q/ha) compared to the private hybrid (312 q/ha).

At an average market price of ₹16/kg, Arka Shyama recorded higher gross returns (₹5,69,600/ha) and net returns (₹4,93,100/ha) as against Sugar Queen, which recorded gross returns of ₹4,99,200/ha and net returns of ₹3,81,400/ha. The benefit–cost ratio was also higher in Arka Shyama (1:6.4) compared to the private hybrid (1:3.2).

The FLD clearly demonstrated that Arka Shyama (S-25) hybrid watermelon is a high-yielding, cost-effective, and economically viable hybrid for cultivation in Karimnagar district. Adoption of this hybrid can substantially enhance farmers' income while reducing dependence on costly private hybrids.

Key words: *Arka Shyama (S-25), Watermelon, Front Line Demonstration, KVK Jammikunta, Yield performance, Economic analysis, Benefit–cost ratio, Karimnagar district*

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Performance Evaluation of Tomato Hybrids under Integrated Crop Management Practices in Karimnagar District Telangana

G Venu Gopal, N Venkateshwar Rao, L Mahesh, D Sreenivas Reddy, J Vijay, G Prabhakar, A.Prashanthi
SMS, KVK Jammikunta Karimnagar-Pin:505122

An Integrated Crop Management (ICM) demonstration on tomato hybrids was conducted by Krishi Vigyan Kendra (KVK), Jammikunta during 2021–2022 in Karimnagar district, covering Manakondur and Huzurabad divisions, to evaluate the performance of improved public-sector hybrids in comparison with a private hybrid under farmers' field conditions. The demonstration involved three tomato hybrids, namely Arka Samrat, Arka Abhed, and a private hybrid (PHS-448), following recommended ICM practices.

All the hybrids were raised with a uniform seed rate of 150 g/ha. The cost of cultivation was comparatively lower in Arka Samrat (₹52,000/ha) and Arka Abhed (₹53,500/ha) than the private hybrid PHS-448 (₹65,000/ha), mainly due to reduced expenditure on fertilizers and plant protection chemicals. With respect to pest and disease incidence, early blight incidence was less in Arka Samrat and Arka Abhed after rainfall, while it was observed in the private hybrid. Tomato Leaf Curl Virus (ToLCV) was not observed in any of the hybrids, whereas bacterial wilt incidence was observed only in the private hybrid.

Among the hybrids, Arka Abhed recorded the highest yield (62 t/ha) followed by the private hybrid PHS-448 (56 t/ha) and Arka Samrat (53 t/ha). Due to better fruit quality and higher market preference, Arka Abhed fetched a higher average market price (₹12/kg) compared to Arka Samrat (₹9/kg) and the private hybrid (₹8.5/kg). Consequently, Arka Abhed recorded the highest gross returns (₹7,44,000/ha) and net returns (₹6,90,500/ha) with a superior benefit–cost ratio of 1:13, followed by Arka Samrat (1:8.1). The private hybrid PHS-448 recorded the lowest economic returns with a benefit–cost ratio of 1:5.3.

The ICM demonstration clearly indicated that public-sector tomato hybrids, particularly Arka Abhed, are high-yielding, disease-tolerant, and economically more profitable under the agro-climatic conditions of Karimnagar district. Adoption of ICM practices along with suitable hybrids can significantly enhance productivity and farmers' income while reducing cultivation costs.

Key words: *Integrated Crop Management (ICM), Tomato hybrids, Arka Abhed, Arka Samrat, Front Line Demonstration, Disease tolerance, Yield performance, Economic analysis, Benefit–cost ratio, KVK Jammikunta, Karimnagar district*

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Performance and Market Acceptability of Kasi Lalima Bhendi Variety under Farmers' Field Conditions in Karimnagar District Telangana

G Venu Gopal, N Venkateshwar Rao, L Mahesh, D Sreenivas Reddy, J Vijay, G Prabhakar, A.Prashanthi
SMS, KVK Jammikunta Karimnagar-Pin:505122

A field trial on Kasi Lalima bhendi (okra) variety was conducted by Krishi Vigyan Kendra (KVK), Jammikunta during 2023–24 in Jammikunta and Huzurabad divisions of Karimnagar district to evaluate its yield and economic performance in comparison with a commonly grown private hybrid, with special emphasis on consumer acceptance and market preference. The trial was conducted under recommended agronomic practices.

Kasi Lalima was sown with a seed rate of 10 kg/ha, whereas the private hybrid required only 4 kg/ha. The cost of cultivation for Kasi Lalima was lower (₹48,000/ha) compared to the private hybrid (₹57,350/ha) due to lower expenditure on fertilizers and plant protection chemicals. Kasi Lalima recorded a higher yield of 112 q/ha, while the private hybrid yielded 103.5 q/ha.

Despite its better yield performance and known medicinal and nutritional properties, Kasi Lalima fetched lower market returns owing to poor consumer preference and limited market demand in the local area. Consequently, the gross returns from Kasi Lalima were only ₹1,00,800/ha, resulting in net returns of ₹52,800/ha and a benefit–cost ratio of 1.25. In contrast, the private hybrid, due to higher market acceptability, realized higher gross returns (₹1,55,250/ha), net returns (₹97,900/ha), and a superior benefit–cost ratio of 1.7.

The trial highlighted that although Kasi Lalima bhendi possesses good yield potential and valuable medicinal properties, its adoption by farmers is constrained by low consumer awareness and poor market preference in the region. Creating awareness among consumers, promoting its health benefits, and developing assured marketing channels are essential to improve its economic viability and enhance farmer adoption in Karimnagar district.

Key words: *Kasi Lalima, Bhendi (Okra), Yield performance, Market acceptability, Medicinal properties, Economic analysis, Benefit–cost ratio, KVK Jammikunta, Karimnagar district*

IHASE-2025/379

Influence of Postharvest Treatments and Storage Conditions on Physicochemical and Biochemical Quality of Ber (*Ziziphus mauritiana* L.) cv. Gola

Bhawna
Department of Horticulture, CCS HAU, Hisar, Haryana
jangrabhawna1996@gmail.com

Rapid postharvest deterioration limits the commercial utilization and market potential of ber (*Ziziphus mauritiana* L.) fruits. The present study evaluated the effects of selected postharvest treatments and storage conditions on the physicochemical and biochemical attributes of ber cv. Gola. Freshly harvested fruits were treated with lemongrass oil (0.1%), sesame oil (2%), Aloe vera gel (100%), salicylic acid (1 mM), calcium chloride (2%), citric acid (0.5%), and sodium nitroprusside (1 mM), along with an untreated control. Treated fruits were stored under ambient and refrigerated conditions.

Progressive changes in physiological loss in weight (PLW), decay incidence, firmness, total soluble solids (TSS), titratable acidity, total sugars, ascorbic acid content, chlorophyll content, and antioxidant activity were monitored during storage. All treatments significantly slowed deterioration and maintained superior quality compared with untreated fruits. Calcium chloride and salicylic acid were particularly effective in delaying senescence and maintaining firmness and acidity, while Aloe vera gel enhanced colour stability, chlorophyll retention, and overall sensory attributes. Refrigerated storage further suppressed metabolic activity and reduced biochemical degradation, thereby extending fruit storability.

The results demonstrate that integrating appropriate postharvest treatments with optimized storage conditions substantially enhances shelf life, physicochemical stability, and nutritional quality of ber fruits.

Keywords- *Antioxidant activity; ascorbic acid; Aloe vera coating; postharvest physiology; ber; storage quality*

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Effect of rootstock, grafting method and time on graft success in peach cv Shan-i-Punjab under Haryana conditions

Jaipal[1], RPS Dalal
Department of Horticulture, CCS HAU, Hisar, Haryana

This investigation was carried out with the objectives to evaluate the effect of rootstock, grafting method and time on graft success of low chill peach cv. Shan-e-Punjab under Haryana condition. The experiment was conducted at CCSHAU, Hisar, Haryana under semi-arid irrigated condition during 2018-19. Three different rootstocks viz., Peach cv. Sharbati seedling and rooted cutting of Plum cv. Kala Amritsari and Green Gage were propagated by three grafting methods viz., tongue, wedge and whip on different times viz., 9th and 25th of January in Factorial Randomized Block Design (FRBD) with three replications. Results revealed that higher graft success was observed in plants grafted on 9th January (60.95%) over 25th January (58.24%). Tongue grafting resulted in significantly higher graft success (62.77%) over wedge grafting (57.95%) and whip grafting (58.11%). Similarly, rootstock differed significantly in influencing graft success and higher graft success (64.75%) was recorded in Sharbati seedling as compared to Kala Amritsari (56.65%) and Green Gage cutting (57.39%). Hence, it may be concluded from this study that for higher graft success, Sharbati seedling, tongue grafting method and 9th January grafting time are best.

Keywords: *Grating time, tongue grafting, Sharbati seedling, rootstock, graft success*

IHASE-2025/381

Impact of drip irrigation and fertigation on seed yield, biological yield, and economics of fennel

Akash[1] and T. P. Malik[1]

[1]Department of Vegetable Science, CCS HAU, Hisar 125004, Haryana, India

[*]Corresponding author email id: akashsaroha02@gmail.com

A field study titled "Impact of drip irrigation and fertigation on seed yield, biological yield, and economics of fennel" was conducted during Rabi 2021–22 and 2022–23 at the Vegetable Research Farm, CCS HAU, Hisar. The experiment evaluated two fennel varieties (HF-143 and Hisar Swarup), four irrigation levels (0.6, 0.8, 1.0, and 1.2 IW/CPE), and three nitrogen doses (20, 35, and 50 kg ha^{-1}). Irrigation at 1.2 IW/CPE resulted in the highest seed yield (1834.0 kg ha^{-1}), biological yield (6163.8 kg ha^{-1}), and nitrogen use efficiency (60.04 kg kg^{-1}), comparable to 1.0 IW/CPE. The greatest water use efficiency (8.31 kg ha^{-1} mm^{-1}) was recorded at 0.6 IW/CPE, while 50 kg N ha^{-1} achieved the maximum seed yield (1640.8 kg ha^{-1}). HF-143 consistently outperformed Hisar Swarup, and the highest benefit-cost ratio (3.24) was observed under $V_2I_4N_3$ and $V_2I_3N_3$. Therefore, irrigation at 1.0–1.2 IW/CPE with 50 kg N ha^{-1} proved optimal for improving yield, resource-use efficiency, and profitability in fennel under drip fertigation, supporting sustainable production and resource-efficient agriculture.

Keywords: *Fennel, Nitrogen use efficiency, Water use efficiency, Yield, Economics*

IHASE-2025/382

Evaluation of Organic Amendments Against Rice Blast Under Field Conditions

Aakash

Senior Research Fellow Chaudhary charan Singh Haryana Agricultural University, Hisar, Haryana

Rice blast caused by *Pyricularia oryzae* Cavara is a major constraint to rice production, affecting both foliage and panicles and resulting in significant yield losses. A field experiment was conducted during Kharif 2022 and 2023 at the research farm of Rice Research Station, Kaul to evaluate the efficacy of selected organic amendments against leaf and neck blast in rice cultivars PB 1121 and CSR 30. The experiment was laid out in a randomized block design with five treatments—Beejamrit (10 ml kg^{-1} seed), Jeevamrit (10 ml kg^{-1} seed), Ghanajeevamrit (200 kg ha^{-1}), poultry manure (2000 kg ha^{-1}), and desi cow manure (5000 kg ha^{-1})—along with an untreated control. During Kharif 2022, Ghanajeevamrit @ 200 kg ha^{-1} recorded the lowest leaf blast severity (30.94% and 33.19%) and neck blast severity (26.45% and 28.22%) in PB 1121 and CSR 30, respectively, compared to untreated plots which exhibited the highest disease intensity. Similar results were observed in Kharif 2023, where Ghanajeevamrit significantly reduced leaf blast (28.78% and 32.39%) and neck blast severity (24.41% and 26.63%), while control plots showed maximum severity. Pooled analysis over two years indicated that Ghanajeevamrit resulted in the highest reduction over control for leaf blast (30.86% and 25.28%) and neck blast (30.10% and 29.46%) in PB 1121 and CSR 30, respectively. Beejamrit ranked next in effectiveness, whereas desi cow manure was the least effective treatment. The results suggest that Ghanajeevamrit @ 200 kg ha^{-1} can effectively reduce rice blast severity and may be incorporated as a sustainable component in eco-friendly disease management strategies.

Keywords: *Rice blast, Pyricularia oryzae, organic amendments, Ghanajeevamrit, Beejamrit, leaf blast, neck blast, sustainable agriculture.*

IHASE-2025/383

Post-harvest quality and shelf-life of polyhouse grown cucumber as influenced by plant growth regulators, spacing and varietal difference

Renu Fandan, Makhan Lal and Kuldeep Kumar
Department of Vegetable Science
Chaudhary Charan Singh Haryana Agricultural University, Hisar-125004, Haryana, India
Email: renufandan1995@gmail.com

A study was conducted during the Rabi seasons of 2022–23 and 2023–24 at the Precision Farming Development Centre, CCS Haryana Agricultural University, Hisar, situated in a semi-arid, subtropical climate. The experiment utilized a split-plot design with three replications. Main plots featured two cucumber varieties: PusaParthenocarpic Cucumber-6 (PPC-6) and Punjab Kheera-1 (PK-1). Sub-plots involved two plant spacings (60 × 60 cm and 60 × 45 cm), while sub-sub plots included treatments with plant growth regulators (PGRs): NAA (25 & 50 ppm), GA_3 (10 & 20 ppm), ethrel (100 & 200 ppm), combinations of ethrel + GA_3, NAA + GA_3, NAA + ethrel and a water-spray as control. PGRs were applied as foliar sprays at the two and four true leaf stages. Post-harvest losses of fruits were assessed under ambient conditions.PPC-6 demonstrated consistently lower post-harvest losses than Punjab Kheera-1 under both 60 × 60 cm and 60 × 45 cm spacing. Under the wider spacing, PPC-6 registered PLW of 10.87–11.05%, decay of 11.78–12.15%, and total loss of 22.65–23.20%, whereas PK-1 recorded slightly higher losses (PLW 10.95–11.14%, decay 11.91–12.26%, total 22.86–23.40%) during 2022-23 and 2023-24, respectively. Similar trends were observed at closer spacing.The combination treatment of NAA 20 ppm + GA_3 10 ppm delivered the lowest losses across all treatments. In contrast, the control (water spray) exhibited the highest losses (PLW 11.13–11.34%, decay 12.08–12.46%, total 23.21–23.79%).Storage duration exerted a marked effect: by day 12, PLW had doubled (23.3%), decay surged to 36.5%, and cumulative losses approached 59% under both spacing regimes. Notably, interaction effects among variety, spacing and PGRs were largely non-significant.In conclusion, the integration of PPC-6 with foliar application of NAA 20 ppm + GA_3 10 ppm, especially at 60 × 60 cm spacing, is identified as the optimal strategy for minimizing post-harvest losses in polyhouse-grown cucumbers.

Keywords: *Cucumber, polyhouse, PGRs, physiological loss in weight (PLW), decay loss, total loss*

IHASE-2025/384

Monitoring of *Earias vittella* and *Helicoverpa armigera* through Pheromone Traps in Okra under Tarai Region of Eastern Uttar Pradesh Conditions

Dilip Kumar[1], Rajnish Kumar[1]*, Amarendra Pratap Singh[1] and Gyan Prakash Morya[2]

[1]Department of Entomology, B.R.D.P.G. College, D.D.U. Gorakhpur University, Deoria (U.P.), India.

[2]Department of Entomology, I.A.N.S., D.D.U. Gorakhpur University, Gorakhpur (U.P.), India.

Corresponding author: rajnisjkumar.rk1@gmail.com

The present investigation entitled "Monitoring of *Earias vittella* and *Helicoverpa armigera* through Pheromone Traps in Okra under Tarai Region of Eastern Uttar Pradesh Conditions" was carried out during the *Kharif* (Winter) *season* 2021-23 at the nearby farmer's field of B.R.D.P.G. College, Deoria (U.P.) affiliated to D.D.U. Gorakhpur University, Gorakhpur, India. The study was designed under Large Plot Technique, grown on a plot size of 150 m^2 (15 m X 10 m) with a spacing of 60 cm X 30 cm rows and plants with weekly observations on the okra variety 'Arka Anamika'. Okra (*Abelmoschus esculentus* L.), is also commonly known as Lady's finger, which an important vegetable crop belonging to the family Malvaceae. *Earias vittella* F. (Okra shoot & fruit borer) and *Helicoverpa armigera* H. (Okra fruit borer) are considered the most damaging pests of okra. The pest pressure was moderate and concentrated mainly between 32 and 36 SMW (Standard Meteorological Week) for *Earias vittella* and between 32 and 35 SMW for *Helicoverpa armigera* in okra during the *Kharif* seasons of 2021-22 and 2022-23 through pheromone traps respectively. The population of *Earias vittella* was steadily increased to 5.53 moths/trap in 30th SMW to 8.30 moths/trap in 32nd SMW, showing a rapid build-up as the crop entered its reproductive phase, while the population of *Helicoverpa armigera* was also steadily increased to 7.81 moths/trap in 31st SMW to 13.19 moths/trap in 33th SMW. This result represents the most critical window of infestation, where pest management measures are essential to minimize crop losses.

Key words: *Okra (Abelmoschus esculentus L.), Helicoverpa armigera, Earias vittella. Monitoring, Pheromone Trap, Tarai Region, Uttar Pradesh, India.*

IHASE-2025/385

Enhancement of Bioactive Phytochemicals in Coarse Grain Biscuits Using *Giloy* Stem Powder

Mahima Kumari[1] Dr. Parvinder Kaur[2], Dr. Veena[3]
[1]Research Scholar, Department of Food and Nutrition, BPSIHL. Bhagat Phool Singh Mahila Vishwavidyalya Khanpur Kalan, Sonipat, Haryana, 131305.
[2]Associate Professor, Department of Food and Nutrition, BPSIHL, Bhagat Phool Singh, Mahila Viswavidyalya Khanpur Kalan, Sonipat, Haryana, 131305.
[3]Associate Professor, Department of Food and Nutrition, BPSIHL, Bhagat Phool Singh, Mahila Viswavidyalya Khanpur Kalan, Sonipat, Haryana. 131305.
e –mail: mahimarupeshgodara@gmail.com

The present study was conducted to evaluate the phytochemical content of coarse grain biscuits developed using *Giloy* stem powder (GSP). *Giloy (Tinospora cordifolia)* is an important medicinal plant widely recognized for its therapeutic, antioxidant and nutraceutical properties due to the presence of several bioactive compounds such as tannins, flavonoids, alkaloids and phenolic compounds. Keeping in view its health-promoting potential, *Giloy* stem powder was incorporated into coarse grain biscuits to improve their phytochemical and functional properties. The biscuits were prepared by substituting the flour mixture with different levels of *Giloy* stem powder, namely Type-I (5%), Type-II (10%) and Type-III (15%), and compared with the control sample prepared without supplementation. The developed biscuits were analyzed for tannin and flavonoid contents. The results revealed that supplementation of *Giloy* stem powder significantly ($P \leq 0.05$) enhanced the phytochemical composition of the developed coarse grain biscuits. The tannin content of the control biscuits was recorded as 1.08 mg/100 g, which increased significantly to 1.51 mg/100 g in Type-I, 2.28 mg/100 g in Type-II and 3.05 mg/100 g in Type-III biscuits. A gradual and consistent increase in tannin content was observed with increasing levels of *Giloy* stem powder supplementation, with the highest value recorded in Type-III biscuits. Similarly, flavonoid content also showed a significant increasing trend with increasing incorporation of *Giloy* stem powder. The flavonoid content of the control biscuits was found to be 2.22 mg/100 g, which increased to 2.28 mg/100 g in Type-I, 2.45 mg/100 g in Type-II and 3.05 mg/100 g in Type-III biscuits. The highest flavonoid content was observed in Type-III biscuits, indicating that higher levels of *Giloy* stem powder positively influenced the phytochemical profile of the product. The increase in tannin and flavonoid contents may be attributed to the rich phytochemical composition of *Giloy* stem powder. These phytochemicals possess strong antioxidant activity and contribute to several health benefits, including protection against oxidative stress and chronic diseases. The study concluded that incorporation of *Giloy* stem powder effectively enhanced the phytochemical quality and nutraceuticals potential of coarse grain biscuits and can be utilized for the development of functional bakery products with improved health-promoting properties.

Keywords: *Giloy, phytochemical, nutraceuticals, biscuits etc.*

IHASE-2025/386

Study of soil potassium fractions under the STCR approach and their effect on yield of wheat and nutrient use efficiency in a Vertisol

Divya Bhayal
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Jabalpur
(Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, M.P.)

A field experiment was conducted during the Rabi seasons of 2020–21 and 2021–22 at the research farm of the Department of Soil Science, JNKVV, Jabalpur, to study soil potassium fractions under the STCR approach and their effect on yield of wheat and nutrient use efficiency in a vertisol. The experiment comprised six treatments: control, GRD (120:80:60 kg $N:P_2O_5:K_2O$ ha^{-1}), target yield of 4.5 t ha^{-1}, target yield of 6.0 t ha^{-1}, target yield of 4.5 t ha^{-1} + FYM @ 5 t ha^{-1}, and target yield of 6.0 t ha^{-1} + FYM @ 5 t ha^{-1}, arranged in a Randomized Block Design with four replications. Application of STCR-based nutrient management significantly improved plant height, tillers $plant^{-1}$, dry matter accumulation, grains ear^{-1}, test weight, and grain and straw yields over control and GRD. The treatment targeting 6.0 t ha^{-1} + FYM recorded the highest yield, nutrient content, and uptake of N, P, K, and S. Nutrient recovery efficiencies, particularly N and P recovery, were markedly enhanced under STCR treatments integrated with FYM. Soil physical properties such as bulk density, porosity, and water holding capacity also improved under integrated nutrient management. Application of NPK with or without FYM significantly increased water-soluble, exchangeable, non-exchangeable, lattice, total, and labile K fractions at all soil depths. The study indicated that STCR-based integrated nutrient management, especially target yield of 6.0 t ha^{-1} + FYM @ 5 t ha^{-1}, enhanced wheat productivity, nutrient use efficiency, soil fertility, and potassium dynamics in Vertisol soils.

Keywords: *STCR approach, potassium fractions, wheat, nutrient use efficiency, Vertisol, soil fertility.*

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Effect of Integrated Nutrient Management on Productivity and Profitability of Green Pea–Baby Corn Cropping System

Aakash
Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi – 221005, Uttar Pradesh
Corresponding author: akash.agro10@bhu.ac.in

A field experiment entitled "Integrated Nutrient Management in Green Pea–Baby Corn Cropping System in Varanasi Region" was conducted during 2019–20 and 2020–21 at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University to evaluate the effect of integrated nutrient management practices on growth, yield, nutrient uptake, system productivity and economics of green pea–baby corn cropping system. Different combinations of inorganic fertilizers, farmyard manure (FYM), microbial consortia, Rhizobium, phosphorus solubilizing bacteria (PSB) and waste decomposer were used in green pea, whereas integrated nutrient combinations involving nitrogen, phosphorus and microbial consortia were applied in baby corn. The experimental soil was sandy clay loam, slightly alkaline in reaction, low in organic carbon and available nitrogen, and medium in available phosphorus and potassium. The results indicated that integrated application of organic, inorganic and microbial nutrient sources significantly improved growth parameters, chlorophyll content, dry matter accumulation, yield attributes and yield of both crops over control and sole chemical fertilizer application. Treatments receiving higher levels of FYM along with microbial consortia and waste decomposer in green pea and integrated nutrient combinations with microbial consortia in baby corn recorded superior productivity and profitability. Integrated nutrient management also enhanced nutrient uptake and improved soil fertility status after harvest of crops. The study concluded that integration of organic, inorganic and biological nutrient sources is an effective and sustainable strategy for improving productivity, profitability and soil health of green pea–baby corn cropping system under Varanasi conditions.

Keywords: *Integrated nutrient management, green pea, baby corn, cropping system, microbial consortia, waste decomposer*

IHASE-2025/388

Precision Genome Editing for the Development of Climate-Resilient Buffalo

Shweta Yadav[1], Manoj Kumar Singh[1], Naresh.L. Selokar[1]
[1]Embryo Biotechnology Lab, Animal Biotechnology Division,
ICAR- NDRI, Karnal, Haryana
Presenting author: Shweta Yadav (shwetayadav2521998@gmail.com)
Corresponding author: Naresh.L. Selokar (naresh.selokar@icar.gov.in)

Phenotypic traits, particularly coat characteristics, play an important role in thermoregulation and productivity of dairy animals exposed to heat stress. Animals possessing lighter-colored coats generally absorb less solar radiation, thereby exhibiting improved heat tolerance and sustained production performance. The present study aimed to disrupt the Dopachrome Tautomerase (DCT) gene, a key component of the melanin biosynthesis pathway, using CRISPR-Cas9 technology to establish gene-edited buffalo cells for developing climate-resilient animals. Guide RNAs (gRNAs) targeting the DCT gene were designed using CHOPCHOP and transfected into buffalo fibroblast cells. Following genome editing, single-cell colonies were established and screened through PCR amplification of the target locus followed by Sanger sequencing. Editing efficiencies in mixed and clonal cell populations were evaluated using TIDE and ICE analyses. The mixed cell population exhibited an editing efficiency of approximately 30%. Screening of 28 single-cell colonies identified five monoallelic DCT knockout clones. Sequence analysis confirmed the presence of indels at the target site, demonstrating successful CRISPR-mediated gene disruption. These findings establish DCT-edited buffalo fibroblasts as a potential donor cell source for Somatic Cell Nuclear Transfer (SCNT). Future studies will focus on generating cloned embryos from the edited cell lines and evaluating their developmental competence and phenotypic outcomes. This work represents an important step toward the development of heat-resilient buffaloes through targeted genome engineering.

Keywords: *Buffalo, Heat Stress, CRISPR-Cas9, DCT, Fibroblast, Genome Editing*

IHASE-2025/389

Virulence Study of Acinetobacter spp. Isolated from Biofloc Culture System

Sanat Chandravanshi
Department of Aquatic Animal Health Management, College of Fisheries,
Central Agricultural University Lembucherra, Agartala, Tripura, PIN: 799210

Acinetobacter spp. are emerging pathogens with diverse virulence factors, affecting both human infections and fish diseases across various environments. This study aimed to investigate the in vivo pathogenicity, virulence potential, and post-infection (LD50) immune, hematological, and biochemical responses of two known human pathogenic A. nosocomialis and A. seifertii, which were previously isolated from diseased fish of biofloc culture system in Tripura, India. The identification of the isolates was confirmed through a range of biochemical tests and 16S rRNA gene sequence analysis. An in vivo pathogenicity test was conducted to determine the LD50 dose of the bacteria in Labeo rohita fingerlings, which was found to be 1x104.7 and 1x104.3 cells fish-1 for A. nosocomialis and A. seifertii, respectively. Clinical signs and mortalities were also observed when the LD50 dose was injected into L. rohita fish, including lethargy, skin discoloration, hemorrhage, ulcers, exophthalmia, eye opacity, dropsy, and fin rot, indicating severe disease manifestation. Total RBC count, Hb, PCV, Na+, albumin, respiratory burst activity, and anti-protease activity were significantly ($p < 0.05$) lower in the infected group compared to the control group. In contrast, the total WBC count, total protein, glucose, globulin, ALP, SGOT, SGPT, and K+ levels were significantly ($p < 0.05$) higher in the infected group compared to the control group. The pathogenic potential of A. nosocomialis and A. seifertii poses a threat to aquaculture. This is the first description of A. nosocomialis and A. seifertii as pathogens in aquaculture.

Keywords: *A. nosocomialis, A. seifertii, Labeo rohita, Pathogenicity, LD50, virulence genes*

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Efficacy of Different Plant Oils for the Management of Sheath Blight of Rice

Vipul[1], Ashwani Kumar[2], Anil Kumar Saini[3] and Rakesh Punia[4]
[1]Ph.D Scholar, Dept. of Plant Pathology, CCSHAU, Hisar
[2]DES (Plant Pathology), KVK, Kurukshetra, CCSHAU, Hisar
[3]Assistant Scientist, Dept. of Genetics and Plant Breeding, CCSHAU, Hisar
[4]Assistant Scientist, Dept. of Plant Pathology, CCSHAU, Hisar
E-mail: doc.vipbajwa00@gmail.com, Ph. No. 9416743392

Rice sheath blight caused by *Rhizoctonia solani* Kuhn is one of the most destructive diseases limiting rice production. The present study evaluated the efficacy of five botanical oils against *R. solani* under both *in vitro* and field conditions. Under *in vitro* conditions, lemongrass oil exhibited the highest mean mycelial growth inhibition of 60.74 per cent, followed by neem oil (52.22 %), aak oil (38.89%), datura oil (31.48%) and eucalyptus oil (27.04%). An increase in oil concentration resulted in progressively greater inhibition of mycelial growth, with the highest mean inhibition of 42.96 per cent recorded at 500 ppm. Field evaluation conducted during *Kharif* 2023 and *Kharif* 2024 further demonstrated that foliar application of botanical oils significantly reduced sheath blight severity and increased grain yield compared with the untreated control. Among the treatments, lemongrass oil proved to be the most effective, recording the lowest pooled PDI of 44.45 per cent the highest disease reduction of 44.44 per cent and the maximum grain yield of 76.46 q ha^{-1}, followed by neem oil, whereas eucalyptus oil was the least effective. Overall, the findings indicate that lemongrass oil has considerable potential as an eco-friendly alternative for the sustainable management of rice sheath blight and enhancement of rice productivity.

Keywords: *Botanical oils, Rice, Sheath blight and Management*

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Prevention and Control of Nipah Virus Infection: A One Health Approach

Manisha Parihar
Assistant Professor
RPS College of Veterinary Sciences, Satnali Road, Balana,
Mahendergarh, Haryana Pincode- 123029

Nipah virus (NiV), a highly pathogenic zoonotic virus belonging to the genus *Henipavirus* (family *Paramyxoviridae*), has emerged as a significant public health concern due to its high case fatality rate, recurrent outbreaks, and potential for person-to-person transmission. Fruit bats (*Pteropus* spp.) serve as the natural reservoir, with spillover occurring through direct contact with infected bats, contaminated food products, intermediate animal hosts such as pigs, or infected humans. Recurrent outbreaks in South and Southeast Asia, particularly in Bangladesh and the Indian state of Kerala, highlight the urgent need for effective prevention and control strategies.

The absence of a licensed, widely available vaccine or specific antiviral therapy makes prevention the cornerstone of disease management. A comprehensive One Health approach, integrating human, animal, and environmental health sectors, is essential for minimizing spillover events and preventing outbreaks. Key preventive measures include strengthening surveillance in wildlife, livestock, and human populations; early diagnosis through molecular techniques such as real-time reverse transcription polymerase chain reaction (RT-PCR); rapid case isolation; effective contact tracing; strict infection prevention and control practices in healthcare facilities; and community awareness regarding avoidance of bat-contaminated fruits and raw date palm sap. Conservation of the natural habitat and minimizing human–wildlife interactions alongwith enhanced farm biosecurity and continuous monitoring of high-risk regions will contribute to reducing the risk of transmission.

Recent advances in vaccine development, monoclonal antibody therapies, genomic surveillance, and predictive outbreak modeling offer promising avenues for future preparedness. Strengthening interdisciplinary collaboration, laboratory capacity, and risk communication under the One Health framework will be critical for improving outbreak preparedness and response. Sustainable surveillance systems, public awareness, and coordinated national and international efforts remain fundamental to mitigating the impact of Nipah virus infection and safeguarding both human and animal health.

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Innovations in Agricultural Stone Picking: An Overview of Mechanised Solutions

Yashpal Yadav*[1], S. S. Meena[2], Meenu Jakhar[3]
PhD Scholar*[1, 3] and Head & Professor[2]
[1,2]Department of Farm Machinery and Power Engineering
College of Technology and Engineering, MPUAT, Udaipur, India-313001
[3]Department of RMCS, I. C. College of Community Science
CCS HAU, Hisar, India-125004.
E-mail: yashpalrao3059@gmail.com

The occurrence of stones/boulders (≥ 2mm) in soil surface layers of agricultural fields makes it difficult for agricultural operations like tillage, seed bed preparation, seeding, etc. Tillage operations are impeded by stones, leads to frequent worn out of tillage machinery additionally, increases operational costs for the farmer. Different types of machinery are used such as conveyor-based, hydraulic lifting and rotary screening to mechanically pick the stones from the soil and in doing so minimize soil disruption. Many agricultural soils contain a variable percentage of coarse fractions over fine earth fractions in their arable layer, which can hinder cultivation, harm equipment, and necessitate additional time and effort for soil tillage. They might even render using machines unfeasible. When these circumstances arise, soil destoning must be carried out to restore arable land and maximize cultural management in accordance with contemporary agricultural methods and soil cultivation equipment. Since stone pickers are largely automated or GPS guided, and optimized using AI, they have become quite efficient as compared to the past. Besides its efficiency in operational terms, these innovations also make for environmentally sound farming practices by minimizing soil compaction and erosion. However, while these advancements have been made, mechanized stone picking still suffers from high costs of entry, low ease of maintenance and limited accessibility for smallholder farmers. Areas of ongoing research in the field of machine adaptability to different soil conditions, energy efficiency and environmental sustainability continue. We expect future improvements in precision agriculture and smart autonomy will improve the performance and cost of stone pickers, making them more affordable to a larger number of farmers. The present review discusses the history, working principle and technological advancement of mechanized stone pickers as well as the challenges faced in mechanized stone picker implementation in a targeted manner, for their impact on modernizing agricultural practices and increasing farm productivity.

Keywords: *Stone picker, agricultural machinery, mechanized farming, precision agriculture, soil management*

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Digital Literacy as a Tool for Sustainable Rural Development

Meenu
PhD Scholar
Department of Resource Management and Consumer Science
I.C. College of Community Science, CCS HAU, Hisar
E-mail: meenujakhar1998@gmail.com

Digital technologies have emerged as important tools for promoting sustainable development by improving access to information, financial services, education, healthcare resources and government programmes. However, rural women often remain digitally marginalized due to limited access to smartphones, inadequate digital skills and low confidence in using digital platforms. The present study was undertaken to assess the effectiveness of a need-based digital literacy training module in enhancing the digital competencies of rural women. The study was conducted in Agroha and Barwala blocks of Hisar district, Haryana. Initially, 200 rural women were surveyed to assess their existing digital literacy status. Based on the identified needs, a ten-day need-based digital literacy training module was developed and implemented for 50 purposively selected rural women. The module covered smartphone operations, social media applications, digital payments, e-commerce platforms, educational applications, cyber safety and online service utilization. Pre- and post-training assessments were conducted to evaluate knowledge gain and skill enhancement. The baseline survey revealed that only 9.0 per cent of respondents owned a personal smartphone, while 73.0 per cent relied on shared household devices. Knowledge regarding advanced digital activities such as online shopping (WMS = 1.74), digital payments (WMS = 1.85) and e-mail usage (WMS = 1.53) was found to be low. Following the training intervention, substantial improvements were observed across all digital domains. The highest knowledge gain in Block I was recorded for online shopping (Gain = 3.16; t = 10.14) and online payments (Gain = 3.04; t = 9.76), while in Block II the maximum gain was observed in sending, receiving and reading e-mails (Gain = 3.36; t = 10.73). The participants reported increased confidence, independence and willingness to continue learning digital skills. The study concludes that need-based and participatory digital literacy interventions can effectively bridge the digital divide among rural women. Strengthening digital competencies can facilitate access to educational resources, digital financial services and government programmes, thereby contributing to women's empowerment and sustainable rural development.

Keywords: *Digital Literacy, Rural Women, Sustainable Rural Development, Digital Inclusion, Women's Empowerment, Digital Skills.*

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Occurrence of Intertidal Marine Bivalve Along Sikka Coast, Gujarat, India

Shubham Janbandhu
Department of Fisheries Resource Management, College of Fisheries Manglore
Karnataka Veterinary Animal and Fisheries Sciences University, Bidar-575002.

Bivalves are aquatic molluscs that are found in diverse habitats, encompassing both marine and freshwater environments. Bivalves play an important role in providing livelihood and nutritional security to the coastal population. The present study revises bivalve diversity and their current status along the two selected sites of the Sikka coast, Jamnagar, Gujarat i.e., the Vador site and the GSFC jetty site. Both the sites are under the jurisdiction of Marine National Park, Forest Department. Sampling was done from December 2021 to May 2022. The collected samples were identified up to species level with the help of different reference books. During the entire study, 15 bivalve species belonging to 7 orders, 11 families and 15 genera were recorded from two sites. *Brachidontes undulatus* and *Saccostrea cucullata* were the densest and most abundant species throughout the study period at both sites, whereas *Pinna bicolour* and *Pinctada fucata* were most frequently recorded throughout the study. Mean Shannon diversity index (H') values for bivalves for the entire study period at GSFC (1.603) were comparatively higher than at Vador (1.421). Station-wise, mean Margalef's richness index was higher at GSFC (2.185) than Vador (1.917). The mean evenness value at the Vador was 0.3672, while the GSFC value was 0.4282.

Keywords: *Bivalve, Gulf of Kuchchh, Diversity, Abundance*

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Next-Generation Proteomic Biotyping via MALDI-TOF Mass Spectrometry: A Paradigm Shift in Rapid Aquatic Pathogen Identification and Aquaculture Disease Diagnostics

Muneshwar PavanKalyan*[1], Yash V. Charthad[1]
Muneshwar Tejashwini[2], Mrunal Narendra Nasre[3]
[1]Department of Aquatic Health and Environment, College of Fisheries
Central Agricultural University, Lembucherra, Tripura- 799210
[2] Jawaharlal Nehru Technological University Hyderabad, Telangana, 500085
[3] College of Fisheries, Shirgaon, Ratnagiri, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth (DBSKKV), Dapoli, Maharashtra
*E-mail: pavankalyanmuneshwar@gmail.com

Infectious epizootics remain the paramount impediment to sustainable global aquaculture productivity. Conventional diagnostics relying on phenotypic assimilation profiles, selective plating, and multi-locus gene sequencing (16S/18S rRNA) are inherently labor-intensive, cost-prohibitive, and often inadequate for timely therapeutic intervention. Over the past decade, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) has emerged as an ultra-rapid, high-throughput, and cost-effective proteomic platform for microbial biotyping. By generating distinct ribosomal protein spectral fingerprints within the 2,000–20,000 range, MALDI-TOF-MS facilitates automated species- and strain-level differentiation in minutes. This platform has achieved robust diagnostic reliability across major aquatic bacterial pathogens, including Flavobacterium psychrophilum, Flavobacterium columnare, Pseudomonas anguilliseptica, Renibacterium salmoninarum, Vibrio anguillarum, Yersinia ruckeri, Streptococcus agalactiae, and marine Tenacibaculum taxa. However, unresolved diagnostic bottlenecks persist in closely related species complexes, such as Aeromonas salmonicida, where spectra overlap necessitates hyphenated genotypic or high-resolution chemometric confirmation. Recent technological enhancements—incorporating machine learning-assisted peak pattern recognition, customized Main Spectra Profile (MSP) in-house reference libraries, and Direct Colony/Intact Cell Mass Spectrometry (ICMS)—have substantially expanded diagnostic discriminatory power. Furthermore, advances in rapid antimicrobial susceptibility testing (AST) via peak-shift assays and direct-from-tissue detection highlight the clinical versatility of mass spectrometry. This review synthesizes current proteomic workflows, evaluates comparative diagnostic metrics against classical and molecular standards, addresses current commercial spectral database voids in aquatic veterinary medicine, and delineates future frontiers for field-deployable MALDI diagnostics in commercial finfish and shellfish systems.

Keywords: *MALDI-TOF-MS, Microbial proteomic fingerprinting, Aquatic pathogen diagnostics, Main spectra profiles, Fish health surveillance, Species-level identification.*

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Genetic Variability and Correlation Analysis for Yield and Associated Traits in Cotton under Irrigated and Rainfed Conditions

Renu Rani*, Omender Sangwan, Sandeep Kumar
Department of Genetics and Plant Breeding
CCS Haryana Agricultural University, Hisar-125004, Haryana
E-mail: renusihagado@gmail.com

The success of cotton breeding programmes largely depends on the availability of genetic diversity and the identification of desirable traits associated with productivity. The present study was undertaken to characterize genetic variation and determine associations among yield-related traits under contrasting moisture regimes. During 2022, 120 test genotypes along with four standard checks were assessed in three blocks following an augmented block design under irrigated and rainfed conditions. Observations were collected on fifteen quantitative traits encompassing crop phenology, plant morphology, physiological attributes and yield. Genetic parameters were estimated using genotypic and phenotypic coefficients of variation (GCV and PCV), broad-sense heritability and genetic advance. Relationships among traits were examined through Pearson's correlation coefficients based on block-adjusted genotype means. Considerable differences in genetic variability were evident among the evaluated genotypes. Under irrigation, GCV varied from 4.76% for days to flowering to 35.41% for seed cotton yield, whereas the corresponding range under rainfed conditions was 5.92–39.52%. Broad-sense heritability under irrigation varied between 22.20% for stomatal conductance and 97.95% for number of bolls per plant. Under rainfed conditions, the estimates ranged from 35.32% for stomatal conductance to approximately 96.45% for number of monopodial branches per plant. High heritability accompanied by high genetic advance for seed cotton yield suggested substantial scope for genetic improvement through selection. Correlation analysis revealed that boll weight had the strongest positive relationship with seed cotton yield under irrigated ($r = 0.469$) and rainfed ($r = 0.417$) conditions. Number of bolls, sympodial branches and relative water content also showed significant positive associations with yield in both environments. Additionally, photosynthetic rate and SPAD readings were positively correlated with yield under rainfed conditions.

Overall, the findings provide useful information for selecting superior cotton genotypes and improving yield potential across contrasting moisture environments.

Keywords: *Cotton, augmented block design, genetic variability, GCV, PCV, heritability, genetic advance, correlation, irrigated conditions, rainfed conditions.*



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