

PROCEEDINGS OF

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AGRI 2026
VISION



8th International Conference on **Sustainable Agriculture for Food Security**

January 28-30, 2026 | ICAR-IIHR-CHES, Bhubaneswar, Odisha, India

(SARM in collaboration with ICAR-IIHR-CHES)



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CONFERENCE PROCEEDINGS

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8th International Conference on

Sustainable Agriculture for Food Security

January 28-30, 2026 | ICAR-IIHR– Central Horticultural Experiment Station, Bhubaneswar, Odisha, India

Organized by SARM, in collaboration with ICAR-IIHR-CHES



Society for Agricultural Research & Management

कृषि अनुसंधान और प्रबंधन संस्थान

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Conference Proceedings of
8th International Conference on
Sustainable Agriculture for Food Security

January 28-30, 2026 | ICAR-IIHR– Central Horticultural Experiment Station, Bhubaneswar, Odisha, India

Edition: 05, Vol. 01, Issue 01

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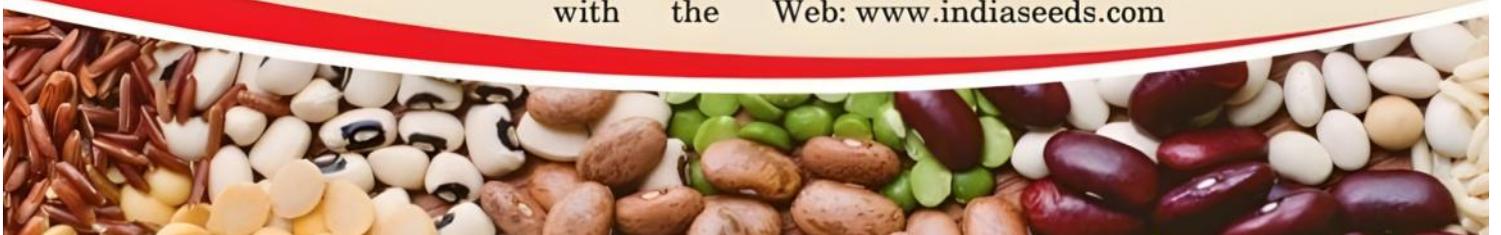
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Messages



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डॉ. मृत्युंजय महापात्र

मौसम विज्ञान विभाग के महानिदेशक,
विश्व मौसम विज्ञान संगठन में भारत के स्थाई प्रतिनिधि
विश्व मौसम विज्ञान संगठन के तीसरे उपाध्यक्ष

Dr. Mrutyunjay Mohapatra

Director General of Meteorology,
Permanent Representative of India to WMO
Third Vice President of WMO



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पृथ्वी विज्ञान मंत्रालय
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Government of India
Ministry of Earth Sciences
India Meteorological Department
Mausam Bhawan, Lodi Road
New Delhi-110003



Message

I am delighted to extend my greetings to the organizers and participants of the **8th International Conference on Sustainable Agriculture for Food Security (Agri Vision 2026)**, being held at ICAR-IIHR-CHES, Bhubaneswar.

In the current era, the predictability of weather and the stability of our climate have become the primary determinants of global food security. As we face increasing frequencies of extreme weather events—from unseasonal rains to prolonged heatwaves—the role of **Agrometeorology** has transitioned from a support service to a frontline defense for the farming community.

At the **India Meteorological Department (IMD)**, our mission is to provide accurate, localized, and timely weather forecasts that empower farmers to make informed decisions. The synergy between meteorological science and agricultural practice is the cornerstone of "Climate-Resilient Agriculture." This conference provides an invaluable opportunity to discuss how advanced technology, AI-driven predictive modeling, and early warning systems can be better integrated into the agricultural value chain.

Bhubaneswar, a city that has demonstrated remarkable resilience in the face of various natural challenges, serves as a fitting venue for these deliberations. I am confident that **Agri Vision 2026** will foster a deeper understanding of how we can mitigate climate risks and ensure that our path to food security remains sustainable and inclusive.

I congratulate the organizing committee for their initiative in addressing these vital issues and wish all the delegates a highly successful and impactful conference.


(Mrutyunjay Mohapatra)



केंद्रीय आयुर्वेदीय विज्ञान अनुसंधान परिषद्
आयुष मंत्रालय, भारत सरकार
Central Council for Research in Ayurvedic Sciences
Ministry of Ayush, Govt. of India

प्रो. (वैद्य) रबिनारायण आचार्य, पीएचडी, डीएससी
Prof. (Vaidya) Rabinarayan Acharya, PhD, DSc
महानिदेशक / Director General

Dated the 1ST January 2026

Message



It is a matter of immense pleasure to provide this message for the conference booklet of "Agri Vision 2026: An International Conference on Sustainable Agriculture for Food Security", organised by the Society for Agricultural Research & Management (SARM) from 28th to 30th January 2026 at the ICAR-IIHR-CHES, Bhubaneswar.

The theme of this conference, "Challenges to the food security & nutrition: New age technologies to address them", is both timely and vital. In an era where global food systems face unprecedented pressures, integrating innovative technologies with traditional wisdom is essential to ensure sustainable nutrition and security for all.

Agricultural health is the foundation of human wellness. Sustainable agriculture safeguards not only our food security but also the holistic health of humanity. The conference booklet provides a comprehensive platform, covering diverse sectors from Plant Science and Horticulture to Bio-energy and Agri-policies, which are all crucial for a holistic approach to food security.

I commend Society for Agricultural Research & Management (SARM) for its dedication to promoting research, fostering innovation, and empowering the farming community. The inclusion of Plenary Sessions, Farmer-expert interactions, and Exhibitions during this conference will undoubtedly facilitate a meaningful exchange of knowledge between scientists, policymakers, and practitioners.

I wish the organisers and all participants a highly productive and successful conference. May the deliberations of this Conference yield actionable strategies that strengthen our agricultural systems and advance nutritional well-being.

(Prof. Vd. Rabinarayan Acharya)



त्रिलोचन महापात्र

अध्यक्ष

पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण
(संसद के अधिनियम द्वारा निर्मित सांविधिक निकाय)
कृषि एवं किसान कल्याण मंत्रालय
भारत सरकार



Trilochan Mohapatra

Chairperson

Protection of Plant Varieties and Farmers'
Rights Authority

(A Statutory body created by an Act of Parliament)
Ministry of Agriculture and Farmers Welfare
Government of India



MESSAGE

It gives me immense pleasure to extend my warm greetings to the organizers and participants of the “*Agri Vision 2026: An International Conference on Sustainable Agriculture for Food Security*” organized by Society for Agricultural Research & Management (SARM) during January 28–30, 2026 at ICAR–IIHR–CHES, Bhubaneswar, Odisha.

Food and nutrition security remains among the most critical challenges of our time, especially in the face of climate change, resource constraints, population growth, and evolving socio-economic conditions. The theme of Agri Vision 2026, “*Challenges to the Food Security & Nutrition: New Age Technologies to Address Them*,” is therefore highly relevant and timely. The conference’s comprehensive focus on plant sciences, horticulture, animal and dairy sciences, fisheries, agri-business, rural banking, agri-waste upscaling, bio-energy, and agri-policies reflects a holistic approach toward sustainable agricultural development.

I am pleased to note that the conference will bring together researchers, academicians, policymakers, industry professionals, farmers, and young innovators from India and abroad through plenary sessions, oral and poster presentations, exhibitions, farmer–expert interactions, and awards. Such a multidisciplinary platform will certainly facilitate meaningful knowledge exchange, foster collaborations, and encourage the adoption of innovative and climate-resilient agricultural practices.

I commend SARM for its commitment to promoting research, innovation, and capacity building in agriculture and allied sectors, and for its efforts to strengthen the link between research institutions and the farming community. I am confident that Agri Vision 2026 will contribute significantly toward strengthening food security, enhancing farmers’ livelihoods, and shaping sustainable agricultural policies for the future.

I extend my best wishes for the grand success of the conference and hope it achieves its envisioned objectives.

(Trilochan Mohapatra)

Date: 26th December, 2025

DR. TEJ PARTAP
Vice Chancellor



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Date: 19/1/2026

SOCIETY FOR AGRICULTURAL RESEARCH
AND MANAGEMENT (SARM)
January 9, 2026

AGRI VISION 2026: An International Conference on Sustainable Agriculture for Food Security being organised by SARM is a praiseworthy initiative. I admire the thought behind the theme of the conference i.e. Challenges to food security and nutrition – new age technologies to address them. Participants will have opportunity to share and listen to perspectives and research findings on various aspects of agriculture in the conference sessions .

I am of the view that conferences like this one offer opportunity to researchers, policy planners and line agency workers, and agribusiness companies to get new ideas , identify new partners as well as evolve a collective thinking about future course of action i.e. priorities of the future.

The key challenges to food security and nutrition in the coming decades will be impact of climate change on food production systems, shrinking crop land in the face of expanding urbanisation world wide but specially in the developing world which has more people to feed on comparatively less farm land. Socioeconomic changes that are reflected by the changing food demands with increasing income levels will be yet another challenge. The silver lining is that technological advancements are helping cope with these challenges of food production, grow more food in smaller space, reducing post harvest losses and safe food in better ways and even faster than yester years.

My best wishes for successful conference and meaningful outcomes of knowledge and information which lead the way in research and policy making.

Thank you .

TEJ PARTAP



वै.औ.अ.प. - राष्ट्रीय वनस्पति अनुसंधान संस्थान CSIR - National Botanical Research Institute



राणा प्रताप मार्ग, लखनऊ - 226001, उ.प्र., भारत
Rana Pratap Marg, Lucknow - 226001, U.P., India

डॉ. अजित कुमार शासनी
निदेशक
Dr. Ajit Kumar Shasany
Director



MESSAGE

It gives me immense pleasure to extend my warm greetings to all the delegates, researchers, academicians, policymakers, industry representatives, and students participating in the **8th International Conference on Sustainable Agriculture for Food Security (AGRIVISION 2026)** being held during **January 28-30, 2026**.

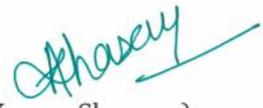
Sustainable agriculture remains at the heart of global efforts to ensure food and nutritional security in the face of climate change, environmental degradation, shrinking natural resources, and a rapidly growing population. Conferences such as AGRIVISION 2026 provide an important platform for the exchange of ideas, sharing of cutting-edge research, and fostering collaborations that can translate scientific innovations into practical solutions for resilient and sustainable agri-food systems.

CSIR-National Botanical Research Institute, Lucknow, has been continuously contributing to research in plant science, biodiversity conservation, crop improvement, and sustainable utilization of plant resources. The themes of this conference strongly resonate with our mandate and vision of leveraging science and technology for societal benefit. I am confident that the deliberations and interactions during this conference will generate valuable insights and actionable strategies towards achieving sustainable agriculture and long-term food security.

I commend the organizers for their efforts in bringing together national and international experts on a common platform and wish the conference great success. I also hope that all participants find the deliberations intellectually enriching and the conference a memorable experience.

With best wishes.

Date: 20.01.2026


(Ajit Kumar Shasany)



ಭಾ. ಕೃ. ಸಂ. ಪ - ಭಾರತೀಯ ತೋಟಗಾರಿಕೆ ಸಂಶೋಧನಾ ಸಂಸ್ಥೆ
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डॉ. तुषार कान्ति बेहेरा
Dr. Tusar Kanti Behera
निदेशक/Director



January 19, 2026

Message from the Patron

It gives me immense pleasure to extend my warm greetings to the organizers, delegates, researchers, academicians, students, and all stakeholders participating in the **8th International Conference on Sustainable Agriculture for Food Security (AGRIVISION 2026)** being held during **January 28–30, 2026 at CHES, Bhubaneswar**.

Sustainable agriculture is central to ensuring global food and nutritional security in the face of climate change, shrinking natural resources, and increasing population pressure. Platforms such as AGRIVISION play a pivotal role in bringing together scientists, policymakers, industry leaders, and farmers to deliberate on innovative technologies, resilient farming systems, climate-smart practices, and policy frameworks that can transform agriculture into a more sustainable and inclusive enterprise. The theme of the conference is timely and highly relevant, offering an excellent opportunity to exchange knowledge, share experiences, and foster international collaborations.

I commend the organizing committee for their dedicated efforts in convening this prestigious international event and for providing a forum that encourages interdisciplinary dialogue and solutions-oriented research. I am confident that the deliberations and outcomes of AGRIVISION 2026 will contribute meaningfully to strengthening sustainable agricultural development and food security at national and global levels.

I wish the conference every success and hope that it leads to impactful recommendations and enduring partnerships.


(Tusar Kanti Behera)
Patron, AGRIVISION 2026



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Kausalyaganga, Bhubaneswar-751002, (Odisha), India

डॉ प्रमोद कुमार साहू

निर्देशक

Dr. Pramoda Kumar Sahoo

Director



Message

It gives me immense pleasure to know that the Society for Agricultural Research and Management is organizing "Agri Vision 2026: An International Conference on Sustainable Agriculture for Food Security" during January 28-30, 2026 in collaboration with ICAR- IIHR-CHES, Bhubaneswar, Odisha.

I am happy to know that the Agri Vision 2026 based on the theme "Challenges to the food security and nutrition: New age technologies to address them," will discuss issues and challenges covering all aspects of agriculture besides addressing sustainable fisheries and aquaculture, and particularly on new age technologies developed in the sector to address food security. I sincerely believe that the platform of Agri Vision will provide valuable strategies for addressing all issues of the sector and stakeholders upon wider deliberation to make agriculture in general and aquaculture in particular, a dependable option for increasing the quality and quantity of agriculture production.

I wish all the best for the successful organisation of the conference.

Place: ICAR-CIFA, Bhubaneswar

Date: 22.01.2026

(Pramoda Kumar Sahoo)

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Keynote Presentations



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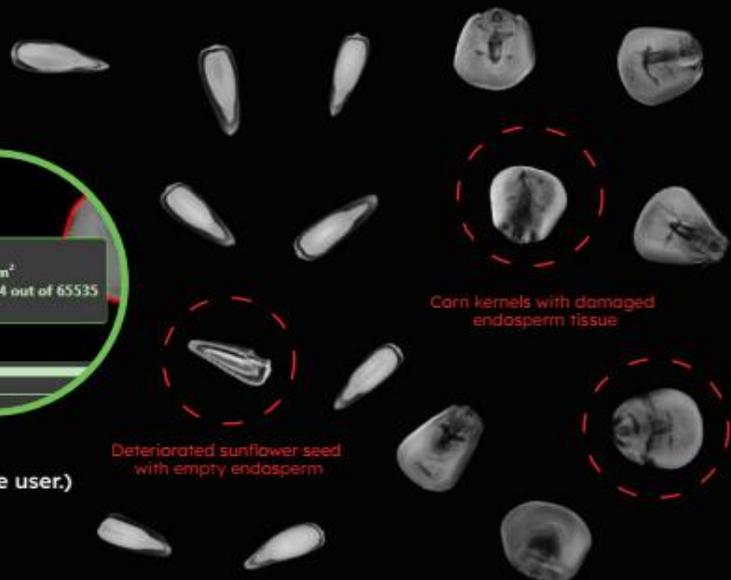
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Seed No[16]
Size=197.28 mm²
Density = 17494 out of 65535
% Fill = 82 %

Zoomed-in section showing Size, Density, and Seed Fill Percent (%)* as calculated by DIGISEED for an individual seed (outlined in red; 82% seed fill is below the threshold that was set by the user.)



Corn kernels with damaged endosperm tissue

Deteriorated sunflower seed with empty endosperm

*Seed Fill % calculates how much of the seed shell is filled by cotyledon and other internal seed structures.

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Bridging the gap: prioritizing conservation and sustainable management of plant germplasm resources

Madhugiri Nageswara-Rao*

USDA-ARS, Subtropical Horticulture Research Station, Miami, FL, USA

Abstract:

This research and service efforts emphasize the critical role of crop wild relatives (CWR) within the USDA-National Plant Germplasm System (NPGS) at the Subtropical Horticulture Research Station for maintaining essential genetic diversity and landscape resilience. These wild plant species, encompassing trees and shrubs related to cultivated crops, provide vital traits for breeding programs aimed at improving disease resistance, climate adaptability, and overall sustainability. Despite their importance, CWR populations face significant threats from habitat loss, urbanization, the climate crisis, and invasive species, leading to a critical erosion of their genetic resources. The study highlights vulnerabilities such as fragmented populations, limited ex situ conservation in germplasm banks, and insufficient integration into broader landscape management strategies. Opportunities for safeguarding these resources are explored through strategic in situ and ex situ conservation, targeted research, and effective policy interventions. By leveraging advanced genomic tools and ecological modeling, the NPGS researchers advocate prioritizing at-risk species and incorporating their valuable genetics into breeding pipelines to enhance the resilience of the horticulture industry. Ultimately, the study calls for robust collaborative efforts among scientists, policymakers, and land managers to develop comprehensive conservation frameworks, underscoring that protecting CWRs within the NPGS is essential not only for ecological stability but also for ensuring future food security and sustainable landscapes amidst global ecological changes.

Keywords: plant germplasm, propagation and horticulture techniques, population genetics, conservation biology, ecological assessment, regulatory science, medicinal plants, phenomics, and genomics

Biography:

Dr. Madhugiri Nageswara-Rao works as an Ornamental Project Lead Scientist at the USDA Agricultural Research Service's Subtropical Horticulture Research Station in Miami, Florida. His research focuses on Subtropical/Tropical Ornamental and Medicinal Genetic Resource Management. Before joining USDA ARS, Dr. Rao worked with USDA APHIS on national and international regulatory sciences at Linden, NJ. He has worked in the Pharmaceutical and Biotechnology Industries and with various Universities. Dr. Rao has diverse expertise in working with population genetics, conservation biology, ecological assessment, regulatory science, and genomics of various ornamental plants (e.g., coreopsis, bamboo, palms, daylily, woody landscapes, and sandal), fruit crops (e.g., citrus, grapes, pineapple, mango, guava, avocado, and papaya), other agricultural plants as well as medicinal and forest wild species. Dr. Rao's research contributions have been published in several reputed and peer-reviewed international journal articles. He has also contributed various book chapters, co-edited international books, served on several scientific committees, secured national and international scientific awards, led grant proposals, successfully mentored students, staff, and visiting scientists, and made >150 scientific presentations at various national and international scientific meetings. Dr. Rao's outreach activities include conducting trainings and workshops, interacting with farmers, and responding to stakeholder needs.

Research Interest: plant germplasm, propagation and horticulture techniques, population genetics, conservation biology, ecological assessment, regulatory science, bioprospecting, phenomics, and genomics

E: Madhugiri.Nageswara-Rao@usda.gov or mnrbhav@gmail.com



Cold atmospheric Pressure Plasma improves seed germination, seedling growth, drought tolerance and nutritional profile of microgreens

Srinivasa Rao Mentreddy*, **Sravan Kumar Sanathanam**, and **Judith Boateng**

Alabama A&M University, Huntsville, Alabama, USA

Abstract:

Cold atmospheric plasma (CAP), a weakly ionized noble gas consisting of free electrons and positively charged ions, reportedly breaks seed dormancy, enhances plant growth and yield, and mitigates seed-borne pathogens. This study evaluated CAP at 7 kV, 1 μ s pulse width, and 5 kHz frequency, to enhance seed germination, growth, and nutrient quality of microgreens. Fifteen microgreen species' seeds were exposed to either Argon (Ar) or Helium (He) CAP for 0 (Control), 30, 60, or 90 seconds and then assessed for moisture imbibition rates in the laboratory. Similarly treated mustard greens' seeds were assessed for seedling growth and nutrient profiles in a greenhouse experiment. Radish, buckwheat, and scallion seeds treated with He CAP for 90 seconds exhibited significantly improved moisture imbibition, while spinach and Pac Choi showed similar response in the 30-second treatment with Ar. Cilantro, scallion, and mustard greens responded positively to both Ar and He CAP. Broccoli, cabbage, and fenugreek showed no response. In the greenhouse trial, the Ar 30-second treatment increased plant height by 98% compared to the Control, while the He 60-second treatment increased the growth rate by 94.3%. Biomass improved by 78.2%, 63.2%, and 51.6% for Ar and He 60-seconds, and Ar 30-second treatments, respectively. Seeds treated with Ar LTP for 30 s and subjected to 10% drought stress using PEG 8000 produced 17% greater root length than the Control. The He 90, Ar 60, and He 60-second treatments enhanced total phenolic content by 32.6%, 27.6%, and 24.8% over the Control. Antioxidant power increased by 24.3%, 23.6%, and 23.2% with Ar 90, Ar 30, and He 90-second treatments, respectively, compared to the Control. The research concludes that cold plasma enhances seed germination, improves seedling growth and drought tolerance, and nutritional value of microgreens

E: srinivasa.mentreddy@aamu.edu



Adaptive responses to high CO₂ by oil seed crop plants *Brassica juncea* and *Brassica campestris* grown in free air Carbon Dioxide Enrichment (FACE) environment

Baishnab Charan Tripathy*

Sharda University, Greater Noida, India

Abstract:

Adaptation of oil seed crop plants to climate change was studied in *Brassica juncea*, cv *Pusa Jaikisan*, and *Brassica campestris* cv *Pusa Gold* grown in free air carbon dioxide enrichment (FACE) (600 mmol mol⁻¹) (eCO₂) environment for three consecutive years. The eCO₂ plants had higher leaf area, biomass, and yield per plant as compared to ambient air-grown plants. The dark respiration increased in eCO₂ to support better crop growth. The light response curves of carbon assimilation demonstrated a 30%-40% increase in the light-saturated photosynthesis rate and higher quantum yield of carbon assimilation by leaves of eCO₂-plants mostly due to reduced photorespiration. The A-Ci curves demonstrated that the maximum carboxylation efficiency, V_{max} was not reduced in eCO₂ plants due to unaltered rubisco abundance. A decrease in stomatal conductance in eCO₂ reduced the transpiration rate and increased the water use efficiency. However, an increased leaf area index in eCO₂ would have offset the gains due to reduced transpiration. Proteomics and genomics profiling revealed an increase in the expression of proteins/genes involved in photosynthesis, nitrogen assimilation, ribosome biogenesis, signal transduction, antioxidative response and a decrease of those involved in photorespiration, amino acid metabolism, Fe-S cluster cofactor, and protein degradation as adaptation to eCO₂.

E: baishnabtripathy@yahoo.com



Efficacy modulation of *Momordica charantia* L. Phytocomponents in adult Zebrafish (*Danio rerio*): A dose-dependent study using GC-MS, In-Silico ADMET, & In vivo techniques

Yashaswi Nayak* and Sanjib Kumar Mohanty

Centurion University of Technology and Management, Bhubaneswar, India

Abstract:

Momordica charantia, commonly known as bitter melon, is known for its medicinal properties despite its therapeutic potential, the toxicological effects of its components are not well understood. This study presents a comprehensive evaluation of the phytocomponents of *Momordica charantia* L. focusing on their therapeutic assessment through in-silico and in-vivo approaches. The phytochemical profiling was conducted using Gas Chromatography-Mass Spectrometry (GC-MS), revealing the presence of bioactive compounds. To assess the drug-likeness of these components, an ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) profiling was performed in silico, providing insights into their pharmacokinetic properties and safety profiles. Among the bioactive compounds, quinine was highlighted for further investigation due to its significant pharmacological impacts. Acute toxicity of quinine was assessed in adult zebrafish (*Danio rerio*) by following OECD guidelines. In this study, the adult zebrafishes were exposed to different concentrations of quinine (0.125 mg/L, 0.250 mg/L, 0.50 mg/L, 2.5 mg/L, 5 mg/L and 10 mg/L) for 21 days. The behavioral test was evaluated by light and dark preference test (LDPT) to check the behavioral response. The result showed altered behavioral pattern in response to higher concentration of quinine as compared to control group. Current study identified a high-risk dose of 0.50 mg/L and proposed a safer alternative dose of 0.250 mg/L for future experiments. The findings suggest that *M. charantia* phytocomponents, particularly quinine, exhibit promising therapeutic potential with an optimized safety margin, further exploration in drug development.

Keywords: Quinine phytocomponents, In-silico-ADMET, GC-MS, LDPT Test, Zebrafish

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Performance of yield and quality of cocoa (*Theobroma cacao* L.) grown under different cropping systems in Andhra Pradesh

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Abstract:

Cocoa (*Theobroma cacao*L.) is a tropical evergreen tree, an important beverage crop. India produces 30,388 metric tonnes of dry beans annually from an area of 1,11,036 ha, with a productivity of 897 kg/ha. Andhra Pradesh leads in cocoa cultivation with an area of 44,993 hectares with 12,378 tons and the highest productivity at 900 kg/ha. In general, cocoa became an integral part of palm-based cropping systems of India and Andhra Pradesh. In Andhra Pradesh, cocoa cultivation is largely confined to West Godavari, East Godavari, Srikakulam, Krishna, Visakhapatnam, Nellore and Vizianagaram districts.

A study was carried out at farmer's field involving six treatment combinations with four replications, laid out in a factorial randomized block design (FRBD). Observations on nutrient analysis, yield parameters, quality parameters were recorded using standard procedures and analyzed statistically. The physico-chemical properties of various soils under the study revealed that pH, EC (dSm⁻¹), organic carbon (%), nitrogen (kg/ha), phosphorous (kg/ha) and potassium (kg/ha) in laterite and alluvial soils ranged from 6.30- 7.08 & 6.34-7.99, 0.11 - 0.21 & 0.07-0.37 dSm⁻¹, 0.43-0.50 & 0.43-0.52 %, 342.44 – 456.11 & 321.44 -453.33 kg/ha, 35.11-39.94 & 35.11-39.18 kg/ha and 177.33 – 210.10 & 177.33-201.77 kg/ha respectively.

In different cropping systems, cocoa grown as a monocrop recorded the highest values for pod weight (544.77 g), fresh bean weight per pod (138.04 g), dry bean weight per pod (52.86 g), nib recovery (89.90%), number of pods per tree (91.94) and dry bean yield per tree (4.97 kg). In contrast, the lowest values for pod weight (407.36 g), fresh bean weight per pod (89.94 g), dry bean weight per pod (36.76 g), nib recovery (87.22 %), number of pods per tree (53.56) and dry bean yield per tree (1.57 kg) were observed in cocoa intercropped with oil palm. With regard to cocoa grown in various soils, the highest fresh bean weight per pod (121.66 g), dry bean weight per pod (47.61 g), number of pods per tree (78.67) and dry bean yield per tree (3.48 kg) in cocoa grown in laterite soils, whereas the highest number of bold beans per pod (35.22) was recorded in alluvial soil. Interaction effect of cropping systems and soils revealed that cocoa as monocrop grown in laterite soil achieved the highest yield (3.64 t/ha) followed by cocoa as monocrop in alluvial soil (3.10 t/ha) as against lowest yield (0.58 t/ha) in cocoa in oil palm gardens grown in alluvial soil.

With respect to quality parameters of cocoa grown in different cropping systems and soils, maximum fat content (55.62%) was observed in cocoa grown as a monocrop as against the lowest of 50.81 % in cocoa+ oil palm cropping system. The interaction of cropping systems and soils, the highest fat content (59.96%) was recorded in cocoa grown as a monocrop in laterite soil compared to minimum fat content (50.55%) in cocoa intercropped with oil palm in alluvial soil. The study revealed that cocoa grown as a monocrop in laterite and alluvial soils, showed significantly superior growth, yield, and quality traits, followed by cocoa intercropped with coconut as against cocoa intercropped under oil palm.

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Breeding chillies for tackling major biotic stresses

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Abstract:

Chilli (*Capsicum annum* L.) is a high-value vegetable and spice crop, cultivated extensively for its pungency, colour, and nutritional quality, but its productivity is increasingly threatened by various biotic stresses under present climate change scenario. To address these challenges, integrated genetic and molecular breeding approaches were undertaken to develop resistance to begomoviruses, anthracnose fruit rot, south east Asian thrips. A major QTL for begomovirus resistance was identified on chromosome 6 in IHR4615, with the marker IHR-LCV-SSR-76 showing a prediction efficiency of 89.50%. Additional resistance sources were identified in *Capsicum chinense* and *C. frutescens*, and resistance in IIHR-B-HP-58 was controlled by a single recessive gene, with associated QTLs on chromosomes 5 and 11. For anthracnose fruit rot, GBS-GWAS and locus-specific microsatellite analyses enabled fine mapping of epistatic QTLs on chromosomes 2 and 6, narrowing the candidate regions to ~836 kb and 135.15 kb, respectively. Resistance from *C. baccatum* (PBC81) was successfully introgressed into *C. annum* through a bridge-cross approach. For thrips (*Thrips parvispinus*) resistance, a standardized screening protocol was developed, and IIHR-B-HP-79 (*C. frutescens*) was identified as a resistant donor. Leaf volatile profiling using GC-MS-SPME revealed biochemical markers associated with thrips resistance. Overall, these results highlight the potential of integrated genomics-assisted breeding strategies to accelerate the development of climate-resilient chilli cultivars with durable resistance, supporting sustainable production and enhanced farmer income. Future breeding strategies should focus on pyramiding resistance genes from elite lines and wild relatives, particularly uncharacterized accessions from Northeast India, the Western Ghats, and Eastern India, alongside abiotic stress tolerance and integrated pest management, to develop resilient, high-yielding, and economically viable chilli cultivars.

Biography:

Dr Naresh Ponnamm did B.Sc (Horticulture) from ANGRAU, Hyderabad, M.Sc (Horticulture) from University of Agricultural Sciences, Bengaluru and Ph.D (Horticulture) from University of Horticultural Sciences, Bagalkot. He holds considerable experience in chilli breeding, germplasm maintenance, hybridization and handling of the populations and forwarding generations through Marker assisted selection. He undergone SERB- Overseas Post-doctoral fellowship at World Vegetable Centre, Taiwan on Genotyping-by-sequencing, and SNP markers. Presently working as Scientist at Division of Vegetable Crops, ICAR-Indian Institute of Horticultural Research, Bengaluru. He handled external projects mainly on chilli breeding programs funded by DST, NASF, MIDH and RKVY etc. He has published 36 research articles in national and international peer-reviewed journals and four book chapters and several popular articles.

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T. sphaerococcum (Indian Dwarf Wheat), A boon for stress and nutritional resilience

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Abstract:

Climate change has become a significant problem for global agriculture as it has led to an increase in abiotic stress. In India, also, climate change has drastically affected agriculture with an increase in drought spells, flooding, and drastic temperature variations. One of the crops which has been significantly affected is wheat because of drought and heat stress. Wheat has been a part of the Indian civilisation since ancient times as can be seen both physically through excavations and in literary context through ancient texts. One can find references of wheat as “*Godhuma*” in ancient Sanskrit texts. It finds references in *Ayurveda* too as can be seen in *Charaka Samhita* and *Susrutha Samhita*. One of the species of wheat (*Triticum*), *T. sphaerococcum* (Indian Dwarf Wheat) has been prominently found in excavations of ancient India like Mohen-jo-daro etc. The *T. sphaerococcum* (AABBDD $2n=6x=42$) which originated in India was grown in primitive Punjab, Sindh and the Gangetic plains. As the generic name, *Paigambari*, suggests it was assumed to have been introduced from Arabia. However, studies in the field of genetics and genomics have clearly shown that this species has evolved in South Asia. The Indian dwarf wheat had a major role in the overall wheat productivity during the neolithic period and there are evidences that show it as the major crop during 3000 B.C. but now this grain is almost out of cultivation because of its low productivity. However, it is known to have several advantages such as heat and temperature tolerance, short and strong culm, better tillering capacity, resistance to several biotic and abiotic stress, and can be grown in rainfed conditions as well. Nutritionally it has been found to be rich in protein, minerals and amino acids compared to common bread wheat, making the Indian Dwarf Wheat a potential source for breeding nutritionally rich wheat varieties. Even after having remarkable qualities and being endemic to India, it has still not been fully utilised. *Triticum sphaerococcum* has a plethora of prospective uses and its genes can be used in the advancement of wheat varieties which are climate and nutritionally resilient. In the present study we have characterised two landraces of *T. sphaerococcum* grown in Prayagraj region and discuss the history, significance, advantages, and prospects of *T. sphaerococcum*.

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Prevalent and emerging diseases affecting Dragon Fruit (*Selenicereus* spp.) in India

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Abstract:

Dragon fruit are climbing cacti belongs to the genus *Selenicereus* spp. and family Cactaceae. The genus *Selenicereus* spp. has a totally of 14 species which vary in fruit and flesh color. Among them, *S. undatus* (red epicarp with white pulp), *S. monacanthus* (syn: *H. polyrhizus*, red epicarp with red pulp) and *S. megalanthus* (yellow peel with white flesh) are the most cultivated species around the world. Dragon fruit is also known by numerous vernacular names like pitaya, pitahaya, strawberry pear, Buah naga, etc., and due to its popularity in India it is recently named as 'Kamalam'. Southeast Asia produces the most dragon fruits worldwide, with Vietnam as the top producing and exporting country (Balendres and Bengoa, 2019). With rising demand for this fruit, the GOI is targeting to expand its cultivation to 50,000 hectares in five years. Even though, dragon fruit cultivation has gained popularity in India, but it is often challenged by biotic diseases that limit production potential. As dragon fruit is considered one of the potential future fruit crops for India, knowledge on prevailing diseases is need of the hour to develop strategies to tackle them. Diseases like stem rot, anthracnose, canker and grey blight are prevalent in India are discussed with their diagnostic symptom, causal organisms, and available management strategies.

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Biopesticides based sustainable nematode management in horticultural crops

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Abstract:

Globalization and intense pressure on land owing to the accelerating population have led to diversification of agriculture and increasing area under protected cultivation. Hence, vagaries due to biotic stresses have become inevitable due to intensified cropping. Among the biotic stresses, plant parasitic nematodes have assumed an alarming dimension as hidden enemies of crop, directly as pathogens and indirectly predisposing the plants to pathogens. On an average, the crop losses due to plant parasitic nematodes are estimated at 21.3% losses amounting to Rs. 102,039.79 million annually; the losses in 19 horticultural crops being assessed at Rs. 50,224.98 million. Nematode menace in vegetables grown under protected cultivation are alarming, causing severe crop losses due to congenial conditions of higher temperature, humidity and use of high agronomic inputs in polyhouses. Growers can no longer rely completely on chemical pesticides as many fumigants and nematicidal pesticides are withdrawn from market owing to their environmental and health risks. This necessitates sound scientific solutions and novel environmental-friendly strategies with refined methodologies that are economically feasible and socially acceptable by the farmers.

In India, ICAR – Indian Institute of Horticultural Research, Bengaluru has made a major breakthrough in commercialization of microbial bioagents and five microbial biopesticides viz., *Paecilomyces lilacinus*, *Pochonia chlamydosporia*, *Trichoderma viride*, *T. harzianum* and *Pseudomonas fluorescens* have been registered at Central Insecticide Board & Registration Committee (CIB&RC), Faridabad for managing plant parasitic nematodes. Strategies for stage-wise application throughout the cropping period and cost-effective methodologies for large scale application in polyhouses have been standardised which are economically feasible, socially acceptable and environmentally sustainable. Biopesticides can be applied as seed treatment and substrate treatment that ensures production of disease free seedlings at the early stage. In main fields, soil application after enrichment of 1 ton of FYM or vermicompost or neem cake with 2 kg each of *Pseudomonas fluorescens*, *Paecilomyces lilacinus* and *Trichoderma viride*/ *harzianum* and application of this enriched organic mixture at 5 t per ha at the time of bed preparation and repeated application quarterly intervals in standing crop has drastically reduced damage due to root knot nematodes in several horticultural crops under open field and polyhouse conditions. The biopesticide formulations can also be sent through drip/ drenching at 5ml/lit at regular intervals of 30 days. Following all these biopesticide interventions regularly, farmers are able to reduce the use of chemical pesticides to the tune to 30 – 40% with the increased yields from 20 – 30%.

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Evaluating aquaponic-derived and synthetic nutrient solutions for lettuce cultivation in vertical hydroponics

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Abstract:

Vertical farming systems such as hydroponics and aquaponics offer sustainable solutions for maximizing crop productivity per unit area. A study was conducted during 2024-2025 at the ICAR-Indian Institute of Water Management (IIWM), Bhubaneswar, to compare the performance of liquid fertilizer-based hydroponics and aquaponics on the growth and yield of three lettuce varieties viz. green (*Lactuca sativa* var. *crispa*), romaine (*Lactuca sativa* var. *longifolia*), and red (*Lactuca sativa* var. *batavian*) under a naturally ventilated polyhouse using a Completely Randomized Design. The hydroponic nutrient solution was formulated using Epsom salt ($MgSO_4$, 1 M), iron chelate (0.01 M), mono ammonium phosphate (2 M), calcium nitrate (1.5 M), and potassium nitrate (1.5 M). The aquaponic system integrated air-breathing fish species, *Channa striata* and *Anabas testudineus*, reared in FRP tanks. Results revealed that aquaponics significantly enhanced vegetative growth, with increases of 23% in shoot length, 27.5% in leaf length, and 9% in leaf width compared to hydroponics. However, hydroponics promoted greater root development, recording a 33% increase in root length over aquaponics. Green lettuce grown under aquaponic conditions exhibited the highest yield, showing a 19.7% increase compared to other treatments. The aquaponic system's fish tank showed improved water quality in terms of turbidity (34.4 ± 3.6), TSS (216 ± 7), nitrate (0.28 ± 0.07), nitrite (0.03 ± 0.0), and NH_4^+ (0.41 ± 0.03), most likely as a result of the plants' absorption of nutrients. Due to the high alkalinity (>90 ppm) and 12-hour aeration, there was no discernible shift in pH or dissolved oxygen. Among the fish species, *Anabas testudineus* demonstrated superior growth performance, with higher weight gain, performance index, feed efficiency, survival rate (96%), and a lower apparent feed conversion ratio (1.08 ± 0.02) than *Channa striata*. Overall, the study highlights the potential of aquaponic systems for integrated crop-fish production with improved plant growth, yield, and water quality.

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Prof. S. R. Das, the father of 54 rice varieties is popularly known as the Rice man of Odisha

- Born on 1st March, 1951 in Ranchi, Jharkhand, while his father was employed as a central government employee. He was the second son of Shri Jogesh Chandra Das and Golap Sundari Das of village Mahalpara of Gop Block, Puri district in Odisha. His early days were at Ranchi. His student life started in Bhubaneswar after his father was transferred and posted in AG, Odisha. He studied in Govt. high school, BJB College and got his under-graduate and post-graduate degrees in agriculture from OUAT during 1973 and 1975, respectively. He obtained his Ph.D. degree in Genetics from the Indian Agricultural Research Institute, New Delhi, during 1987.
- Dr. Das joined the Department of Plant Breeding and Genetics of OUAT in 1976 and became Professor in 1999.
- He was the former Professor and Head, Department of Plant Breeding and Genetics, College of Agriculture, OUAT, Bhubaneswar, and worked as a Visiting Research Fellow, Division of Plant Breeding, Genetics & Biotechnology, International Rice Research Institute, (IRRI) Manila, Philippines during 2010.
- He was superannuated during 28th February, 2011, and worked as a Consultant Division of Plant Breeding, Genetics & Biotechnology, IRRI, Manila, Philippines, during 2011 and 2012 and presently working as Honorary Professor, in the Department of Plant Breeding & Genetics, OUAT, Bhubaneswar
- Dr. Das was working as a rice scientist since 1976 and has devoted his entire service career in rice research. His contribution for the development and release of 54 high yielding rice varieties suitable for different ecosystems of the state of Odisha during the period 1980-2016 has been well recognized, currently covering more than 70% of the rice area in the state.
- Out of these fifty four varieties Khandagiri, Udayagiri, and Mandakini for uplands, Konarka, Manaswini and Pratikshya for medium lands and Mahanadi, Mrunalini and Upahar for lowlands are widely grown and popular among the farming community in the state of Odisha.
- It is worth mentioning that his association in the development and release of a lowland rice cultures "OR 142-99" in Cambodia in the name of "Santepheap-3" and lowland cultures "OR 1128-7-1" and "OR 1898-18", developed by him was released in Tamilnadu and West Bengal respectively. Rambha has been identified promising for rainfed lowlands in Myanmar and Sarathi for irrigated areas in Bangladesh, China, Thailand, Vietnam and Malaysia.
- Pratikshya released during 2005 has replaced the widely grown variety Swarna in medium lands by virtue of its high yields, better resistance and superior grain quality and the University has earned more than 300 thousand rupees as license fee by registration of this variety under Intellectual Property Right. Seed Producer's Welfare Association Kolkata of West Bengal had made a business of Rs. 200 Crores milestone by selling seeds of a single variety "Pratikshya"
- His contribution in collection, evaluation and maintenance of nearly 100 indigenous aromatic rices of Odisha is highly commendable. His efforts led to the development and release of two short grain aromatic rice varieties like "NuaKalajeera" and "NuaAcharamati".

Naming of the rice varieties:

- There are several interesting events under which the names of the varieties were given.
- It was 2005 Dr. Das while presenting the performance of four varieties like Sidhanta, Pratikshya, Upahar and Jogesh in the state variety release committee, Madam Chopra the then Director of Agriculture asked him that what is the significance of naming such varieties. Dr. Das replied that the king of Nayagarh sitting with all his wise men noticed that a lizard was coming and going out of the door step and it seems that the lizard was disturbed. The king ordered to call Pathani Samanta to give the reason. Saente came, sat on the floor, open his pothi and made calculation. He politely told that the disturbed lizard is waiting for his lover to come from Sambalpur. There was a roar of laughter among the wise men sitting around the king and criticized the uthenticity of Pathani Samant's calculation.
- Saente closed his pothi stood up and told that his calculation is based on certain principles (Sidhanta), which is nirbhul and satya. He left the place. I therefore gave the name Sidhanta to the variety which is early maturing and suitable for uplands. After some time a sari wala came to the queen's palace and when showing some Sambalpuri silk sarees a lizard came out and went near the door step. Both the lovers met each other and their Pratikshya ended. Therefore, the name of the variety is given as Pratikshya, which has replaced the widely grown variety Swarna in medium lands by virtue of its high yields, better resistance and superior grain quality.
- Upahar is another late maturing variety which is a gift to the farmers and suitable for lowlands. When Dr. Das decided to study agriculture, everybody in his family was reluctant except his father. Therefore, he named the very early maturing variety Jogesh for the memory of his father.
- In 2008, Professor Dr. Das went to Dr. Sarojini Sarangi's clinic for the treatment of his wife. Dr. Das noticed a big poster depicting a powerful poem 'ATMAJA' which is based on female foeticide. There were beautiful girl child's names like Tanmayee, Hiranmayee, Jyotirmayee, Manaswini, Mrunalini, Mandakini and Tejaswini which attracted Dr. Das. He decided to name his rice varieties with such names and the varieties were released during 2008 to 2012.
- The fetus inside the mother's womb telling that I am your darling daughter 'Tanmayee tanuja' will glow with your golden countenance (Hiranmayee) and will reflect with your resemblance. Once only, after my birth will see you as my mother. Your radiant image (Jyotirmayee) will form a part of my heart always.
- Oh! Mother, give me birth just once; Give me freedom from your womb, give me life and allow me to listen my heart's content. Oh! Mother tells the truth that will you give me birth or decimate me by listening to others. I will reborn from your ruddy self as a lotus (Manaswini) and as Mrunalini I will fill the whole world with my sweet fragrance. As Mandakini- the Ganges I will flow from Himalayas to Kumarika. With a hermit's heart and radiant beauty (Tejaswini) I will be an exclamation in the whole world!!
- Dr. Das used to tell from his experience that for honoring "Upendra Bhanja, Pathani Samanta, Gangadhar Meher Buxi Jagabandhu and Bira Surendra Sae" the rice varieties were named as Bhanja, Samanta, Meher, Jagabandhu and Surendra. Similarly, Odisha's great king Kharavela, famous sculpture Konarka and great rivers like Mahanadi, Birupa and Ramachandi were named as varieties in rice. Dr. Das also pointed out that the name of lady laborers like Urbashi, Kanchan and Sebati working with us were also named as varieties.

Awards and Recognitions given to Dr.Das for significant contribution in rice research:

- Dr. Das is a recipient of RaoBahadurDr.RamDhan Singh Memorial Trust Award from Haryana Agricultural University, during 2003;
- Dr. R.B. Ekbote Prize from Maharashtra Association for Cultivation of Science, Pune, in 2006.
- He was recognized internationally by receiving the prestigious Senadhira Rice Research Award for 2012, sponsored by the International Rice Research Institute, Manila, Philippines for his outstanding contributions to rice research and international cooperation in rice varietal development.
- Dr. Das received Life Time Achievement Award on Golden Jubilee celebration of OUAT during 2012, for his commendable service as a teacher, researcher and administrator.
- He received Doyen of Rice Research, Golden Jubilee Award-2015 in recognition of outstanding contributions in developing mega rice varieties for enhancing the food and livelihood security by the ICAR- Indian Institute of Rice Research, Hyderabad.
- Dr. Das received Life Time Breeder's Achievement Award in recognition of his outstanding contributions in the field of Crop Improvement during the National Conference on enhancing Agricultural growth with special reference to North East India: held at CAU (Imphal), Umiam, Meghalaya during 16-17 January,2025.
- Dr. Das received Life Time Achievement Award in recognition of his exemplary achievements in rice research and leadership during the Diamond Jubilee Conference held at ICAR-IIRR, Hyderabad on 28th April,2025.
- He received Suban Khuntia Krushi Gabesak Puraskar-2025 in recognition of rice research and varietal development in rice

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Wettability studies of plant leaf surfaces using an optical tensiometer with water, oil, and emulsions



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Abstract:

Contact angle measurement provides a quantitative assessment of liquid spreading or beading, serving as a key indicator of hydrophilic or hydrophobic surface behaviour. This study investigates the wettability of plant leaf surfaces by analyzing contact angles formed between a liquid droplet and leaf surface using an optical tensiometer. The present work is focused on examining the interaction of three liquid types: distilled water, groundnut oil, and w/o emulsions. The emulsion samples were prepared with 50:50 volume fractions of water and oil components. The water component was a mixture of water and salts, while the oil-component was a mixture of groundnut oil and emulsifier (Tween 80 and SMO). Droplets of these three fluids with volumes of 5 μ L and 8 μ L were carefully deposited on selected natural leaf surfaces including tulsi, neem, oleander, and Ashoka leaves, to understand the influence of droplet size and liquid composition on surface behaviour. The results show that leaf surfaces generally exhibited lower wettability with water, moderate with w/o emulsions, and enhanced spreading with oil. The overall trends highlight the combined role of surface microstructure and surface energy in governing liquid behaviour on natural leaves. The findings of this work are expected to contribute towards better formulations of emulsion-based agrochemicals.

Keywords: Wettability, Contact Angle, Optical Tensiometer, Leaf Surface

Biography:

Dr. Sumit Tripathi is an Assistant Professor at Institute of Infrastructure, Technology Research and Management (IITRAM), Ahmedabad. He earned his Ph.D. jointly from IIT Bombay (India) and Monash University (Australia) in 2017 and held postdoctoral positions at Monash University and IIT Kanpur. With about ten years of experience in academia and industry, he has published extensively and participated in conferences across India, Australia, USA, Japan, and South Korea. He is a life member of several professional societies including NSFMP, ISHMT, IPA, ISSME, STAM, ISTE, ISSST, and a Senior Member of IEEE.

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Empowering Gen-Z (Farmers) with a new digital modelling framework for climate-resilient agriculture



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Abstract:

96% village-level internet connectivity opens a transformative frontier: enabling Gen-Z farmers to use generative AI as a real-time diagnostic and decision-making tool in the face of climate extremes, crop stress, and insurance disputes. This abstract introduces a lightweight, cost-effective framework using Gemini 2.5 Flash Lite to demonstrate how farmers can upload crop images and receive structured, tabular diagnostics—identifying crop type, growth stage, and health status. For example, a rice crop image yields after typing text prompt in Google search engine in AI mode: “Diagnostic response in a tabular format of the crop type, growth stage, and health based on this image?”.

Category	Description
Crop Type	Rice (<i>Oryza sativa</i>)
Growth Stage	Vegetative phase—early to mid-tillering, with lush green foliage and active tiller formation
Health	Healthy—uniform growth, vibrant color, no visible signs of disease or deficiency

Crucially, this system supports multilingual voice prompts, allowing farmers to interact in Hindi, Bengali, Oriya, and other regional languages. For instance:

Hindi: “मैंने भरतपुर जिले में गेहूं की फसल लगाई है... फसल के लिए क्या सावधानियां बरतनी चाहिए?”

This democratized interface reframes farmers not as passive recipients of advice, but as active modelers—capable of generating, interpreting, and acting on AI-driven insights.

Keywords: Climate-Resilience, LLM, Generative-AI, Gemini-2.5-Flash-Lite, Prompt-Engineering

Biography:

Dulal Chakrabarti retired from IMD after 33+ years of service as Head, Information Systems and Services. At present he is a consultant in BKC WeatherSys Pvt. Ltd.

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The bright side of parasitic plants: what are they good for?



Harekrushna Swain, Y. Mahesh, Rikertre Lytan and R. Kottaimuthu

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Abstract:

Parasitic plants are often seen as pests. This perception stems from various species inflicting significant harm on farming and forestry practices. Nonetheless, there is much more to parasitic plants than merely being regarded as presumed weeds. Many of these plants also have beneficial impacts on natural ecosystems and human communities. Generally, parasitic relationships diminish the growth and reproductive success of their host plants. However, the connections formed by a parasitic plant that latches onto several host plants may initiate the transfer of systemic signals between them. Numerous studies have shown that parasitic plants can act as keystone species within ecosystems. Their detrimental effects on dominant community members, such as invasive species, might promote species coexistence and ultimately boost biodiversity. Various parasitic species contribute positively to nutrient cycling and offer resources to other organisms, such as herbivores and pollinators, facilitating interaction cascades in ecosystems. Additionally, there is a longstanding practice of utilizing parasitic plants for medicinal and cultural reasons across the globe. A limited number of species yield edible fruits. Some parasitic plants are even grown in agricultural and forestry contexts to allow for the efficient harvesting of their products. The horticultural application of certain parasitic species has also been explored. Although parasitic plants provide numerous advantages, they must always be managed cautiously. Specifically, these species should not be grown outside their native areas to prevent the threat of uncontrolled proliferation and the ensuing harm to ecosystems.

Keywords: Parasitic plants; Host plants; Biodiversity; Ecosystems; Medicinal; Cultural.

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Paddy straw as a biofuel feedstock: Infrastructure needs and financial estimates for effective storage



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Abstract:

India is projected to be the fastest-growing bioenergy market globally between 2023 and 2030, accounting for nearly 35% of new global demand. With abundant surplus biomass, India has a significant opportunity to accelerate its bioenergy transition while simultaneously addressing crop residue burning, fossil-fuel dependence, and farmer income diversification. Punjab alone generates nearly 20 million tonnes of paddy straw annually, a substantial share of which is burnt, contributing to regional air pollution. Although Punjab has set an ambitious target to manage six million tonnes of paddy straw through ex-situ utilisation, achieving this goal requires a robust and predictable biomass supply chain—within which storage is a critical yet underexamined component. Existing policies in India support baling, collection, and utilisation, but a coherent policy discourse around biomass storage infrastructure remains absent.

This study adopts a mixed-methods approach, integrating international policy review with onground insights from eight paddy-straw-utilising industries in Punjab. It assesses infrastructure needs, land requirements, storage losses, and financial viability while estimating optimal land footprints using satellite-based analysis. Findings reveal widespread feedstock losses (15–25% annually), frequent fire incidents, high moisture levels (up to 40%), and significant land-leasing challenges. Infrastructure on leased land is inadequate compared to industrial premises, increasing risks and costs. Optimised storage layouts reduce land requirements by up to 33% for rectangular bales, and investments of INR 250–400 per tonne offer favourable payback when losses exceed 15–20%. The study highlights the urgent need for explicit biomass storage guidelines to reduce losses, enhance industry reliability, and enable India's bioenergy and air quality goals.

Keywords: Biomass storage, crop residue management, air quality, biofuel, crop residue burning

Biography:

Ayushman has joined The Council as a Research Analyst with the Clean Air Team. His work focuses on air pollution mitigation and crop residue burning in northern India. He aims to work on the intersection of science and behaviour change to transform waste into value, enabling a circular economy. Prior to joining The Council, Ayushman worked as a consultant at CEEW, contributing to the Clean Air team's mission. Having established a strong foundation in finance, he transitioned into the climate sector with a background that includes (projects encompassing) microfinance and business development. Ayushman holds a Master's degree in Corporate Sustainability and Environmental Management from the University of York, where his dissertation was on a systematic review of vegan, vegetarian, and meat diets using a life cycle assessment (LCA) approach in the European Union. He also holds a Bachelor's in Business Administration (Hons. Finance) from O.P. Jindal Global University.

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Quality assessment of different value-added green tea products

Bidisha Sharma

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Abstract:

Green tea is a popular beverage, with steadily rising production and consumption over the last decade. While it offers various health benefits, value addition through herbs, flowers, and natural flavours enhances its taste, appeal, and health benefits, boosting consumer interest and market demand. This study investigated the effects of blended green tea with herbal ingredients (ginger, mint, rose, tulsi) at concentrations of 1.00–4.00% on its quality and functionality. The blends were subjected to biochemical, colour, and sensory analyses. Results showed that herbal additions increased moisture and ash content, with tulsi green tea blends showing the highest values. Antioxidant activity and total phenolic content were significantly enhanced at higher concentrations (3.00–4.00%), with mint green tea recording the highest values. Caffeine content was reduced in all herbal blends compared to plain green tea particularly showing lower values in rose green tea blend. Colour analysis revealed herb-specific modifications, and sensory evaluation indicated a preference for rose, ginger, and tulsi blends at higher concentrations than pure green tea. The study demonstrated that herbal blending can effectively improve the biochemical, visual, and sensory properties of green tea. Diversifying tea products would offer a strategy to fetch higher market prices offset high production costs, thus can enhance profit margins and consumer acceptance through new flavours, tastes, and health benefits.

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Gandhamardan hill- Odisha's living pharmacy with unique natural agroforestry and community resilience model



Abhisekh Pradhan

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Abstract:

Gandhamardan Hill, Biodiversity Heritage Site (37th in India, 2023) in western Odisha's Bargarh and Bolangir districts, sustains over 1,200 plant species and above 500 animal species across tropical moist deciduous zones (1,200–1,600 mm rainfall). This "Ayurvedic Paradise" supports 60 villages via a natural multilayered agroforestry system: canopy (mango: 15 varieties, e.g., Sundurie; mahua), mid-layer (amla, harada, kusum), and understory (tubers, e.g., Pit Kanda; more than 100 upland paddy landraces). Tubers, being an integral part of the Gandhamardan agro ecosystem, add nutritional depth and cultural value to the community as its part of the prasad given to the local deity. Currently 15 varieties of tubers documented, including Pit Kanda, Kasa Kanda, and Jhimi Kanda etc. Communities rely livelihoods encompass sal leaf, honey, bamboo crafts, livestock and stream fisheries. Temples (Nrusinghanath, Harishankar) integrate tubers and forest products into prasad and festivals (Nuakhai, Baikucha) promote traditional varieties. Sustainable land use pattern with inclusion of traditional varieties make the system sustainable. This study using 30 FGDs, 45 KIs, participatory mapping, and multi-stakeholder workshops proposes Gandhamardan as a GIAHS site. GIAHS initiatives led by the DA&FE, Government of Odisha with UN FAO, WASSAN, MSSRF, Ahinsha Club, and Odisha Biodiversity Board to promote sustainable NTFP harvest protocols, community seed banks, and agri-ecotourism. These efforts aim to reduce migration, enhance value chains, and ensuring Gandhamardan's legacy as a global model of agro ecological resilience.

Keywords: Gandhamardan Hill, agroforestry, tubers, GIAHS, Biodiversity Heritage Site, traditional knowledge, community resilience, cultural conservation, sustainable livelihoods, and food system.

Biography:

Abhisekh Pradhan is a passionate agriculture expert specializing in sustainable farming and biodiversity. He earned a B.Sc in Agriculture from CUTM (CGPA 8.48) and M.Sc in Agronomy from AUS (CGPA 8), with an ongoing PhD in Agronomy. His experience 10 years in different professional role including at COE horticulture, Agriculture Development Officer at FMC, Lecturer at AUS, Scientific Officer at World Vegetable Center and ICRISAT and since 2022, Senior Agriculture Expert at WASSAN on Odisha Millet Mission and SPPIF. Key achievements include mapping 540 villages for millets and pulses, forgotten foods proposals, and Agri heritage documentation.

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Untangling regulated metabolic and molecular features in plant cells for surviving under salt stress by seed priming with Mangrove derived bacterial bio stimulant



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Abstract:

Soil salinity is a major environmental threat specifically near coastal areas that hinders plant growth. Scientists are investigating metabolic pathways to understand the cross-kingdom interaction of microbial biostimulants that boosts plant growth under abiotic stresses. Our study focuses on isolating and identifying endophytic bacteria from the roots of distinct types of mangrove plants that are naturally salt-tolerant and grow in the Sunderban region of West Bengal, India. We examined them on a non-host model plant (*Solanum lycopersicum*) under salt stress. Out of all the strains recovered, six best isolates were chosen based on morphometric growth patterns recorded using the BBCH scale in pot experiments. Morphological, biochemical, and molecular (16S rRNA) identification revealed the diversity of the endophytic bacteria. Finally, a consortium was prepared with four strains (selected based on competitiveness analysis), and applied to *Solanum lycopersicum* under salt stress. The physiological and biochemical data showed treated plants with superior qualities. Additionally, a field experiment conducted under saline stress revealed higher fruit yield in treated plants. High-throughput metabolomic techniques were used to identify the regulation of primary metabolites, polyamines and phytohormones in treated and non-treated plants under salt stress. Based on transcriptomic studies, the regulation of gene expression in tomato leaves was found to be significantly altered, highlighting the complexity of salt stress response systems in the model crop. Many potential genes involving in hormone synthesis, osmolyte production, ROS scavenging, primary and secondary metabolism were found to have undergone a significant transcriptional reprogramming in the treated plants.

Keywords: Biostimulant, Endophyte, Mangrove, Metabolomics, Plant growth promoting bacteria (PGPB), *Solanum lycopersicum*, Salt stress, Transcriptomics

Biography:

Dr. Harshata Pal, completed her PhD programme in Horticulture from Bidhan Chandra Krishi Viswavidyalaya (2010) and joined as Research Associate at Bose Institute, Kolkata (2010-2012). She achieved DBT-Women Scientist Fellowship as independent Principal Investigator under DBT BiCARE programme (2013-2016). April, 2016 she joined as Assistant Professor at Amity University Kolkata in the department of Biotechnology. She received international project funding from IGSTC and worked as PI and Project Coordinator (2021-2024). She published in many peer-reviewed international journals with Elsevier, Springer, Wiley and Taylor & Francis publisher groups. Her research lab mainly works on climate resilient agriculture with microbial solutions.

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CRISPR/Cas-based genome editing for genetic improvement of *Solanum lycopersicum* L.



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Abstract:

CRISPR/Cas-based genome editing platform has emerged as a highly efficient and reliable tool for precisely modifying target genes to enhance desirable agronomic traits in crops. In India, recent deregulation of SDN1/SDN2 genome-edited crops by the Government has further accelerated the potential of such innovations. Due to rapid global climate change, the yield and productivity of economically important crops, like tomato (*Solanum lycopersicum* L.), have been severely affected by various abiotic and biotic stresses. Therefore, there is urgent need for the development of multiple stress tolerance in crops, utilizing fast-breeding technologies. In this context, a comprehensive study on developing genetic tolerance to biotic and abiotic stress factors in tomato through genome editing and functional genomics are presented. The study has performed systematic CRISPR/Cas9-based genome editing of negative regulatory genes of multi-stress tolerance, namely *SIHyPRP1* and *SIDEA1*. Their Loss-of-function analysis imparted significant tolerance to drought, salinity, bacterial leaf spot, and bacterial wilt disease in transient and stable tomato lines (GE_{d2}). The study showed the key negative regulatory role of *SIDEA1*, a poorly studied 8CM family gene, functions together as an anchor gene with *SIHyPRP1* in imparting multistress tolerance in tomato. Given the severe impact of early blight, caused by *Alternaria solani*, and the limited genetic information available, the study further aims to identify disease susceptibility genes through transcriptome-wide analysis and to generate early-blight-resistant tomato lines using the established state-of-the-art genome editing system. Overall, this study provides a comprehensive framework for developing climate-resilient, multi-stress-tolerant tomato varieties and holds significant promise for sustainable crop improvement.

Keywords: CRISPR/Cas9, *Solanum lycopersicum*, HyPRP1, DEA1, early blight, multi-stress tolerance, climate-resilience

Biography:

Dr Banashree Saikia is a plant biotechnologist specialized in molecular biology, genome editing, and functional genomics for crop improvement. She earned her Ph.D. in Biological Sciences from CSIRNEIST Jorhat under AcSIR and is currently working as a DST-WISE Postdoctoral Fellow and Principal Investigator at CSIR-NEIST. Dr Saikia has published extensively, including first-author and corresponding-author papers, with over 300 citations. Her work primarily focused on plant CRISPR/Cas systems, biotic & abiotic stress biology, and climate resilience. She has received several awards for research excellence and actively contributes to independent R&D, scientific writing, teaching, workshops, and science communication.

Acknowledgements:

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Comparative genomics analysis of *Rhizosphere* and *Endophytic Trichoderma* isolates from tropical tuber crops



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Abstract:

Trichoderma fungi are valuable biocontrol agents and plant growth promoters, particularly in tropical tuber crops. In this study, we conducted a multi-district survey, isolating numerous *Trichoderma* strains from rhizosphere soil and plant tissues using selective media. Promising isolates were identified through extensive screening based on growth characteristics, antagonistic activity against pathogens, microscopic and SEM analysis, mass production on agricultural waste substrates, and compatibility with various agrochemicals and botanicals. The top-performing rhizosphere-competent and endophytic isolates were further assessed in field trials for integrated disease management against soil and foliar-borne pathogens in greater yam and elephant foot yam. Molecular identification involved PCR with ITS primers, Sanger sequencing, NCBI submission, and phylogenetic analysis of representative *Trichoderma* isolates. Whole-genome sequencing generated high-quality, chromosome-level assemblies for the selected rhizosphere and endophytic *Trichoderma* isolates. Despite their distinct ecological niches, the genomes showed remarkable similarity in gene content and functional profiles, including highly conserved KEGG pathways and Gene Ontology annotations. Both isolates possessed identical secondary metabolite biosynthetic gene clusters. However, CAZyme analysis revealed key differences in carbohydrate-active enzymes, with the rhizosphere isolate exhibiting enhanced carbohydrate-binding capabilities, suggesting greater potential for plant polymer adhesion and degradation in competitive soil environments. These findings were corroborated by SEM-based root colonization assays demonstrating stronger rhizosphere attachment by the rhizosphere isolate. This genomic insight provides a foundation for the targeted selection and development of *Trichoderma* strains for sustainable biocontrol and crop improvement in tropical tuber systems.

Keywords: *Trichoderma*, Comparative genomics, Rhizosphere, Endophyte, CAZyme

Biography:

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Genomics-enabled dissection of white mold resistance in common bean



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Abstract:

Biotic stresses cause about 20 - 30% of yield losses in global agriculture, a serious threat to food security and sustainability. Common bean (*Phaseolus vulgaris* L.), is an important source of protein and micronutrients for millions of people. White mold from *Sclerotinia sclerotiorum* is one of the most damaging diseases. Yield losses can range from 30 to 60 percent under favorable conditions. The resistance to this disease is quantitatively inherited and strongly influenced by environmental factors. Recent progress in association mapping and integrative genomics has greatly improved our understanding of white mold resistance in common bean. Genome-wide association studies across various germplasm panels have found multiple genomic regions linked to disease resistance, plant structure, and related agronomic traits. This confirms that resistance is polygenic. Phenotyping across multiple environments and meta-analyses of QTL have helped identify stable marker-trait associations. Candidate gene analyses have shown pathways related to basic defense, cell wall changes, and stress signaling. These pathways offer important insights into how hosts and pathogens interact. Combining genomic prediction with multi-trait selection models marks a significant step for practical breeding. With these, breeding programs can work on improving white mold resistance and traits related to yield at the same time while reducing the time needed for breeding cycles. These genomics-based approaches provide sustainable alternatives to chemical disease control and aid in creating climate-resilient and high-yielding common bean varieties. This directly contributes to sustainable agriculture and global food security.

Biography:

Dr. Sujan Mamidi is a Senior Scientist at HudsonAlpha Institute for Biotechnology, Alabama, USA, Affiliate Scientist at the University of Missouri–Columbia, and Adjunct Faculty at ANGRAU, India. He has published 60+ research articles, including lead authorship in Nature, Nature Biotechnology, and Nature Genetics, He also contributed various book chapters and has extensive editorial contributions. His research focuses on multi-omics and crop improvement, with over 100 conference presentations, guidance to Ph.D. scholars, and many international collaborations.

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Beyond the GI act: Interlinkages with the PVPFR Act 2001 for the GI tagged rice in India



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Abstract:

Agrobiodiversity is critical for livelihood sustenance and any misappropriation of IP rights of farmers would affect it adversely. In the context of GI tagged rice varieties, the GI Act 1999 and the Plant Variety Protection and Farmer Rights Act 2001 (PVPFR Act) are the twin IP legislations that recognize the relevance of farmer communities. Unlike the PVPFR Act, the GI Act does not provide for elaborate post registration requirements, particularly on conservation, effective enforcement and most importantly benefit sharing. While the need to improve marketing of GI rice is being realized, it is necessary to identify the conservation mechanism with respect to the varieties, agricultural practices, regio-cultural aspects and livelihood sustenance mechanisms for a more effective protection of GI tagged rice and the associated farmers. It is from this perspective that the current study analyses the interface of the two legislations and examines the requirement of recording GI variations due to changes to microclimatic conditions. Further, it proposes the need for the integration of farmer variety registration information and the GI registration into a separate compendium. Linking the benefit sharing mechanism under both the legislations, additional linkages with the People Biodiversity Registers and the ABS mechanism under the Biological Diversity Act would enable and strengthen the reach of Farmer Rights further. In this regard, the relevance of certain judicial pronouncements is discussed and a definite process for drawing the interlinkages in the legislations have been proposed.

Keywords: GI tagged Rice, GI Act, PVPFR Act, Farmer Rights, benefit sharing and GI

Biography:

Prof (Dr) M. Padmavati teaches and conducts research on the implementation of IP laws. She is a PhD in Plant Sciences and has working experience with agribiotech industry prior to joining IIT Kharagpur. She has a Masters in IP Law and teaches several courses in IP Law especially Patent law, Biodiversity Protection and Farmer Rights, Protection of Traditional knowledge and aspects related to GI. She is a member of national as well as international bodies. Her research group also focusses on food GI.

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Geographical indications (GIs), market access, and farmer incomes: Evidence from India's GI tagged non-Basmati Rice varieties



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Abstract:

GIs represents an important yet underutilized intellectual property right within India's agri-food chain, linking geography, quality, heritage/reputation and smallholder livelihoods. The present study covers multiple GI-tagged non-Basmati rice varieties spread across nine states; and adopts a mixed-method approach, drawing upon secondary and empirical research. The scoping review of literature has identified a critical research gap, as existing studies on GI-tagged rice varieties in India are predominantly focused on analysis of morphological, genetic, and agronomic traits, with limited exploration of GI as a marketing tool in the domestic and export markets. More specifically, systemic research on GI-tagged non-Basmati rice varieties in India from an agricultural marketing perspective, remains less explored. The present exploratory study based on in-depth interviews with GI-cultivating farmers, members of Farmers Producer Organizations, GI proprietors, traders, officials from State Agricultural departments, faculties from State Agricultural Universities, and other relevant stakeholders reveal unique observations. It was observed that strong policy networking and institutional coordination in the case of Kalanamak rice in Uttar Pradesh, whereas in Bihar, Kerala and Odisha, scheme-level initiatives supporting the promotion of aromatic non-Basmati rice varieties remain at a relatively nascent stage. Despite contextual differences, common challenges were found across GI varieties, including cultivation-related (low yields and high production costs), weak collective mechanisms, adulteration, limited traceability, lack of standardized processing, packaging and branding, and inadequate storage infrastructure along with lack of useful data on cultivation of these varieties. These challenges may have serious implications on the future of GI rice varieties, sustainable supply chains, farmer incomes and livelihoods. The study highlights the imperative for policy interventions and institutional mechanisms to promote GI as an effective marketing tool to integrate with markets and lead to income realization for GI-cultivating farmers.

Keywords: Agricultural Marketing, Geographical Indications (GI), Agricultural GI, GI Rice, Non-Basmati

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Post harvest use of sodium nitroprusside and shellac coating maintained fruit quality and shelf life of Sapota in ambient condition



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Abstract:

Sapota (*Achras sapota* L.) is a sugar-rich tropical fruit of Sapotaceae family having laxative property with rich antioxidant activity but having short shelf life and rapid quality deterioration during ambient storage conditions. So, the research trial was attempted during May-June, 2023 at Post Harvest Laboratory, Department of HAMP, Mizoram University, Aizawl, India with sapota fruits (cv. Cricket Ball) collected from Sam's Garden, Tanhril Village and stored at ambient condition (20-25°C, relative humidity 65-85%). Experiment was laid out in Complete Randomized Design (CRD) with nine treatments viz. T₁: SNP 0.02mM, T₂: SNP 0.05mM, T₃: SC 2%, T₄: SC 5%, T₅: 0.02mM SNP+ SC 2%, T₆: 0.02mM SNP+ SC 5%, T₇: 0.05mM SNP+ SC 2%, T₈: 0.05mM SNP+ SC 5%, T₉: Control (Water dipped). Observation on weight loss percentage, percentage decrease on fruit length, diameter, fruit texture, pulp colour, TSS, acidity, total sugar, reducing sugar, ascorbic acid, total phenol were recorded at three days interval, while antioxidant activity and fruits decay was recorded at 12 days after storage (DAS). Study revealed that sapota treated with 0.02mM SNP + 5% shellac coating had minimum weight loss (11.59%), decrease in length (7.98%) and diameter (6.92%) with high fruit texture (29.39N cm⁻²), TSS (18.86°Brix), total sugar (16.87%) and ascorbic acid content (10.32 mg 100g⁻¹) at 12 DAS. Besides, fruits under this treatment had minimum fruit decay (13.33%) resulted in highest shelf life (13.73 days). Thus, postharvest combined use of SNP (0.02mM) and Shellac Coating (5%) can be a potential approach for shelf life extension of sapota at ambient condition.

Keywords: Ascorbic Acid, fruit decay, Sapota, Shellac, Shelf life, SNP



Biography:

Debashis Mandal is Associate Professor in Dept. Horticulture, Aromatic & Medicinal Plants, Mizoram University, India having 11 books, 22 book chapters and 55 research papers to his credit. He is recipient of 4 awards, multiple extramural research grants and visited many countries for his professional meetings, seminars and symposia.

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Mangrove ecosystems as blue carbon reservoirs: Mechanisms and impact on climate change mitigation



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Abstract:

A massive and dense Tropical coastal forest formation by mangroves, comprising seagrasses, and saltmarshes, play pivotal role in carbon dioxide sequestration from atmosphere, recognized as “coastal blue carbon” which was designated by Nellemann (2009). The Carbon sequestration capacity of coastal wetlands, specifically the mangroves, seagrasses, and salt marshes are legendary for their efficiency compared to the terrestrial and freshwater equivalents. This sequestration efficacy accomplish a vital role in the carbon cycle, and vibrant for mitigating climate change impacts across the world. Parallel to the technological innovations in emission reduction, natural climate elucidations, especially blue carbon ecosystems (BCE), have harvested substantial consideration for their prospective to mitigate global climate change impact. These elucidations are fundamental to greenhouse gas accounting practises in global policies by the Inter- governmental Panel on Climate Change (IPCC). Natural climate solutions have been estimated to have the capacity to annually capture 23.8 petagrams (Pg) of CO₂ equivalent, representing approximately 37 % of the cost-effective CO₂ reduction needed by 2030 to limit global temperature increases to below 2 ° C.

Mangrove vegetation and "blue carbon" are intensely entangled, while mangroves (including seagrasses, and salt marshes) acting as one of nature's most authoritative tools for capturing and storing carbon per unit area than even any tropical rainforests. Mangroves process carbon through two primary "reservoirs":

- Above-ground Biomass: The trunks, branches, and leaves of the trees capture CO₂ through photosynthesis and store it as organic matter.
- Below-ground Storage: This is where mangroves formation, approximately 50% to 99% of the carbon in a mangrove ecosystem is stored in the soil and root systems.

A mangrove forest stores the vast majority of its carbon underground in the soil, while a typical rainforest stores most of its carbon in its wood and leaves (living biomass). Mangroves nurture in waterlogged anaerobic and thus, the microbial decomposition works incredibly slowly. Instead of rotting and releasing gas, the organic matter remains intact and gets buried. As sea levels rise, mangroves trap sediment and build up their floor vertically. This allow constantly creating new layers of storage on top of the old ones. They can continue to bury carbon for thousands of years. Mangroves face harsh conditions like high salinity and shifting tides and thus, they invest heavily in massive, dense root systems for their sustainability. They allocate a much higher percentage of their total biomass to their roots compared to land trees. When these roots die, they are already underground in that "oxygen-free" zone, leading to immediate long-term storage.

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Mathematical modelling of drying kinetics and rehydration behaviour of green peas



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Abstract:

The present study investigated the drying kinetics, mathematical modelling and rehydration characteristics of green peas. Fresh green peas with an initial moisture content of approximately 70% (wet basis) were dried in a laboratory-scale tray dryer at drying air temperatures of 50, 60 and 70 °C until equilibrium moisture contents of 5.00%, 4.76% and 3.57% (dry basis), respectively, were achieved. The total drying time decreased with increasing drying temperature, ranging from 6.33 h at 50 °C to 5.67 h at 70 °C. Moisture content continuously decreased with drying time at all temperatures and the entire drying process occurred in the falling-rate period. Experimental moisture ratio data were fitted to five thin-layer drying models: Newton, Page, Henderson and Pabis, Wang and Singh and Two-term Exponential models. The goodness of fit was evaluated using the coefficient of determination (R^2) and root mean square error (RMSE). The Page model provided the best fit across all drying temperatures, exhibiting the highest R^2 (up to 0.9961) and the lowest RMSE values. Rehydration behaviour of dried green peas was evaluated using the Peleg model. Results showed that the initial water absorption rate increased with increasing rehydration temperature, as indicated by a significant decrease in Peleg's constant K_1 . Peleg's constant K_2 , associated with equilibrium moisture content, varied with temperature. Green peas dried at 70 °C exhibited the highest rehydration ratio, indicating superior rehydration quality. Overall, the study demonstrated that drying temperature significantly influenced drying kinetics, model suitability and rehydration properties of green peas.

Keywords: Green peas, Drying kinetics, Thin-layer drying models, Moisture ratio, Rehydration characteristics

Biography:

Anindita Karmakar is a dedicated academic and researcher in the field of Post Harvest Engineering. She currently serves as an Assistant professor in Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. She did M.Tech from IIT, Kharagpur and Ph.D from BCKV, India. She has hands-on experience with laboratory-scale drying equipment and drying data analysis. Her research aims to improve drying efficiency, product quality and shelf life of agricultural commodities.

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Seed Spices for rural livelihoods in Odisha: Evidence from on-farm demonstrations



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Abstract:

Introducing high-value crops into non-traditional regions is an effective approach for strengthening rural livelihoods, particularly in hill and tribal landscapes where farming options are limited. Seed spices, despite their importance in India's agricultural export sector, are largely produced in a few western and central states, leaving significant scope for geographic expansion and livelihood diversification. The Eastern Ghats of Odisha represent a promising yet underexplored region for such interventions. An on-farm evaluation of five seed spice crops viz., fenugreek, fennel, nigella, ajwain and coriander through on-farm demonstrations across five blocks of Koraput district (Dasmantpur Semiliguda, Pottangi, Laxmipur, and Nandapur) during 2024-2026. The project implemented in 130 small holder and tribal farmers and was implemented by ICAR-IISWC, Research Centre, Koraput in collaboration with ICAR-NRCSS, Ajmer and KVK, Similiguda and the Odisha Rural Development and Marketing Society (ORMAS). The training and skill development programme was organised, demonstrate to farmers regarding package practices of spices and distribution of inputs more than 500 farmers under TSP/SCSP.

The results revealed encouraging crop and location-specific performance. Fennel achieved its highest productivity in Pottangi block, yielding up to 748.9 kg per acre, while coriander recorded favorable yields in Similiguda and Nandpur (348 kg per acre). Fenugreek displayed strong adaptability in Dasmantpur, though yields were comparatively lower in Koraput and Laxmipur blocks. These results indicate that the climatic and soil conditions of the Eastern Ghats are suitable for selected seed spice crops.

The study demonstrates that inclusion of seed spices as high-value crops can enhance farm diversification and income opportunities in Odisha's hill regions. For sustained livelihood impact, institutional support in seed supply, post-harvest handling, value addition, and collective marketing through Farmer Producer Organizations is essential. Integrating seed spices into state livelihood and agricultural development programmes can help establish them as viable and sustainable income sources for rural communities.

Keywords: High-value crops, seed spices, livelihood diversification, Eastern Ghats, Odisha, Farmer Producer Organizations

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A native strain of *Heterorhabditis indica* from Indo-Gangetic plains: characterization, molecular phylogeny and field efficacy against bark eating caterpillars in guava ecosystem



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Abstract:

Entomopathogenic nematodes (EPNs) belonging to the families *Steinernematidae* and *Heterorhabditidae* are effective biological control agents for managing a wide range of insect pests. There is considerable scope for the discovery of novel EPN strains and species adapted to local agro-climatic conditions and target insect pests. In the present study, native strains of entomopathogenic nematodes were isolated from the Indo-Gangetic plains of northern India. Laboratory and field experiments were conducted during 2024-25 at the ICAR-Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh, India, to evaluate the efficacy of three native EPN species against larvae of the bark-eating caterpillar, *Indarbela quadrinotata* (Walker) (Lepidoptera: Cossidae), a major pest of guava. The virulence of all three EPN strains was assessed through in vitro bioassays using third-instar larvae. Based on LC_{50} values, *Heterorhabditis indica* was identified as the most virulent strain and was subsequently evaluated under in vivo and field conditions. Molecular characterization of the selected strain was carried out using a multigene phylogenetic approach based on ITS rDNA and mitochondrial COI (cox1) gene sequences. Field evaluation involved spot application of a liquid formulation of *H. indica* on the trunks of guava trees infested with *I. quadrinotata*. A synthetic insecticide treatment (Chlorpyrifos 25 EC) was included as a standard check. Application of *H. indica* resulted in an 87.72% reduction in bark-eating caterpillar damage, compared to a 92.40% reduction achieved with the chemical insecticide. Although the efficacy of the EPN treatment was marginally lower than that of the chemical control, its environmental safety and compatibility with sustainable pest management practices make it a promising alternative. This study provides the first evidence of the effectiveness of entomopathogenic nematodes against *I. quadrinotata* under both laboratory and field conditions, highlighting their potential as an eco-friendly component of integrated management strategies for bark-eating caterpillars in guava.

Key words: subtropical fruits, biocontrol, bark eating caterpillars, EPN, infective juveniles

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Soil hydraulic conductivity under agricultural-to-horticultural land use change in the Eastern Ghats, India



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Abstract:

Unsustainable land management practices have degraded soil hydraulic properties (SHPs), underscoring the need for sustainable land-use strategies to prevent further decline. Assessing SHPs under different land-use systems is essential for identifying suitable management options in fragile agroecosystems. The Eastern Ghats region of India, particularly Koraput district in Odisha, is among the most vulnerable agroecosystems and was therefore selected for this study. The impact of land-use transition from conventional agriculture to horticultural systems on SHPs was evaluated. Surface soil infiltration rate and hydraulic conductivity were measured using a Hood infiltrometer under four land-use systems; cashew plantation, mango plantation, pasture land, and agricultural land- at pressure heads of 0, -1, and -3 cm. The contributions of macropores and combined meso- and micropores to saturated water flow were also quantified. The results showed that cashew plantations exhibited the highest infiltration rate, hydraulic conductivity, macropore contribution to total flow, soil organic carbon content, hydraulically active porosity, tension, and residual flux compared with other land uses. Soil pores with radii greater than 0.50 mm contributed 67.34%, 66.03%, 51.77%, and 51.29% of the total saturated flow under cashew, mango, pasture, and agricultural land uses, respectively. The corresponding hydraulically active porosities were 0.00502%, 0.00392%, 0.00085%, and 0.00076% of the soil volume. These findings demonstrate that SHPs are highly sensitive to land-use change under near-saturated conditions. The study indicates that converting barren and pasture lands to horticultural plantations, particularly cashew, can substantially improve soil hydraulic functioning in the Eastern Ghats region.

Keywords: Eastern ghats region, Soil hydraulic properties, Hood infiltrometer, Hydraulic conductivity, Land use change

Biography:

Dr Saswat Kumar Kar is a Scientist (Land and Water Management Engineering) at the ICAR-Indian Institute of Soil and Water Conservation (IISWC), Research Centre, Koraput, Odisha. He holds a Ph.D. and M.Tech. in Soil and Water Conservation Engineering from Banaras Hindu University and a B.Tech. in Agricultural Engineering from OUAT, Bhubaneswar. His research focuses on soil erosion, watershed hydrology, soil hydraulic properties, drought vulnerability assessment etc.

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Indigenous knowledge-based livelihood mapping for economic empowerment of tribal communities in fragile mountain regions of Kashmir

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Abstract:

Tribal communities in the Himalayan region of Jammu and Kashmir possess significant livelihood skills encompassing traditional livestock rearing, ethnobotanical knowledge, subsistence agriculture and strong indigenous knowledge systems. These communities sustain their livelihoods within the ecologically fragile terrain between Greater Himalayas and the Pir Panjal. and are increasingly constrained by weak institutional linkages, limited livelihood mapping and employment opportunities. To provide an in-depth assessment and empirical insights into tribal livelihood patterns and their coping strategies in Ganderbal district of Kashmir, the present study aims at strengthening livelihood security through evidence-based planning, capacity-building and collectivization.

The study adopted a multi-stage sampling design and employed a close-ended structured questionnaire supplemented ground level interactions and focus group discussions. In the first stage of sampling, Ganderbal district was purposively selected as the study area, followed by the selection of 15 villages in the second stage. 40 respondents were selected randomly in each of the sample villages to capture representative household-level data. Livelihood mapping focused on key employment-oriented domains with emphasis on eco-tourism, medicinal and aromatic plants (MAPs), handicrafts, subsistence agriculture and dairy-based activities. The findings suggest that the livelihoods of a large proportion of the sample population can be upscaled by creating institutional linkages with registered tourism boards, nodal officers and government departments. The results reveal that the sample village, Naranag exhibits an overwhelming dependence on tourism with 99 per cent of the sample population engaged directly or indirectly in the sector. Similarly, in villages like Andarwan, Mamar and Benehama approximately, 90 %, 95 % and 80 % of the sample population, respectively, were primarily dependent on dairy-based activities while a few respondents mostly females were involved in Handicrafts. Engagement in the cultivation and collection of Medicinal and Aromatic plants was found to be limited, due to the regulatory restrictions associated with forests and lack of awareness regarding on-farm cultivation practices. Livelihood activities in the study area were largely subsistence-based with only a limited proportion of households involved in cattle rearing which provides limited livelihood security to these communities. Findings indicate a very limited uptake of government schemes particularly those involving credit, due to fear of loans, indebtedness and insufficient awareness. There was scope of collectivization of various individual respondents through Self-Help Groups (SHGs), cooperatives and Farmer Producer Organizations (FPOs). A community-based skill-oriented

Public-Private Partnership framework can enhance income generation by connecting tribals with private retailers, markets and various govt. agencies. The study offers a policy relevant insights for integrating livelihood mapping with sector-specific collectivization and provides a viable pathway towards sustainable and secure tribal livelihoods in fragile northern Himalayan Mountain regions of Kashmir, India.

Keywords: Tribal Livelihoods; Livelihood Mapping; Tourism; Medicinal and Aromatic Plants; Dairy-based Livelihoods; Collectivization; Livelihood Security; Sustainable development, PPP model.

Biography:

Dr. Omar Fayaz Khan is an Assistant Professor at the Institute of Business and Policy Research, SKUAST-Kashmir. He holds PH.D. in Management from the Islamic University of Science and Technology, Awantipora. His research interests include livelihood studies, work-life balance, sustainable development and socio-economic issues in fragile regions.

Climate-driven agro-ecological vulnerability: Flood-induced chemical dependency, food & nutrition security, biodiversity decline risks in vegetable-based farming systems adjacent to Sandi Bird Sanctuary, a Ramsar-recognized wetland



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Abstract:

Flood-prone, wetland-adjacent farming systems across the Indo-Gangetic Plains are experiencing accelerating livelihood and food-system instability due to climate-induced flooding and prolonged waterlogging. In landscapes surrounding the Ramsar-designated Sandi Bird Sanctuary, Hardoi (Uttar Pradesh, India), repeated failures of paddy, maize, pulses, and vegetables have forced economically vulnerable smallholders to shift rapidly toward short-duration commercial vegetable cultivation, driving a sharp intensification of agrochemical use with cascading risks for food and nutrition security and ecosystem integrity.

This study assessed the emergence and impacts of climate-driven agrochemical intensification through an interdisciplinary mixed-methods investigation of 820 farm households across 21 villages within a 5-km radius of the sanctuary in 2025. Household surveys, participatory rural appraisal, and agro-ecological and landscape-level assessments were triangulated with expert inputs from ICAR institutes, KVK Hardoi, Acharya Narendra Deva University of Agriculture and Technology, and sanctuary authorities. Flooding and waterlogging reduced yields by 70–80% in rice, >80% in maize, 80–90% in pulses, and up to 90% in vegetables, generating acute food and income shocks that triggered a distress-driven transition toward high-input vegetable monocropping.

The study found that vegetable-based production systems exhibited severe chemical dependence, with bio-pesticide adoption remaining below 5% and pesticide application frequencies exceeding recommended thresholds by three- to five-fold, reaching up to 22 spray rounds per crop cycle in some vegetable crops. Given that only 1–10% of applied pesticides reach target organisms, substantial off-target dispersion and accumulation in soil, water, air, and biota were observed, accelerating eutrophication, toxicity, and biodiversity loss within the Garra River–Sandi wetland complex.

The study identifies a climate-induced chemical lock-in driven by livelihood insecurity, debt exposure, and post-disaster psychological stress. Introduction of the flood-tolerant rice variety IR64-Sub1 restored Kharif yields (44–47 q ha⁻¹), reduced reliance on risky vegetable monocropping, and lowered chemical pressure.

HCL Foundation facilitated community-based awareness, technical guidance, and strategic planning on regenerative agriculture, flood-resilient cropping, ecological pest management, and decentralized bio-input systems, laying the foundation for a scalable transition pathway that links post-flood agricultural recovery with wetland conservation, Environmental, Social and Governance (ESG) objectives, and the Sustainable Development Goals.

Keywords: Climate-induced chemical lock-in, Agrochemical intensification, Food and nutrition security, Flood-prone agro-wetlands, Regenerative agriculture, Wetland biodiversity

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Exploring nutritional and genetic diversity in curry leaf genetic resources



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Abstract:

Curry leaf (*Murraya koenigii* L. Spreng), an aromatic and nutritionally rich leafy spice of the family *Rutaceae*, holds dual significance as a culinary herb and traditional medicinal plant in India. Despite its diverse uses and economic potential, the crop remains underexplored in terms of genetic diversity and nutritional profiling. The present study aimed to evaluate the genetic variability of mineral nutrients in curry leaf germplasm conserved ex-situ at the ICAR–Indian Institute of Horticultural Research (ICAR-IIHR), Bengaluru, India. A total of 80 accessions collected from diverse agro-ecological regions across India were assessed for ten mineral elements, five macronutrients (Ca, P, K, Mg, and S) and five micronutrients (Fe, Zn, B, Mn, and Cu). The study revealed substantial genotypic variation across all traits, highlighting the species' rich nutritional and genetic diversity.

The macronutrient concentrations varied widely, with calcium (0.30–5.97%), potassium (0.09–3.52%), and phosphorus (0.11–0.77%) being predominant, while among micronutrients, iron (51.71–439.16 ppm) and boron (26.02–143.38 ppm) exhibited the highest variation. Notably, several accessions showed exceptionally high concentrations of calcium and iron, surpassing levels reported in previous studies. The phenotypic and genotypic coefficients of variance were high for all traits, accompanied by high heritability (>70%) and substantial genetic advance, indicating additive gene action and the feasibility of improving these traits through selection. Correlation analysis revealed significant positive associations among calcium, magnesium, copper, and manganese, suggesting the possibility of simultaneous enhancement of multiple nutrients. Principal component analysis (PCA) explained 73.04% of the total variance, with calcium, phosphorus, potassium, sulphur, and magnesium contributing most to population divergence. Cluster analysis based on Ward's algorithm grouped genotypes according to their regional origins, revealing three distinct clusters that reflected both genetic and geographical differentiation.

This study identified several nutritionally elite genotypes, such as IC652403, IC652419, IC652461, and IC652517, characterized by high calcium, iron, and zinc concentrations. These accessions represent valuable genetic resources for future breeding programs targeting nutrient-dense and biofortified curry leaf varieties. The findings not only highlight the immense potential of *M. koenigii* in combating micronutrient deficiencies through food-to-food fortification but also provide the first comprehensive insight into its mineral nutrient diversity under ex-situ conservation. This work lays a foundation for the systematic utilization of curry leaf germplasm toward nutritional enhancement, genetic improvement, and sustainable crop development.

Keywords: *Murraya koenigii*, ex-situ conservation, mineral nutrients, genetic diversity, heritability, PCA, nutritional biofortification.

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Phenotypic mapping of livestock and poultry genetic resources of Dehradun District of Uttarakhand



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Abstract:

Phenotypic mapping of Animal genetic resources (AnGR) refers to the systematic documentation of livestock and poultry populations within specific geographical regions. This approach aids in cataloguing all recognized breeds and populations present in the area, as well as monitoring populations that migrate over time due to their functional value or economic viability. As per the latest Census, the livestock population of Dehradun district is 0.42 million. A field survey was conducted in five blocks of Dehradun district and the nearby area (Sahaspur, Vikasnagar, Doiwala, Kalsi and Jwalapur) to document livestock composition and identify distinct populations. The survey revealed predominance of indigenous crosses of Jersey and Holstein Friesian breeds, along with the presence of Belahi cattle, Murrah and Gojri buffaloes, some non-descript goats and backyard poultry, including Aseel and Kadaknath breeds. Notably, a lesser-known cattle population was identified in the Kalsi and Chakrata blocks, Chakrati or Kalsi cattle. These animals exhibited distinct traits including small body size, white to light grey coat colour, and a prominent hump and dewlap. The identification of this population underscores the need for further phenotypic and genetic studies, and conservation strategies to safeguard livestock biodiversity in the Himalayan region. This study provides comprehensive information about the livestock and poultry populations in the Dehradun district of Uttarakhand.

Biography:

Dr. Kumar is serving as a Senior Scientist at the ICAR–National Bureau of Animal Genetic Resources, Karnal, Haryana. His research focuses primarily on functional genomics, phenotypic and genomic characterization, and the conservation of animal genetic resources.

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Strengthening Custom hiring centres for better crop residue management: Lessons from Punjab



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Abstract:

In India, agricultural residue burning accounts for 13% of all PM_{2.5} emissions, degrading air quality, soil health, and contributing to groundwater depletion. To address this, the Crop Residue Management (CRM) Scheme was launched to subsidise CRM machines, such as Super Seeders, to ~40,000 custom hiring centres (CHCs) - community-led entities that rent machines to farmers, reducing individual machine ownership costs and supporting rural entrepreneurship. Based on key-informant interviews with 65 CHCs across Ludhiana, Patiala, and Sangrur in Punjab- a stubble-burning hotspot state- we provide an overview of the CHC model and strategies to enhance its financial viability.

We find that renting CRM machines is cost-effective for farmers with less than 45 acres, accounting for just 10–33% of the machine purchase cost. Government-run CHCs, such as those run by co-operatives, serve more farmers and cover larger areas than private ones run by farmer groups. However, private CHCs more often offer complete packages with a fuelled tractor and tend to be more profitable due to lower overheads. Both face challenges in machinery mishandling, underutilised assets, and high maintenance expenses. However, service delivery tracking and transparent decommissioning processes are only in place for government entities. While in-situ practicing CHCs employ 2-20 workers, ex-situ businesses report employing up to 50.

To improve CHCs' financial viability, the government should allocate part of the capital subsidy towards CHCs' maintenance expenses, establish a decommissioning plan for all CRM machines based on extended producer responsibility frameworks, and expand existing resources to track machinery usage for all CHCs.

Keywords: Crop Residue management, Crop residue burning, agricultural machinery service centres, farm mechanisation, community-led solutions

Biography:

Srishti is a Research Analyst at the Council on Energy, Environment, and Water. Her work focuses on promoting a circular economy for agricultural residue to curb stubble burning through policy design and implementation. Before joining CEEW, she had also interned at NITI Aayog, where she evaluated the achievement of the United Nations' Sustainable Development Goals (SDGs) targets. Srishti holds a master's degree in Environmental Economics from the Madras School of Economics, Chennai, and a triple major in economics, mathematics, and statistics from Christ University, Bengaluru.

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Tracing the rise of crop residue burning in Madhya Pradesh: Trends, drivers and policy gaps



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Abstract:

India generates 230 Mt of surplus paddy and wheat residue annually. Of which, 40 per cent of paddy residue and 22 per cent of wheat residue is burnt, releasing pollutants like black carbon, carbon monoxide, PM_{2.5} and carbon dioxide, etc. Following the National Green Tribunal's 2015 ban on crop residue burning and the introduction of environmental compensation, states like Punjab and Haryana have implemented policy measures, including incentives, subsidies and awareness programs to discourage burning and shift farmers' behaviour towards sustainable crop residue management. However, the issue of crop residue burning has shifted from its traditional hotspots to states like Madhya Pradesh. By 2020, Madhya Pradesh emerged as the second largest emitter of crop residue burning contributing 30 per cent to the total agricultural burnt area in India and by 2025, it surpassed Punjab in both Kharif and Rabi fires. Although underreporting due to satellite bypassing during the Kharif season has remained a concern in Punjab in recent years, Madhya Pradesh has consistently recorded higher Rabi fire counts. In 2023-24, the crop residue management scheme guidelines were extended to Madhya Pradesh to tackle the increasing trend of cropland fires in the state. As per Budget estimates for 2025-26, the state plans to utilise INR 265 Crore for agricultural mechanisation and crop residue management. Front line demonstrations of machines like super seeder, awareness programs for farmers and promoting development of biofuel plants are the key interventions in the state. This study assesses the historical trend of cropland fires in Madhya Pradesh from 2012 to 2025 and examines their impact on air quality during peak burning periods. It combines satellite-based spatio-temporal analysis with field-level interactions involving farmers, government officials, and private stakeholders to understand state-specific challenges, farmer perceptions, and the on-ground implementation of policy measures. The analysis reveals that Kharif and Rabi fires have increased by approximately 60% and 119% respectively, over the study period, alongside, the area under paddy expanded by 109% and wheat by 46% during the same period. Field-level interactions with farmers in high-burn districts of Madhya Pradesh reveal that farmers opt for residue burning for both wheat and paddy residue citing challenges related to limited access to crop residue management machinery and operational inefficiencies of existing machines on the heavy black soil. Perceived risks of production loss due to CRM machine adoption also acts as a psychological barrier among farmers. The findings of the study aim to bridge the current knowledge and implementation gap, which can play a critical role in shaping policy decisions and solving the problem of crop residue management.

Keywords: crop residue burning, spatio-temporal analysis, crop residue management

Biography:

Khushi Sharma is working as a consultant with Council on Energy, environment and water, Delhi. Her research focus is around crop residue burning challenges in northwestern states and Madhya Pradesh. She uses data analysis, systematic review and field-level interactions to dive deeper into the sector and generate policy recommendations to bridge the existing gaps. She has completed her Master's in Regulatory Policy and Governance from Tata Institute of Social Sciences, Mumbai and Bachelor's in Philosophy from University of Delhi.

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Millet-based cropping systems under rainfed upland for higher water productivity, farm Income, nutritional security and resilience of marginal farmers of Odisha



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Abstract:

Millets are small grained; rich in nutrients miracle crops have the potential to meet the food and nutritional security. Next to rice, millets are the second most important cereal grain crop of Odisha. Millet-based cropping systems are pivotal for revitalization of rainfed agriculture and inclusion of short duration pulses in sequence increases the water and land use efficiency. A case study was conducted in Ganjam and Nuapada districts of Odisha during 2024 to identify the most profitable millet-based cropping systems under present scenario of climate change.

The study results reveal that finger millet-horsegram in light soils and finger millet-blackgram/greengram under medium to heavy soil was common in Ganjam whereas, little millet- horsegram /greengram were dominant in Nuapada. During deficient rainfall year's finger millet registered highest resilience index of 0.046 followed by horsegram (0.042) and greengram (0.040), whereas rice was lowest (0.02). Intensification of finger millet with horsegram in sequence enhances system yield, income and water productivity by 95.3, 91.1 and 80.6%, respectively, as compared to finger millet-fallow. Finger millet-green gram cropping resulted in increase in system yield, income and water productivity by 143.3, 146.7 and 125.8%, respectively. Little millet-horsegram and little millet- greengram cropping sequence resulted in 94.6 and 148.8% increase in system yield as compared mono-cropping. Thus finger millet-horsegram/ green gram cropping sequence is profitable in the region where it receives substantial amount of rainfall during October. Whereas little millet-based cropping is ideal in the areas where sufficient residual soil moisture are available to meet the crop water requirement.

Keywords: resilience, resilience ratio, finger millet, little millet, system equivalent yield

Biography:

Dr. B. S. Satapathy, Senior Scientist, ICAR-Indian Institute of Water Management, Bhubaneswar, Odisha having specialization in the rice-based farming and cropping system, weed Management, rice production technologies, tuber crops production technologies, water management in millet-based cropping system. As Principal investigator and Co-principal Investigator handled 18 Institute projects and 20 externally funded projects. Developed, revalidated and popularized integrated rice-based farming System models for different rice ecologies. Published 49 research papers in international and national journals, 10 research bulletins, 82 popular articles and other several publications on agriculture.

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Evaluating holistic modules for sustainable nematode management in okra



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Abstract:

Globally, plant parasitic nematodes are one of the major biotic constraints hindering successful crop production, particularly in tropical and sub-tropical regions. Regular outbreaks of root-knot disease caused by *Meloidogyne* spp. have occurred in recent years, impacting considerably on the yield of several horticultural crops, both quantitatively and qualitatively. As management by chemical means is relatively expensive and hazardous, there is always a need to develop integrated nematode management modules by judicious blend of several management options to reduce the use of chemicals. Introducing ideal nematode antagonistic crops/ non host crops in crop rotation play a significant role in reducing initial nematode population for the succeeding main crop.

Experiments conducted at ICAR-Indian Institute of Horticultural Research, Bengaluru revealed that growing velvet bean (*Mucuna pruriens* var. *utilis*) as rotational crop and incorporation of its residues significantly reduced the phytoparasitic nematode population in soil. Field trials were conducted in okra under open field conditions for three years (2022-2025) to evaluate holistic modules for managing root-knot nematodes. Split plot design was adopted with velvet bean and marigold as rotational crops in main plots and testing of biological (*Bacillus subtilis* IIHR Bs-2) and chemical (Fluensulfone 2G) components in sub plots, individually and in combination. Each treatment was replicated thrice. Results revealed that pre-planting incorporation of velvet bean residues, application of Fluensulfone @ 1g/plant and bioagent (*Bacillus subtilis*) enriched FYM @ 5t/ha before planting followed by soil drenching of bioagents at monthly intervals (5 ml/lit) recorded the highest reduction in nematode population (-89.14%) and gall index (-90.45%) and the maximum increase in okra yield (+29.24%) compared to untreated control. Hence this study proves that velvet bean can serve as promising cultural component as a rotational crop/cover crop and can be integrated with other control strategies for effective nematode management.

Keywords: plant parasitic nematodes, *Meloidogyne incognita*, okra, velvet bean

Biography:

Dr. R. Umamaheswari, Principal Scientist at ICAR–Indian Institute of Horticultural Research, Bengaluru had contributed in development of integrated management packages for phytonematodes infesting several horticultural crops. She was associated in development of several cyst nematode resistant potato varieties and root knot nematode resistant varieties and hybrids in fruits, vegetables and ornamental crops. She was involved in development of liquid and talc based formulation of novel biocontrol agent *Bacillus pumilus* (IIHR BP-2) which is highly effective against root-knot nematodes. She had transferred biopesticide technologies to >100 industry licensees all over India. She had published 70 research articles, 15 book chapters and 25 popular articles and technical bulletins.

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Identification and evaluation of advanced bitter gourd (*Momordica charantia* L.) lines for powdery mildew resistance



Varalakshmi B.*, Vivek Hegde, Sandeep Kumar, G.M, Dhananjaya, M.V and Mahadev Kivati
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Abstract:

Bitter gourd (*Momordica charantia* L.), an economically and nutritionally important cucurbit, is widely cultivated across tropical and subtropical regions for its medicinal and dietary value. However, its production is severely constrained by powdery mildew, a destructive foliar disease predominantly caused by *Podosphaera xanthii*. This pathogen is among the most significant threats in bitter gourd-growing areas of India, where the disease occurs year-round and can cause yield losses of up to 50%. Conventional management strategies, such as fungicidal sprays, provide only temporary relief and raise concerns regarding environmental safety, fungicide residues in fruits, input costs, and pathogen resistance. Consequently, genetic resistance remains the most sustainable, cost-effective, and environmentally friendly approach to mitigate powdery mildew in bitter gourd. Through germplasm screening and single-plant selection, the resistant genotype IIHR-144-1 (*M. charantia* var. *muricata*) was identified. Using IIHR-144-1 as a resistance source, 26 advanced breeding lines were developed and systematically evaluated under field conditions. Among these, three genotypes, PMR-24-6 [(IIHR-Btg-38-1-7-4 × IIHR-Btg-144-1)F7-1-1-12-6-1-7], PMR-24-7 [(IIHR-Btg-38-1-7-4 × IIHR-Btg-144-1)F7-1-1-12-6-1-17], and PMR-24-14 [(IIHR-Btg-32-5-2-8 × IIHR-Btg-144-1)F7-2-3-14-2-2-1] exhibited high resistance under natural field conditions. Artificial inoculation tests further confirmed the resistance of PMR-24-6 and PMR-24-7, each recording a percent disease index (PDI) of 11.11 and area under the disease progress curve (AUDPC) values of 302.22 and 325.93, respectively. PMR-24-14 showed moderate resistance, with a PDI of 22.96 and an AUDPC of 465.68. In contrast, the susceptible check, Arka Harit, recorded a PDI of 89.07 and an AUDPC of 2871.94 under natural conditions, and a PDI of 100 with an AUDPC of 2103.70 under artificial screening. These findings highlight the potential of PMR-24-6 and PMR-24-7 as promising sources of durable resistance. Their incorporation into breeding programs is expected to strengthen bitter gourd improvement efforts, facilitate the development of resistant cultivars, and contribute to sustainable production systems.

Keywords: Bitter gourd, powdery mildew, resistant source

Biography:

Dr B Varalakshmi has done PhD in Horticulture from the then, AP Agricultural University, Hyderabad with specialization in vegetable breeding. She has 33 of vast experience in breeding of different vegetable crops viz., Ridge gourd, Bitter gourd, Cauliflower and leafy vegetables. She has released 10 varieties, out of which one ridge gourd hybrid got notified at national level for zone 4 & 8, five varieties got notified for Karnataka, and four varieties were identified for release at Institute level. She has registered seven varieties with PPV&FRA, New Delhi. Registered two genetic stocks with NBPGR, New Delhi with downy mildew and powdery mildew resistance in ridge gourd and bitter gourd respectively. She has guided 4 PhD and 6 M.Sc. students in Vegetable Science.

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Effective solubilization of rock phosphates with organic amendments and PSB on groundnut-maize cropping system under red lateritic soils of Odisha



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Abstract:

Rock phosphate serves as a widely used phosphorus source in agriculture, especially in low-input or resource-constrained farming systems. A field experiment was conducted at Chhatabar farm, ARS, SOADU, to investigate the effect of rock phosphate (RP) in combination with organic amendments and phosphate solubilizing bacteria (PSB) on inorganic phosphorus fractions and yield of groundnut - maize cropping system for two consecutive years i.e. 2021-2023. The experiment was laid out in a randomized block design (RBD) with 14 treatments, including control, RP alone, and RP in combination with vermicompost, farmyard manure, humic acid, and PSB replicated thrice. The results showed that the application of RP in combination with organic amendments and PSB significantly increased the mean pod and grain yield and yield attributing characteristics for both the cropping seasons for groundnut and maize respectively which was significantly higher than control plot. The different soil phosphorus fractions such as Saloid-P, Iron-P, Aluminium -P, Ca -P and Reductant soluble-P increased on progressive trend from control to the integrated treatments. The trend followed for groundnut -maize cropping system for concentration of different phosphorus fractions in soil is $Rs - P > Fe-P > Al-P > Ca-P > Saloid-P$. The results suggest that the application of RP in combination with organic amendments and PSB is an effective strategy for improving soil fertility and enhancing the yield of groundnut and maize. This is likely due to the synergistic effects of RP, organic amendments, and PSB in improving the availability of nutrients and enhancing plant growth and development.

Keywords: Yield, Saloid -P, Fe -P, Al -P, Ca -P, Rs -P, PSB

Biography:

Mrs Poonam Preeti Pradhan is currently working as Assistant Professor, Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, SOADU, Bhubaneswar and simultaneously pursuing PhD from Institute of Agricultural Sciences, PSB, Sriniketan, WB. She Completed her Post Graduate (Soil Science and Agricultural Chemistry) and undergraduate from OUAT, Bhubaneswar. She has qualified NET, ICAR 2018. Her strengths are confidence, responsible and sensible leadership and strong communication skill making her an asset for educational institution for better student teacher interaction.

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Identification of SSR marker for Fruit Firmness (*ff*) linked QTL in Indian Melon (*Cucumis melo* L.) for Marker-Assisted Breeding



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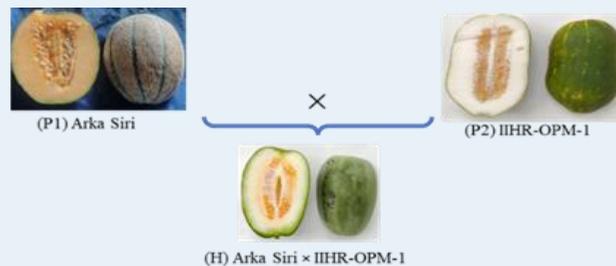
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Abstract:

Fruit firmness is a key quality attribute in muskmelon (*Cucumis melo* L.), influencing consumer acceptance, ripening behavior, shelf life, and post-harvest performance. Improving this trait through marker-assisted selection (MAS) can enhance breeding efficiency by enabling early and precise selection of desirable genotypes. The present study aimed to identify molecular markers associated with fruit firmness linked to the quantitative trait locus QTL *ff*2.1 on the chromosome 2 and QTL *ff*5.1 on the chromosome 5. An intraspecific cross was developed between *C. melo* var. *reticulatus* (Arka Siri) and *C. melo* var. *conomon* (IIHR-OPM-1), and the parental lines along with their F₁ hybrid were used for marker analysis. A total of ten SSR markers reported to be associated with the *ff*5.1 QTL were screened to detect polymorphism. Among these, the SSR marker CmSSR13308, located on chromosome 5, exhibited clear and reproducible polymorphism between the parental genotypes and showed consistent amplification in the F₁ hybrid. Although only one polymorphic marker was identified, its strong association with the fruit firmness QTL *ff*5.1 highlights its potential utility for MAS in muskmelon breeding programs. The identified marker provides a useful molecular tool for improving fruit firmness and enhancing post-harvest quality in muskmelon cultivars.

Keywords: Cucumis, melo, Firmness, Hybrid, SSR, Marker



Biography:

Dr Manjunatha Gowda D C, Senior Scientist at ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka, Indian working on Genetic Improvement of Muskmelon for Biotic and Abiotic stress Tolerance.

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Formulation of new *panchagavya*: Temporal dynamics of physical, chemical and biological properties in preparation vs storage stages



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Abstract:

Panchagavya is a traditional liquid formulation which has been used since prehistoric period for medicine and ecosystem health in Indian subcontinent. This study evaluated the dynamics in its physical characters (such as texture, colour, odour, temperature, EC and pH), chemical characters (such as macro and micro plant nutrients), and biological characters (such as organic matter, bacteria, fungus and actenomyces) in its preparation and subsequent storage stage to facilitate application period for a crop. New *Panchagavya* was prepared in laboratory following a standard protocol with help of locally available material to ease local hill farmer of Nepal and is sampled continuously five day (17, 18, 19, 20 and 22) in late formative stage during preparation and in regular interval (each on 15 days of interval for initial days and then 10 days of interval on later days: that is on 36, 51, 61, 71, 81 days) during preparation stage. Result showed marked changes in physical appearance as well as progressive changes in pH up to the stabilization point, stabilization and subsequent decline in nutrients (macro and micro) content as well as strong fluctuations in biological (organic matter and microorganism loads) components. Over all finding suggest that all the tested days 17th to 81th days of mixing (DAM) provides a favorable combination of Physical acceptability nutrient availabilities and microbial activities for agricultural use with some minute dynamics.

Keywords: Traditional liquid formulation, Laboratory tests, Dynamics and Stabilization of characters, Favorable combination

Biography:

Sabita Aryal Khanna : Assistant Professor Kathmandu University since 2002 after M.Sc.in Environmental Science, IARI, New Delhi. Besides teaching leads many demand driven research such as Organic farming and Nutrient management, Natural Resource Management, Integrated Water Resource Management, Watershed management, Indigenous technologies and approaches, Initial environmental impacts on Sand and gravel extraction , soil and water quality , climate change, law and policies etc. Worked for international and national organizations of Nepal India and UK such as University, Government of Nepal, ICIMOD, University Grant Commission, Oxfam and DFID. More than 30 publications made in form of reports, papers, thesis and book.

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Low cost, less water use and high production biofloc fish farming: Economic empowerment of SC/ST community of Koraput District of Odisha



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Abstract:

In Koraput district of Odisha on an average receive plenty of rainfall (1500mm) annually, hilly terrain, undulating topography, erratic rainfall, low water holding capacity posing threat to Fish growers of the Koraput district. Day by day demand for fish escalating due to burgeoning population coupled with development of new towns in the district. Production is not at par with demand hence fulfilling by requirement through outsourcing from neighbouring state. Biofloc fish farming can be an alternative to overcome the situation to some extent. Biofloc fish farming is a kind of fish farming using microorganism in which friendly (beneficial) bacteria produced & harmful ammonia removed over fish water as well as bacteria are converted into protein rich food for the fishes to re-fed Biofloc. Technology is considered as new blue revolution since nutrient can be continuously recycled & reused in the culture medium, benefited by the minimum or zero-water exchange. Demonstration conducted at ICAR-IISWC, Research Farm Sunabeda under SCSP in a rectangular Biofloc tank (20ftx10ft x5ft) stocking 700 nos. of GIFT Tilapia Fingerlings in the tank. Applied/inoculated Bacillus strains of Probiotics in water for production of beneficial bacterial & regularly 1% body weight of feeds given two times daily. By vigorous aeration the conversion of unused feed & excreta into a protein rich natural food in culture system. The regular sampling shows the doubling growth of the species within every 7 days. After 100 days of culture period 350 kg of fishes were harvested from the tank. Adoption of this technology is better than pond fisheries in terms of judicious use of land & water, better production of fishes with minimum quantity of water, can be taken up in roof space and backyard, scope for landless farmers, more production in less time (within 90-120days) compared to(240-250days) in pond fisheries, reducing environmental impact. Promotion/adoption of the technology is boon for local economy

Keywords: Biofloc, Blue revolution, Bacillus strains, Inoculation, Probiotic

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Impact of extreme weather conditions on legume vegetables and the feasibility of non-traditional crops in tropical humid Odisha



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Abstract:

Extreme weather conditions, particularly high temperature, long day length, and episodic water deficit, are increasingly constraining vegetable legume production in tropical hot-humid regions. Field observations in eastern India revealed severe heat-injury in French bean, manifested as leaf scorching, depressed canopy growth, low chlorophyll content, and poor biomass accumulation. In dolichos bean, elevated temperature and altered photoperiod strongly inhibited flowering in progenies derived from the cross *Arka Swagat* × *S16*, despite normal vegetative growth. Winged bean exhibited no visible foliar damage under high temperature and long day length; however, flowering was completely absent, indicating strong photothermal regulation of reproductive development. These contrasting responses highlight the high sensitivity of legume vegetables to climatic extremes, particularly at the reproductive stage. Seasonal evaluation of cluster bean in Bhubaneswar showed higher yields during Kharif and acceptable summer productivity, supporting its promotion as an alternate climate-resilient crop under tropical humid conditions. To quantify relative water deficit stress tolerance, four vegetable legumes—cluster bean, dolichos bean, French bean, and winged bean—were evaluated under irrigated and water deficit treatments in a net house. Two-factor ANOVA revealed significant crop, stress, and interaction effects for root volume, root biomass density, vine length, proline content, total biomass, and plant growth rate. Water deficit stress caused substantial reductions in growth and physiological traits, with French bean showing the greatest losses in biomass, growth rate, leaf number, and chlorophyll content, confirming its high susceptibility. Winged bean developed a large root system but suffered marked reductions in root volume and chlorophyll, while cluster bean showed major declines in primary root length and net assimilation rate. In contrast, dolichos bean exhibited comparatively lower reductions, increased chlorophyll content, and substantial proline accumulation, indicating superior resilience; multivariate analyses consistently ranked it as the most tolerant.

Biography:

Dr. A. V. V. Koundinya is a Scientist at the Central Horticultural Experiment Station (CHES), ICAR-Indian Institute of Horticultural Research, Bhubaneswar. He holds a Ph.D. in Vegetable Crops from Bidhan Chandra Krishi Viswavidyalaya, West Bengal. His research focuses on genetic improvement of vegetable and tuber crops for yield, quality, and stress tolerance. He has made notable contributions to cassava and legumes improvement, focusing on drought and mosaic disease resistance, and led ICAR and DAE-funded projects. His work integrates conventional breeding and molecular approaches to develop climate-resilient cultivars. He has published in leading journals like *Scientia Horticulturae*, *South African Journal of Botany*, and *Acta Physiologiae Plantarum*. Dr. Koundinya's contributions extend to French bean, winged bean, and teasel gourd improvement. He received the Young Scientist Research Award from DAE, Govt. of India.

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Resilient fruit farming through protected cultivation



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Abstract:

The fruit industry today is faced with several threats including climate variability, land degradation and various biotic and abiotic stresses. Protected cultivation of fruit crops offers a suitable strategy to mitigate various environmental risks. It enables precise control over temperature, moisture, mineral nutrients, wind velocity, light intensity etc. which will help to maximize the yield per unit area per unit time. Modern greenhouse technology has even made it possible to commercially cultivate the banana, with high yields and profits of interest in subtropical areas such as the Canary Islands and Morocco (Sauco et al., 2000). In Okinawa mango production under plastic green house helps to overcome the problems of low fruit set and high incidence of anthracnose (Akinaga & Hasbullah, 2000). Greenhouse papayas grow and fruit better than in the open air as a consequence of both higher temperatures and wind protection, as well as providing protection against papaya ringspot virus (Gunes & Gubbuk, 2012). The maximum number of flowers and larger fruit size in strawberry under black polythene mulch is attributed to more plant growth and development under ideal micro-climatic conditions (Bakshi et al., 2014). Overall, protected cultivation emerges as a climate-smart strategy that strengthens resilience, promotes income stability, and fosters sustainable intensification of fruit farming in the face of changing agroclimatic realities.

Keywords: Abiotic stress, biotic stress, fruit quality, protected cultivation

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Influence of combined application of boron and plant growth regulators on yield and fruit quality of apple ber (*Zizyphus mauritiana* Lamk.)



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Abstract:

A field experiment was conducted during 2024-2025 in a six-year-old apple ber orchard at ICAR-IIHR-Central Horticultural Experiment Station, Bhubaneswar, Odisha to assess the efficacy of combined application of boron (B) and plant growth regulators (PGRs)- α -naphthalene acetic acid (NAA) and gibberellic acid (GA_3) on fruit yield and quality. The experiment followed a randomised block design with nine treatments consisting of borax (0.3% and 0.5%) in combination with NAA (25 and 50 ppm) and GA_3 (25 and 50 ppm), along with a water spray as the control. The treatments (T1: 0.3% borax + 25 ppm NAA, T2: 0.3% borax + 50 ppm NAA, T3: 0.3% borax + 25 ppm GA_3 , T4: 0.3% borax + 50 ppm GA_3 , T5: 0.5% borax + 25 ppm NAA, T6: 0.5% borax + 50 ppm NAA, T7: 0.5% borax + 25 ppm GA_3 , T8: 0.5% borax + 50 ppm GA_3 , T9: water spray) were applied to the canopy three times, beginning at the pea stage and followed by two sprays at one-month intervals. Each treatment was replicated three times with four plants per replication. Observations were recorded for various fruit yield and quality parameters. A marked improvement in yield and fruit size was observed when GA_3 (25-50 ppm) and NAA (25-50 ppm) were applied in combination with the higher B dose (0.5% borax). In contrast, their application with the lower B dose (0.3% borax) produced no significant effect, except for GA_3 at 50 ppm (T4). Among the effective treatment combinations (T4, T5, T6, T7, T8), T8 (0.5% borax + 50 ppm GA_3) resulted in the highest yield (27.18 kg/tree) and average fruit weight (56.48 g/fruit), along with the highest proportion of premium-grade fruits (>60 g). In contrast, the lowest yield and smallest share of premium-grade fruits were recorded in the control T9 (20.61 kg/tree, 45.17 g/fruit, 9.37%). Fruit quality attributes also improved significantly under the combined application of PGRs with boron, with GA_3 -based treatments outperforming those with NAA. Fruits harvested from T8 (0.5% borax + 50 ppm GA_3) exhibited the highest quality indices, including TSS (12.78°B), TSS/acid ratio (37.59), total sugars (12.30%), reducing sugars (4.87%), non-reducing sugars (7.06%), vitamin C (49.53 mg/100 g pulp), total flavonoids (39.71 mg QE/100 g FW), ferric reducing antioxidant power (10.37 mM Fe(II)/100 g FW), and scavenging activity (41.85%), followed by T4 (0.3% borax + 50 ppm GA_3). Overall, the study demonstrates that foliar application of 0.5% borax combined with 50 ppm GA_3 , initiated at the pea stage and repeated twice at monthly intervals, is effective in enhancing yield, fruit size, and quality of apple ber under the hot and humid conditions of coastal Odisha.

Keywords: α -naphthalene acetic acid, apple ber, boron, gibberellic acid, fruit quality, yield

Biography:

Dr. Deepa Samant is a Senior Scientist (Horticulture-Fruit Science) at the ICAR-IIHR-Central Horticultural Experiment Station, Bhubaneswar, Odisha. She joined the Indian Council of Agricultural Research in 2010 and has over fourteen years of research experience in tropical and subtropical fruit crops, with major contributions in mango, guava, pineapple, custard apple, tamarind, jamun and underutilised fruit species of eastern India. She obtained her Ph.D. in Horticulture (Pomology) from the Indian Agricultural Research Institute, New Delhi, and completed her M.Sc. (Horticulture) and B.Sc. (Agriculture) with distinction from GB Pant University of Agriculture & Technology, Pantnagar, Uttarakhand. Dr. Deepa Samant has contributed to the development and refinement of farmer-friendly, location-specific orchard management technologies and has been actively involved in dissemination among growers and other stakeholders. She has published 42 research papers, 53 popular articles, 4 books, 20 book chapters, 6 e-publications, 10 technical bulletins and 10 extension folders.

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Evaluation of bioactive constituents of *Garcinia indica* (kokum) as a potential source of hydroxycitric acid, anthocyanin, and phenolic compounds

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Abstract:

The exploration of indigenous fruits and vegetables as potential natural raw materials for the food and pharmaceutical industries has gained increasing attention among researchers. One such promising but underutilized tree species is *Garcinia indica*, native to the Western Ghats in India, known for its medicinal significance. The primary objective of this study was to comprehensively characterize *Garcinia indica* fruits, emphasizing their potential applications as a source of hydroxycitric acid, anthocyanin (a natural colorant), and phenolic compounds. To achieve this, liquid chromatography-mass spectrometry (LC-MS) was employed to analyze the metabolite composition in the ripe fruit rind of *Garcinia indica*. The results of this analysis revealed that these fruits are notably rich in hydroxycitric acid, ranging from 15.60% to 22.92% concentration, rendering them suitable candidates for the development of weight-loss supplements. Additionally, *Garcinia indica* exhibited a substantial content of anthocyanin (ranging from 4.47 to 7.08 mg g⁻¹), surpassing the levels found in most other fruits and vegetables. This high anthocyanin content positions the fruit as a valuable natural source of food coloring agents. Furthermore, the fruit's phenolic compound content underscores its potential as a rich source of antioxidants. The study identified a total of 38 anthocyanin compounds, several of which were reported for the first time, with major anthocyanins including cyanidin-3-sambubioside, peonidin-3-arabinoside, and pelargonidin-3-glucoside. Among the 30 individual phenolic compounds identified, ortho/para coumaric acid, naringenin, and apigenin stood out due to their abundance and diverse industrial applications. By utilizing two-way hierarchical clustering and a heat map, the study successfully identified the most suitable accessions of *Garcinia indica* for different bioactive compounds. Overall, the present study highlights *G. indica* as a rich, new, and sustainable source of bioactive substances with food, pharmaceutical, and other industrial applications.

Keywords: Bioactive compounds, HCA, Anthocyanin, Phenolics

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Sustainable water management in agriculture: AI-driven precision irrigation systems

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Abstract:

Water scarcity is a growing threat to agricultural productivity and food security worldwide. Traditional irrigation methods often result in inefficient water use and environmental degradation. Modern agriculture faces escalating challenges due to water scarcity and the need for sustainable strengthening. Traditional irrigation often leads to inefficient water use, runoff, and inconsistent yields. AI-driven precision irrigation harnesses real-time data, IoT sensors, and predictive analytics to provide crops with exactly the amount of water needed, enhancing efficiency and sustainability. The emergence of artificial intelligence (AI)-driven precision irrigation systems offers transformative solutions by integrating sensor networks, real-time monitoring, and predictive analytics to optimize water use. This research provides a comprehensive review and case analysis of AI-enabled irrigation technologies, evaluates their impact on water savings, crop yields, and farm sustainability, and discusses implementation challenges and future prospects. AI-supported systems can reduce water use by up to 40%, promote uniform crop growth, and support climate-resilient agriculture. The paper concludes that scaling AI-driven precision irrigation is crucial for advancing sustainable water management in agriculture. This research can impact sustainable agriculture by demonstrating how AI-driven precision irrigation reduces resource waste, enhances resilience to climate variability, and increases farm profitability.

Keywords: AI-driven precision irrigation, Sustainability, Resource Management, Digital Transformation, water management

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Off-season cultivation of fodder oat: A climate-resilient strategy for animal nutrition security

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Abstract:

Sustainable animal food security is closely linked with the continuous availability of quality green fodder throughout the year. In many livestock-based production systems, fodder scarcity during the off-season severely affects animal health, milk yield, and overall productivity. Off-season cultivation of fodder oat (*Avena sativa* L.) has emerged as a viable strategy to bridge the seasonal fodder gap and ensure sustainable animal nutrition. Selection of varieties suitable for off-season cultivation is more essential for sustainable food production. The present study evaluated 14 oat genotypes for germination performance and vigour indices under two contrasting environments—natural high-temperature stress (35.9–42.8°C) and controlled conditions (25°C, 70% RH). Germination was markedly suppressed under high temperature, with values ranging from 0 to 55.35%, while genotype OL-1861 consistently maintained above 50% germination. By contrast, in the controlled environment, germination capacity improved substantially, with G4 and OL-1861 showing the highest rate ($\approx 90\%$), accompanied by enhanced mean daily germination, germination speed, seedling biomass, and vigour indices (SV-I and SV-II). Among all entries, OL-1861 emerged as the most stable across both conditions, combining superior germination efficiency with stronger seedling vigour, making it suitable for off-season and heat-stressed environments. Post-harvest biochemical assays further highlighted genetic differences in enzymatic activities associated with seed germination and stress tolerance. Alpha-amylase activity, varied between 0.91 and 2.16 $\mu\text{g/ml}$ and was positively associated with germination percentage ($r = 0.601$). Similarly, dehydrogenase activity, a marker of respiratory metabolism, showed a positive correlation ($r = 0.587$). Antioxidant enzymes—catalase, peroxidase, and superoxide dismutase—were also strongly linked with stress resilience. Genotype OL-1861 recorded the highest activities for these enzymes (CAT: 1.90 U/ml, POD: 1.917 U/ml, SOD: 48.37 U/ml), supporting its superior stress-adaptive germination ability. OL-1861, in particular, stands out as a promising genotype for future cultivation and breeding programs targeted at stress-prone regions, ensuring better fodder productivity and quality.

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Identification and validation of cucumber germplasm (*Cucumis sativus* L.) lines for downy mildew resistance



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Abstract:

Cucumber downy mildew, caused by the oomycete *Pseudoperonospora cubensis*, is one of the most destructive foliar diseases of cucurbits worldwide, with outbreaks favoured by warm, humid conditions and long-distance spore dispersal, causing substantial yield losses and quality decline in both open-field and protected cultivation. Fungicide sprays give short-term relief but raise concerns regarding environmental safety, fungicide residues in fruits, input costs, and pathogen resistance. Whereas genetic resistance provides a sustainable, economical, and eco-friendly solution to control downy mildew in cucumber. A total of 532 accessions of cucumber were screened for downy mildew resistance under natural epiphytic conditions at ICAR-IIHR, Bengaluru, ICAR-IARI, New Delhi and ICAR-IIVR, Varanasi from 2022-2024. Three promising cucumber accessions IC527431, IC527400 and IC572024 were identified for downy mildew resistance. The present study was conducted to validate downy mildew resistance in three promising cucumber accessions, IC527431, IC527400, and IC572024, under natural epiphytic condition and artificial inoculation under the greenhouse of ICAR-IIHR, Bengaluru, during 2024–25. Among the cucumber accessions screened under natural epiphytic condition, the lowest average PDI and minimum AUDPC were recorded in IC527431 (24.00 & 1433.33), IC572024 (25.78 & 1500.00), IC527400 (28.15 & 1638.89). Similarly, IC527397 (58.33 & 3625.00), IC410682 (57.78 & 3583.33), IC522927 (57.00 & 3525.00) and Pusa Uday (56.67 & 3500.00) were found most susceptible genotypes with maximum average PDI and AUDPC. At 35 days following artificial inoculation, the check varieties Pusa Uday and Pusa Barkha were highly susceptible, recording PDI values of 77.78 and 51.85, respectively. In contrast, only mild leaf symptoms developed on IC572024, IC527431, and IC527400, which showed PDI of 12.96, 14.81, and 29.63 and were classified as resistant to moderately resistant. These germplasm lines therefore represent promising sources of downy mildew resistance for incorporation into cucumber breeding programs.

Keywords: Cucumber, Downy mildew, Resistant source, Artificial screening, *Pseudoperonospora Cubensis*

Biography:

Dr. Vivek Hegde earned his Ph.D. in Vegetable Science from Chaudhary Charan Singh Haryana Agricultural University, Hisar, under the ICAR-SRF program. He holds an M.Sc. in Horticulture from Andhra Pradesh Horticultural University, Hyderabad, with ICAR-JRF, and a B.Sc. in Horticulture from the University of Agricultural Sciences, Dharwad, where he was awarded the university gold medal. He has over 11 years of extensive experience in in-vitro regeneration, pollen cryopreservation, and breeding of diverse vegetable crops. Dr. Hegde standardized efficient pollen cryopreservation protocols in cassava and taro, and developed synthetic seed production technology in cassava, including a protocol for short-term storage of cassava synthetic seeds. He also established robust in-vitro regeneration protocols for cassava, sweet potato, taro, yam, arrowroot, and Chinese potato. He contributed to the identification of four cassava clones that are stable for key yield traits under water stress conditions.

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Minimizing reactive nitrogen loss in lowland rice using natural nitrification and urease inhibitors



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Abstract:

Although slow-release technologies using nitrification and urease inhibitors have been developed, their high cost, environmental persistence, and negative effects on quality of the produce limit their practical use. As an alternative, natural origin inhibitors offer a promising solution. We studied combination of natural sources of both nitrification and urease inhibitors (linseed oil, potassium humate, and garlic powder) and standardized their dosages with neem coated urea (NCU) for rice crop. The release pattern of the products was evaluated at laboratory, followed by their field trials during Kharif 2024 and Rabi 2025 to assess reactive nitrogen loss, soil properties, enzymatic activity, grain yield, yield attributes and NUE. Among various doses, the amount of released N up to 10 hours was significantly lower in linseed oil (LO) + neem-coated urea (NCU) @ 10% of RDN (w/w), in potassium humate (KH) + NCU @ 30% of RDN (w/w) (27.7-74.7%) compared to other two combinations (48.5-76.9%) and in garlic powder (GP) + NCU @ 1% of RDN (w/w). The rice grain yield was highest in neem-coated urea mixed with potassium humate in both the seasons. Among the natural inhibitors, GP performed the best in wet season of 2024 reducing volatilization losses by about 9% than the NCU and by about 20% than the LU. Treatments containing natural inhibitors reduced mean NH₃ volatilization by almost 4.2-9.3% than the NCU and by almost 9.6-14.3% than the LU in dry season 2025, with GP performing better than the other two treatments. Natural inhibitors reduced nitrate leaching by 1.7% and 6.8%, respectively in wet season 2024, while GP and LO reduced nitrate leaching by 4.6% and 7.2%, respectively in dry season 2025 over sole NCU application. N₂O flux was lowest in linseed oil coated NCU in wet season 2024 and dry season 2025, which were 7.8% and 5.8% lower than NCU, respectively. We conclude that natural nitrification and urease inhibitors are reasonably effective in reducing reactive nitrogen loss from lowland rice agroecosystems and can provide yield advantage. Among the natural products, garlic powder is found to be the most ideal product considering its better economic and operational convenience in the context of lowland rice ecology.

Keywords: Nitrogen, nitrification inhibitor, urease inhibitor, leaching, nitrous oxide, volatilization, rice

Biography:

Dr Chatterjee is currently working as a Senior Scientist (Soil Science) at ICAR-CRRI, Cuttack and having 15 years of working experience in ICAR. His research focused primarily on monitoring climate change using an eddy covariance approach, reactive nitrogen loss and mineralogical transformation in soil. He received several awards including Nanaji Deshmukh Team Research award. He is a member of prestigious INYAS and NASI; associate of WAST and NAAS; life members and young scientist awardees of ISCA, CMSI and ISSS. Dr. Chatterjee has published >65 research papers and participated in more than 20 international and national conferences.

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High density planting and sucker arrangement in Banana: A sustainable approach to enhance Banana productivity

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Abstract:

High Density Planting (HDP) and Sucker Arrangement in Banana is an advanced cultivation technique aimed at increasing productivity per unit area by accommodating more plants without adversely affecting growth and yield. Banana being a high biomass and nutrient-demanding crop, responds well to optimized spacing, efficient nutrient management, and improved cultural practices under HDP systems. In conventional banana cultivation, normal spacing such as 1.8 × 1.8 m (3086 plants/ha) accommodates fewer plants, resulting in lower yield per hectare. HDP involves sucker arrangement with wider spacing like 1.8 × 3.6 m with 3 suckers per hill (1542 pits × 3 = 4629 plants/ha), 2 × 3 m with 3 suckers per hill (1667 pits × 3 = 5001 plants/ha), or paired row planting, depending on the variety and agro-climatic conditions. Dwarf and semi-dwarf varieties such as Grand Naine and Robusta are particularly suitable for HDP due to their sturdy pseudo stems and compact canopy. The advantages of HDP include higher yield per unit area, efficient utilization of land, water, and nutrients, better weed suppression due to canopy cover, and early crop maturity. HDP also facilitates mechanization and uniform crop management. However, proper management of nutrients, irrigation, and pests is critical, as closer spacing can increase competition and disease incidence. Adoption of drip irrigation and fertigation is essential under HDP to ensure precise supply of water and nutrients. Regular desuckering, propping, and integrated pest and disease management are necessary to maintain plant health and bunch quality. Overall, high density planting is a sustainable and profitable approach for enhancing banana productivity when combined with scientific crop management practices.

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Physiological and biochemical Response of sunflower (*Helianthus annuus* L.) genotypes to soil applied boron



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Abstract:

A field experiment was conducted to explore the physiological and biochemical response of sunflower genotypes to boron during *summer* 2019-20 at Instructional farm, College of Agriculture, OUAT, Bhubaneswar. The experiment was laid out in Factorial Randomised Block design with two factors (4 genotypes and 4 boron doses) with 16 treatments replicated thrice. The test genotypes were KBSH-44, KBSH-53, RSFH-1887, LSFH-171 and four levels of boron are 0 kg boron/ha (control), 0.5 kg boron/ha, 1 kg boron/ha, 1.5 kg boron/ha. The soil of the experimental site was sandy loam in texture with pH 5.76, organic carbon 0.52% and EC of 0.133 ds/m. The available nitrogen, phosphorus, potassium and boron of the experiment site were 235.7, 32.4, 120.4 kg/ha, and 0.4 mg/kg, respectively. Each experimental plot was uniformly fertilized with 60: 80:60 kg N, P₂O₅ and K₂O/ha. Full P, half N and half K was applied as basal while other half N and K was top dressed at 30 days after sowing. The investigation revealed that growth increased significantly with the increase in boron dose from 0.5 kg boron/ha to 1.5 kg boron/ha in all genotypes. Among different genotypes, KBSH-44 recorded the highest seed yield (1.99 t ha⁻¹), stover yield (5.02 t ha⁻¹) with higher harvest index (28.38) and oil yield (737.93 kg ha⁻¹). The highest yield under KBSH-44 was promoted by highest growth attributing characters like leaf number (13.0), dry matter accumulation (118.9 g plant⁻¹), LAI (1.29), CGR (5.30 g d⁻¹ m⁻²) at harvest with highest chlorophyll content (7.16-SPAD reading), carbohydrate content (38.11 mg/g DW), and protein content (20.72%) along with highest uptake of B (331.12 g ha⁻¹) at 75 DAS. Out of four boron levels, B @ 1.5 kg ha⁻¹ is significantly superior over other treatments recorded the highest seed yield (2.10 t ha⁻¹), stover yield (5.28 t ha⁻¹), oil content (38.59%) and oil yield (811.46 kg ha⁻¹) with higher yield attributing characters like total seed (830.94), head diameter (18.58 cm) which are statistically at par with B @ 1.0 kg ha⁻¹. The highest yield of B @ 1.5 kg ha⁻¹ was also supported by highest growth parameters like number of leaves (13.6), dry matter accumulation (117.43 g plant⁻¹), LAI (1.35), CGR (4.53 g d⁻¹ m⁻²) at harvest which also recorded highest chlorophyll content (11.39- SPAD reading), carbohydrate content (38.26 mg/g DW), protein content (20.87%) along with highest uptake of B (352.88 g ha⁻¹).

Biography:

Dr. Anita Mahapatra is presently working as Scientist (Agronomy) at AICRP on Sunflower, OUAT, Bhubaneswar, Odisha, India. She has completed her undergraduate, postgraduate degree from Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India and Ph.D degree from PSB, Shantiniketan, West Bengal. A teacher with more than 15 years of teaching experience at UG and PG level and a researcher with expertise in nutrient management, weed management and sustainable crop production. She has published several research papers, review papers, book chapters, and technical articles in national and international seminars, symposia and conferences. She is a reviewer in national and international Journals, participated in numerous national and international training programs and life member of several professional societies.

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The influence mechanism of technology adoption in poultry farming



Mathews Biju*, and Anicar D. Manavi

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Abstract:

The poultry sector in India is a vital component of the agricultural economy, contributing significantly to rural employment, food security, and income diversification. Despite notable advancements in production and technology, the adoption of modern poultry innovations among small and medium-scale farmers remains limited due to high costs, inadequate training, and low awareness. The objective of this study is twofold. First, to understand the farmers' perception of self-efficacy, social capital factors influences, technology usefulness, perceived risk and behavioural attitude. Second, was to examine the influence of demographic and economic factors on farmers' behavioral willingness to adopt technological solutions such as automated feeding, smart ventilation, and climate-controlled housing systems. A quantitative descriptive approach was employed, collecting primary data from 150 poultry farmers across Kerala through structured questionnaires. The descriptive statistics indicate a strong overall agreement among respondents regarding positive perceptions toward adopting Poultry Farm Automation (PFA) technology. Farmers expressed particularly favorable views about government and distributor support (Social Capital), technology usefulness, and their willingness to adopt the technology, suggesting recognition of both institutional backing and practical benefits. The moderate standard deviation values reflect low variability in responses, implying a high level of consensus among participants. The data were analyzed using Analysis of Variance (ANOVA) to test the significance of variables including age, education, income, farm capacity, poultry type, and income source on behavioral dimensions like training readiness, investment intention, adoption tendency, and recommendation willingness. The results revealed significant relationships across most variables, indicating that age, income, and farm capacity exert the strongest influence on technology adoption. Younger and higher-income farmers showed greater readiness to adopt innovations, while education enhanced training participation. The findings highlight the need for targeted interventions financial assistance, awareness initiatives, and training programs to promote widespread technological adoption and sustainable growth within India's poultry sector.

Keywords: ANOVA, Behavioral Willingness, Demographic Factors, Poultry Farming, Technology Adoption, Training Readiness

Biography:

Mathews Biju is a postgraduate student (MBA – Full Time, Batch 2023) at M S Ramaiah University of Applied Sciences, Bengaluru, Karnataka. His research interests include agricultural technology adoption, behavioral studies in farming systems, and productivity enhancement in rural enterprises. Under the guidance of Dr. Anicar D. Manavi, he conducted a study on the influence mechanism of technology adoption in poultry farming, focusing on the behavioral and socio-economic factors influencing farmers' willingness to adopt modern technologies. He aims to contribute toward developing data-driven strategies to enhance technology integration and sustainability in the agricultural sector.

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Tradition in transition: Changing cultural practices of Baiga PVTG

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Abstract:

Tribal societies that have historically lived in close association with their traditional knowledge systems and natural environment are now undergoing rapid cultural transformation due to intensified contact with mainstream society. This shift is particularly evident among the Baiga PVTG of Singrauli District, Madhya Pradesh, who are experiencing a range of socio-economic and cultural challenges. The study explores the changing cultural practices among Baiga youth based on primary data from 400 households, collected through surveys, key informant interviews (KIIs), focus group discussions (FGDs), and extensive field observations. The analysis covers key components of Baiga cultural life, including traditional tattooing, folk songs and dances, knowledge of deities, and food-related traditions such as forest-based diets, indigenous recipes, and practices rooted in shifting cultivation. Results indicate a steady decline in several cultural practices, most notably tattooing, musical traditions, ritual knowledge, and customary food habits. Younger generations are increasingly distancing themselves from traditional ways of living and adopting practices shaped by external influences. These patterns highlight the need for focused efforts to promote cultural awareness, strengthen community-driven documentation, and develop support mechanisms to safeguard the cultural heritage of the Baiga PVTG.

Keywords: Baiga, PVTG, Tattoo, Cultural erosion, Cultural loss, Cultural heritage

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Evaluation of boldnut cashew (*Anacardium occidentale* L.) genotypes for yield and quality attributes



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Abstract:

Boldnut cashew genotypes are gaining importance due to their premium grade, higher consumer preference, and export potential; however, systematic evaluation of such genotypes under Odisha conditions remains limited. The present study evaluated twenty boldnut cashew (*Anacardium occidentale* L.) genotypes for growth, yield, and nut quality attributes to identify superior cultivars. The field experiment was conducted during 2022–2023 at the Cashew Research Station, Odisha University of Agriculture and Technology, Bhubaneswar, following a randomized block design with two replications. Four trees per genotype were planted at 6 m × 6 m spacing under standard orchard management practices. Boldnut genotypes (nut weight ≥7.0 g) were selected due to their high commercial and export value.

Significant variability was observed among genotypes for vegetative growth, flowering behaviour, yield, and quality parameters. Genotype K exhibited the highest vegetative vigor, recording maximum plant height (4.87 m) and trunk girth (41.37 cm), while genotype B showed the widest canopy spread. Flowering duration varied considerably among genotypes, ranging from early (November–December) to late (January–February), indicating distinct phenological differences. Among yield attributes, genotype T produced the heaviest nuts (14.98 g) and recorded the highest nut yield (3.44 kg plant⁻¹), while genotype M produced the largest cashew apples (277.7 g).

Quality analysis revealed that genotype T also recorded maximum apple moisture content (88.27%) and kernel sugar content (0.221 g 100 g⁻¹). Nutritional profiling indicated substantial variation, with genotype I recording the highest carbohydrate (39.14 g 100 g⁻¹) and protein content (21.92 g 100 g⁻¹). Genotype R recorded the highest zinc content (67.3 mg kg⁻¹), genotype D the highest calcium (19.35 mg 100 g⁻¹), and genotype G the highest magnesium content (211.39 mg 100 g⁻¹).

Overall, this first systematic evaluation of boldnut cashew genotypes under Odisha conditions identified elite lines combining high yield and superior nut quality. Genotype T emerged as a promising candidate for future breeding and cultivar development programmes, with potential to enhance farmer income, nutritional quality, and India's cashew export competitiveness.

Keywords: Boldnut cashew, yield, nut quality, nutritional composition, genotype evaluation

Biography:

Deepshikha Jena is a PhD scholar in Horticulture (Fruit Science and Horticulture Technology) at Odisha University of Agriculture and Technology, Bhubaneswar, India. She completed her Master's degree from the same university and was awarded a Gold Medal for her academic performance. She is currently pursuing doctoral research. Her research interests include fruit crop improvement, pruning physiology, yield optimization, and quality and nutritional assessment of horticultural crops.

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Design and Development of Tractor mounted Inter cum Intra row Weeder



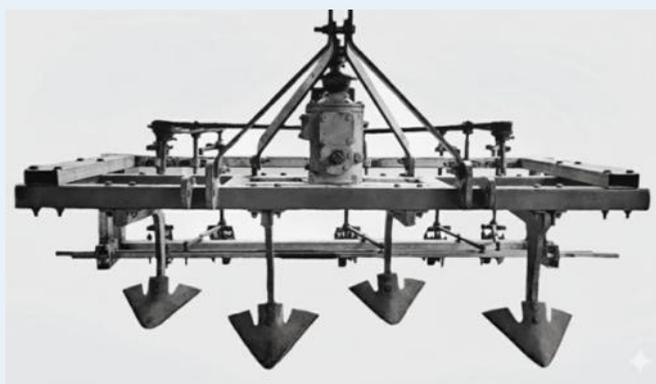
Sharmistha Sahu^{1*}, Bibhuti Bhusan Sahoo

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Abstract:

Weeds are non-native species of plants that restrict the quality of crop production in agriculture. In the row crops, the field is invaded by inter and intra-row weeds. Weeds in the intra-row zone reduce crop yield up to 33% or more. Weed control in the intra-row zone is still a huge challenge. Therefore, the advanced level of technology is used for cleaning up the weeds in between the rows (inter-row) as well as within the rows (intra-row). The existing weeders are less efficient due to incomplete intra-row weeding and require more labor and time. The developed weeder was capable of inter-row and intra-row weeding. It has sweeps to cut the weeds of inter-row. The blades were fixed circularly over the ring, which rotates about the vertical axis and cut the intra-row weeds. This rotor was capable in shifting right and left from the mean position. Initially, it rotates between the rows and gets shifted within the row when receives the signal from the microprocessor. The microprocessor gives the signal to the servo motor when the vacant space comes between two consecutive plants. The microprocessor receives signals from the camera and Arduino board. It was tested in the field of okra crop (45×30 cm spacing) at three different levels of tractor and rotor speed and a fixed depth of 5 cm. The optimized speed of the tractor and rotor were 2.5 km h⁻¹ and 1.76 m s⁻¹ (280 rpm), respectively. At these speeds, the weeding efficiency, effective field capacity, and fuel consumption were 96%, 0.34 ha h⁻¹, and 4.6 l h⁻¹, respectively.

Keywords: Intra-row weeding, weeding efficiency



Biography:

Sharmistha Sahu, currently pursuing a PhD at Centurion University of Technology and Management. She has completed her Bachelor's and Master's degrees in Agricultural Engineering from the College of Agricultural Engineering and Technology (CAET), Odisha University of Agriculture and Technology (OUAT). She has five years of academic experience as an Assistant Professor. Her scholarly contributions include seven research publications in peer-reviewed journals, five book chapters, and two granted patents, reflecting my active engagement in research, innovation, and higher education.

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Deterrent effect of citronella essential oil and its nanoemulsion on oviposition behaviour of diamondback moth, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae)



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Abstract:

Insect pests are a major threat to food security, causing substantial agricultural crop losses worldwide. Indiscriminate use of different synthetic insecticides for control of the insect pests led to human health hazards, environmental toxicity and development of insecticide resistance. Consequently, use of alternative control measures with environmentally sustainable pest management practices are preferred over toxic synthetic chemicals. Plant-derived essential oils (EOs) are rich source of insecticidal bioactive compounds, but their broader application is constrained due to high volatility, inadequate aqueous solubility and easy degradation. To overcome these limitations, nanotechnology-based approaches holds significant promise. We developed the *Cymbopogon winterianus* (citronella grass) essential oil (CWEO)-based nanoemulsion and evaluated its bio-efficacy against *Plutella xylostella*, a highly destructive pest of cruciferous crops worldwide. CWEO was extracted by hydro-steam distillation method and analysed for its constituents using GC-MS. A stable oil-in-water (O/W) CWEO-based nanoemulsion was developed by low energy emulsification method, using Tween 80 as emulsifier followed by sonication and characterized for its hydrodynamic diameter and polydispersity index (PDI) using Dynamic Light Scattering (DLS) and further assessed for its morphology by Transmission Electron Microscopy (TEM). Significant oviposition deterrent effect of CWEO and CWEO-based nanoemulsion was evident against *P. xylostella* female moths under standard laboratory conditions. The oviposition deterrent index (ODI) values increased significantly at different concentrations of CWEO and CWEO based-nanoemulsion. Both CWEO and CWEO based-nanoemulsion can be used for reduction in egg-laying by *P. xylostella* moths leading to decreased pest infestation and subsequent crop loss.

Keywords: *C. winterianus*; Essential oil; Nanoemulsion; *P. xylostella*; Oviposition deterrence; Crop protection

Biography:

Ms. Nida has done her B.Sc. (Hons.) in Zoology and M.Sc. (Zoology) from University of Delhi. She is a recipient of UGC-JRF Fellowship and currently pursuing Ph.D. in Applied Entomology, specializing in the field of insect pest management. Her research focuses on developing sustainable and eco-friendly approaches for managing economically important agricultural pests, with particular emphasis on botanical derivatives and innovative pest control approaches. Her research work has also been published in various journals of international repute. Through her work, she aims to contribute about translating scientific research into practical solutions that support farmers, protect ecosystems, and enhance crop productivity.

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Ovicidal and Repellent Activity of *Cymbopogon winterianus* Jowitt essential Oil against *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae)



Rupom Pathori^{1*}, Nida^{1,2}, Ankur¹, Alka Gupta¹, and Sanjiv Mullick¹

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Abstract:

The fall armyworm, *Spodoptera frugiperda*, is a highly destructive polyphagous pest that infests more than 350 plant species, with maize as its primary host, causing economic losses of approximately US\$2.4-6.2 billion, if left unchecked. Since its 2018 outbreak in India, it has become a major agricultural threat in the country. Overuse of chemical insecticides has led to resistance and health risks, making plant-based essential oils as safer, eco-friendly alternative for managing this pest. Thus, laboratory studies were conducted to assess the potential of *Cymbopogon winterianus* (citronella) essential oil (EO) for ovicidal activity against the eggs and repellency against neonate larvae of *S. frugiperda*. The citronella EO was extracted using hydro-steam distillation method and chemically characterized by gas chromatography-mass spectrometry (GC-MS). The phytochemical analysis indicated the presence of mono- and sesqui-terpenoids in citronella EO, with citronellal (26.38%), geraniol (24.61%) and citronellol (13.80%) identified as the predominant constituents. Further, laboratory bioassays demonstrated significant concentration-dependent ovicidal activity of citronella EO against *S. frugiperda* eggs, with an LC₅₀ value of 1.58 mg/mL. In addition, citronella EO exhibited strong concentration dependent repellent activity against neonate larvae of *S. frugiperda* in the glass tunnel orientation assay. The above results indicate that citronella EO has considerable potential to be used as an environmentally friendly bioinsecticide for the management of *S. frugiperda* populations within integrated pest management strategies aimed at sustainable agriculture.

Keywords: *Spodoptera frugiperda*, *Cymbopogon winterianus* Essential Oil, Ovicidal Activity, Repellency, Integrated Pest Management.

Biography:

Rupom Pathori holds a B.Sc. (Hons) and M.Sc. degrees in Zoology and is currently pursuing a Ph.D. in Applied Entomology in the Department of Zoology, University of Delhi. He is a CSIR-Junior Research Fellow, working at the Nanobiotechnology Research Laboratory, Dyal Singh College, University of Delhi. His research focuses on development of plant-based and nano-enabled biopesticide formulations for integrated pest management. He has presented his research work at various national and international conferences and aims to promote eco-friendly, sustainable alternatives to synthetic pesticides with reduced environmental impact for effective insect pest control in agriculture.

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Integrating sustainable agriculture and livelihood diversification for rural development in Himalayan regions



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Abstract:

Rural livelihoods in the Himalayan region of Uttarakhand are closely linked to smallholder agriculture practiced under fragile ecological conditions, steep terrain, and increasing climatic uncertainty. In the Uttarakhand's Garhwal region, particularly in Uttarkashi district, traditional farming systems have historically supported livelihood security and sustainable resource use. However, recent shifts toward market-oriented agriculture have altered livelihood structures and intensified pressure on natural resources. This study examines how integrating sustainable agricultural practices with livelihood diversification contributes to overall rural development in a Himalayan context. The study was conducted in Naugaon Block of Uttarkashi district, covering 10 villages with a sample size of 283 rural households. Primary data were collected through structured household surveys and field observations. The assessment captured multiple dimensions including agricultural practices, soil and water management, livelihood diversification indicators etc. Quantitative data were analysed using descriptive and comparative methods, while qualitative insights were used to understand farmers' perceptions. The findings reveal that livelihood diversification through horticulture, livestock rearing, and allied activities has enabled households to cope with declining productivity of traditional crops and fluctuating water availability. At the same time, increased reliance on external inputs and water-intensive crops has intensified soil compaction and placed additional pressure on spring-based irrigation sources in several villages. The study concludes that integrating sustainable agriculture with livelihood diversification offers a viable pathway for rural economic development in the Garhwal Himalayas. Context-specific strategies that strengthen traditional resource management systems while supporting diversified income opportunities are essential for enhancing resilience and improving the overall quality of life in Himalayan rural communities.

Keywords: Rural livelihoods, livelihood diversification, community-led development, skill development, rural employment, market linkage, hill regions, Uttarakhand

Biography:

Pratibha Rawat, Research Scholar in the Department of Rural Technology at Hemvati Nandan Bahuguna Garhwal University, Srinagar Garhwal, Uttarakhand. She is currently working as a Junior Research Fellow under Uttarakhand State Council for Science & Technology funded project. My research focuses on rural livelihood systems in the Himalayan region, with emphasis on sustainable agriculture, livelihood diversification, and integration of indigenous knowledge with scientific practices. She has over two years of experience working with civil society organizations on rural development and community-based initiatives. My research interests include integrated rural development, sustainable natural resource management, and participatory approaches.

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Constitutive morpho-physiological and biochemical diversity among grape (*Vitis* spp.) germplasm with relevance to stress-adaptive breeding

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Abstract:

Grapevine (*Vitis* spp.) productivity and sustainability under changing climatic conditions largely depend on the availability of genetically diverse germplasm possessing inherent stress-adaptive traits. The present study aimed to characterize fourteen grape germplasm accessions, including commercially important rootstocks, cultivars, and wild *Vitis* species, to assess constitutive morphological, physiological, and biochemical attributes with potential relevance to abiotic stress tolerance and future breeding programs.

Morphological characterization was performed based on leaf area, presence and distribution of trichomes, trichome density, and trichome type, as these traits influence leaf microclimate regulation and transpiration control. Physiological traits such as stomatal density, epicuticular wax deposition, leaf chlorophyll content, relative water content, and leaf water potential were evaluated to understand inherent water-use efficiency and photosynthetic stability. Biochemical profiling included estimation of total sugars, reducing sugars, phenols, flavonoids, and leaf Na^+ and Cl^- accumulation, which are known to contribute to osmotic adjustment, membrane protection, and ion homeostasis.

Considerable variability was observed among the germplasm for most traits, indicating a wide spectrum of constitutive adaptive potential. Wild species and selected rootstocks exhibited distinct trait combinations associated with improved water conservation and ionic regulation. Stress-induced metabolites such as proline and malondialdehyde were excluded, as the study focused on baseline trait expression under non-stress conditions.

The observed diversity highlights the value of detailed germplasm characterization in identifying donor genotypes for stress-resilient grape breeding. These constitutive traits provide a foundation for targeted selection, hybridization, and future stress-screening studies aimed at enhancing grapevine adaptability to adverse environmental conditions.

Keywords: Grape germplasm , Morpho-physiological characterization , constitutive stress adaptive traits

Biography:

Debi Prasad Mohanty (born 2002) is a postgraduate researcher in horticultural science with a focused interest in grapevine improvement under abiotic stress conditions. He completed his B.Sc. from the Odisha University of Agriculture and Technology and qualified ICAR AIEEA-PG, receiving the ICAR fellowship for postgraduate studies. He is currently pursuing his M.Sc. at ICAR-Indian Institute of Horticultural Research (IIHR).

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Evaluation of modified indirect solar dryers' (MISDs) performance for sustainable drying Colla pulp *Musa balbisiana*



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Abstract:

This study examines the drying properties and quality attributes of treated and untreated banana pulp (*Musa balbisiana* Colla known as athiya khol, native to Southeast Asia and specially to Northeastern, India) using open sun drying (OSD) and a modified indirect solar dryer (MISD). Fresh banana pulp with an initial moisture content of 80% (wet basis) were dried until safe moisture levels were reached. Because of its regulated thermal environment, improved air circulation and shorter drying time, the MISD achieved a lower final moisture content of 8% at 16 hours, while the OSD technique, which depends on direct exposure to ambient sunshine, produced a final moisture content of 11% at 24 hours. The STD's better drying conditions reduced oxidative degradation and enzymatic activity, which resulted in better nutritional and functional component retention. Bioactive component (TPC, TFC, TTA) and proximate composition were analyzed to assess the dried pulp's quality. The findings showed that MISD-dried banana pulp had considerably greater TPC and TFC than OSD-dried samples, indicating superior antioxidant component storage. The effects of moisture concentration and better organic acid retention were the main causes of the little rise in TTA (0.128 0.0056% db) seen in MISD-dried samples. Due to less exposure to ambient pollutants and less nutrient degradation, proximate compositions were better preserved in the MISD. OSD required 33% higher drying times and produced lower-quality products compared to MISD. Hence, MISD is suitable for the value addition of banana pulp drying and sustainable postharvest processing.

Keywords: Athiya khol, OSD, MISD, Quality determination of dried athiya khol.

Biography:

Titikha Machahary is working in the Department of Instrumentation Engineering as a Research Scholar. My work focusses on the development, characterisation and usage of solar thermal energy storage materials in solar drying systems. Through the use of renewable energy technology, my work seeks to improve product quality, increase drying efficiency and advance sustainable postharvest processing. I am especially interested in thermal performance analysis of solar dryers and dried agricultural product quality assessment. Through my study, I hope to encourage sustainable development and the use of clean energy by contributing to eco-friendly, energy-efficient solutions for agricultural processing and value addition.

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Assessment of nutritional composition and antioxidant activities in foxtail millet



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Abstract:

Foxtail millet (*Setaria italica*) is recognized for its rich nutritional and phytochemical composition, making it a promising candidate as a functional food. This study evaluated the nutritional value and antinutrient properties of foxtail millet powder. Additionally, antioxidant activities of extracts prepared using methanol were assessed through various assays, including total phenolic content (TPC), total antioxidant capacity (TAC), ferric reducing antioxidant power (FRAP), and DPPH free radical scavenging activity. Foxtail millet sample was found to contain 8.32-12.45 g/100 g protein, 60.32-75.33 g/100 g carbohydrates, and 10.33-30.45 g/100 g amylose. The anti-nutrient tannin factor is found at the highest in 33.68 mg/100g. The DPPH activity ranged from 34.78 to 79.67% in all studied genotypes. Among the solvents used, the methanolic extract exhibited the highest (68.26 ± 1.51 mg QE/100 g), TAC (169.40 ± 3.45 mg AAE/100 g), and TPC (70.42 ± 2.34 mg GAE/100 g) ($p < 0.05$). The FRAP assay demonstrated a concentration-dependent increase in antioxidant activity. These findings suggest that foxtail millet possesses valuable nutritional and antioxidant properties, supporting its potential as a functional food to enhance dietary quality and health in rural populations.

Keywords: Antioxidant properties, foxtail millet, nutraceutical

Biography:

Abha Rawat, Ph.D. Research scholar at Hemwati Nandan Bahuguna Garhwal University, Department of Seed Science and Technology at Srinagar Garhwal, Uttarakhand, India. She has expertise in seed quality, phenotypic and DUS characterization, genetic diversity, and biochemical analyses in millet. My recent research work is focused on foxtail millet genotypes. I have published 3 research papers, 9 articles, and 4 book chapters.

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Calcium mediated strategy for rapid acidogenic sludge formation with simultaneous improvement in biohydrogen production


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Abstract:

To overcome the reliance on fossil fuels, green hydrogen could be served as a potent sustainable energy source. The demand of hydrogen is expected to surge from 18.8 to 381.3 million tonnes per year by 2050. Hydrogen is tagged as clean, since the combustion generates zero carbon emissions with water as byproducts. The dark fermentation stands to be one of the hydrogen production technologies; among which acidogenic anaerobic sludge bioprocessing (ASB) is explored for their applicability in waste stream processing. However, to kick start ASB, there is requirement of immobilized support or seed sludge from methanogenic digester, which influence the mass transfer limitation. Thus, based on this, here the formation of acidogenic sludge granules (ASGs) with respect to mixed consortium was evaluated in the influence of calcium salts viz., $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ in continuous stirred tank reactor (CSTR) operation with 10% glucose at 37°C. The hydrogen production was improved with Ca^{2+} , with $\sim 2 \text{ L/L}$; the acidogenic biomass production were higher at 400 mg/L of Ca^{2+} . With respect to this, different organic loading rate were studied 0.05 to 0.3 h^{-1} , where the maximum production rate of 440 mL/L/h was observed at a μ_{max} 0.25 h^{-1} . However, with the absence of Ca^{2+} both hydrogen production rate and μ_{max} was reduced to 360 mL/L/h and 0.2 h^{-1} , respectively. For the initiation of acidogenic granulation with the CSTR at



0.2 h^{-1} dilution rate with Ca^{2+} for 118th hour was opted where a pseudo steady state was achieved. The cellular aggregates collected from the bottom of reactor, when observed with the microscopic snaps and imaging tools showed a higher distribution of flocs in Ca^{2+} mediated system. Also, the size of acidogenic flocs attained a maximum of 1.4 to 1.6 mm at 118th hour with the zeta potential of -16.2 mV. Moreover, enhanced extra polymeric substances were recorded with heightened protein and carbohydrate secretion with the presence of Ca^{2+} . Also, microbial biomass was observed as 3.24 g MLSS/L with the ratio of MLVSS/MLSS, 0.74 g/g. Taken together, the calcium one of macro-elements at

lower concentration, initiated a four-step rapid flocculation with granulation, adsorption, adhesion and multiplication of acidogens which enhanced hydrogen production. Thus, proposing a process design which simultaneously shortens the startup time and improves the ASGs quality which could be applied to acidogenic reactors for wastewater treatment plants in the near future.

Keywords: dark fermentation, acidogenic sludge bioprocessing, Ca^{2+} mediated system, rapid flocculation extra polymeric substances

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Climate-resilient integrated farming system modules as a sustainable strategy for enhancing food, nutritional and livelihood security of smallholder farmers



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Abstract:

In India, increasing population pressure and fragmentation of landholdings have limited horizontal agricultural expansion, intensifying challenges related to food and nutritional security and livelihood stability of smallholder farmers. Under such constraints, climate-resilient vertical intensification through Integrated Farming System (IFS) modules has emerged as a holistic, socially acceptable and environmentally sustainable approach to enhance productivity, profitability and resource-use efficiency. IFS integrates field crops, horticulture, livestock, poultry and fisheries to optimize land, water, nutrient and energy use while supporting income diversification, food diversity and year-round employment. A field experiment conducted during 2022–23 under the 6th cycle of the AICRP on IFS at Odisha University of Agriculture and Technology, Odisha evaluated five major components—cropping systems, horticulture, dairy, poultry and fishery—on 1.2 ha, representing a typical coastal smallholder system. The integrated system achieved a total productivity of 37.06 t rice equivalent yield. Dairy contributed the highest rice equivalent yield (15.14 t) and gross income (₹3,27,040), while horticulture recorded the maximum net income (₹1,40,627) and benefit–cost ratio (3.61), indicating superior profitability and nutritional benefits. Resource recycling accounted for 15% of total input costs, reducing dependence on external inputs and improving nutrient-use efficiency. The system generated 399 man-days of employment and exhibited a carbon-negative balance (–289.2 kg CO₂-eq) due to biomass accumulation and tree-based carbon sequestration. Improvements in soil organic carbon, water-holding capacity, bulk density and nutrient availability reflected enhanced soil health. A Sustainable Yield Index of 0.74 confirmed system stability and resilience to climate variability. Overall, the study establishes climate-resilient IFS modules as an effective strategy to strengthen food, nutritional and livelihood security while promoting environmental sustainability in coastal and other similar agro-ecosystems.

Keywords: Integrated Farming System, climate-resilient agriculture, smallholder farmers, resource-use efficiency, coastal agro-ecosystem

Biography:

Sayani Das is a research scholar in the department of Agronomy at Bidhan Chandra Krishi Viswavidyalaya (BCKV), West Bengal. She is a DST-INSPIRE fellow of the Government of India. She has qualified the ICAR-ASRB NET in 2023 and 2025. She completed her MSc in Agronomy from Odisha University of Agriculture and Technology (OUAT) in 2023, where she was awarded a Gold Medal. Her MSc thesis was titled “Evaluation of Farming System Modules for Improving Profitability of Small Farmers in Coastal Odisha, India.” Her academic interests include integrated farming systems, nutrient management, and sustainable crop production.

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Role of micronutrients in improving vegetable quality

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Abstract:

Micronutrients play a crucial role in improving the growth, yield, and quality of vegetable crops, despite being required in small quantities. Elements such as iron (Fe), zinc (Zn), boron (B), manganese (Mn), copper (Cu), molybdenum (Mo), and chlorine (Cl) are essential for various physiological and biochemical processes in plants. Adequate supply of these micronutrients enhances photosynthesis, enzyme activation, protein synthesis, hormone regulation, and nutrient translocation, which collectively contribute to better vegetable quality. Micronutrients significantly influence quality attributes such as color, flavor, texture, nutritional value, and shelf life of vegetables. For instance, iron and magnesium improve chlorophyll formation and greenness of leafy vegetables, zinc plays a key role in vitamin synthesis and growth regulation, while boron is essential for cell wall development, sugar transport, and fruit set. Deficiency of micronutrients often leads to physiological disorders, poor appearance, reduced nutritional content, and lower market acceptability. Foliar application and soil supplementation of micronutrients have been found to be effective strategies to correct deficiencies and enhance vegetable quality under diverse agro-climatic conditions. Integrated nutrient management practices that include balanced application of micronutrients not only improve crop quality but also ensure sustainable vegetable production. Therefore, understanding the role of micronutrients and adopting appropriate nutrient management practices is vital for achieving high-quality vegetable produce, meeting consumer demand, and improving farmers' profitability while maintaining soil health and environmental sustainability.

Keywords: Micronutrients, Vegetable quality, Iron, Zinc, Boron, Enzyme activation, Photosynthesis, Nutritional value, Shelf life, Integrated nutrient management

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Stomatal behavior under heat & drought stresses



Sandeep Nalla*, Samruddhi Lakde, Sonu Singh, Sameer Singh, Prashant Rai, and Vaidurya Pratap Sahi

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Abstract:

Stomata play a pivotal role in plant survival by mediating the balance between carbon acquisition and water conservation. Under contemporary climate change, this balance is increasingly challenged by the frequent co-occurrence of heat and drought stresses, which impose opposing physiological demands on guard cells. Heat stress promotes stomatal opening to enable transpirational cooling, whereas drought stress enforces closure to prevent hydraulic failure. Classical models derived from single-stress studies are insufficient to explain stomatal behavior under such combined stress conditions, where responses are often non-additive, oscillatory, or paradoxical. More than a century ago, Francis Darwin articulated a foundational insight that remains strikingly relevant: stomata are not passive hydraulic valves but responsive organs capable of integrating multiple environmental signals. We revisit Darwin's conceptual framework and synthesize it with contemporary molecular, cellular, and physiological advances to reposition stomata as integrative cellular decision-making units. Recent discoveries identifying temperature responsive kinases that promote stomatal opening, and their direct antagonism by abscisic acid activated drought signaling kinases, provide a mechanistic basis for how guard cells resolve conflicting thermal and hydraulic stresses at the molecular level.

We examine how signal integration in guard cells emerges from coordinated kinase-phosphatase antagonism, calcium and redox signaling, hormonal crosstalk, and metabolic constraints that collectively shape stomatal responses across temporal scales. Importantly, stomatal behavior under combined heat and drought stress is shown to be constrained by guard cell energy status and redox homeostasis, linking signal computation to cellular metabolic capacity. Finally, we discuss the implications of this integrative framework for crop improvement, arguing that resilience under future climates will depend on dynamic stomatal plasticity rather than static conductance traits

Biography:

Sandeep is a PhD research scholar in Genetics and Plant Breeding at Sam Higginbottom University of Agriculture, Technology & Sciences. My research interests include crop improvement, plant genetics, stress biology, plant physiology, and climate-resilient agriculture. My primary area of research is heat and drought tolerance in Durum wheat.

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Expression of virus tolerance in hybrid and segregating generations



Ramana Parth M*, Shivam Kumar Rai, Shashi Tiwari, Prashant Kumar Rai, and Vaidurya Pratap Sahi
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Abstract:

Viral diseases continue to be one of the major constraints in crop production, often causing heavy yield losses and limiting the effectiveness of chemical control measures. Developing virus-tolerant cultivars therefore remains a practical and sustainable option for disease management. The present investigation was carried out to study the expression of virus tolerance in F_1 hybrids and the pattern of segregation in F_2 populations, with the aim of identifying useful breeding material for resistance improvement. Parental lines showing contrasting reactions to viral infection were crossed to produce F_1 hybrids, which were further advanced to F_2 generations. All generations were evaluated under natural disease pressure, and disease severity was assessed using a standard scoring method and expressed as percent disease index (PDI). The parental lines showed clear differences in their response to infection, which helped in assessing the performance of the derived populations. Several F_1 hybrids recorded lower disease severity compared to the susceptible parent, indicating the role of dominance and hybrid vigor in the expression of virus tolerance. These hybrids demonstrated relatively uniform disease response, suggesting their potential use in hybrid-based breeding strategies. In contrast, F_2 populations exhibited wide variation for disease severity, with plants ranging from highly susceptible to moderately tolerant. The occurrence of transgressive segregants with reduced disease symptoms was also observed, indicating recombination of favorable alleles. The contrasting behavior of F_1 and F_2 generations highlights the importance of using both hybrid performance and segregation patterns in resistance breeding. While F_1 hybrids provide immediate benefits through enhanced tolerance, F_2 populations offer greater scope for selection and development of stable virus-tolerant lines. The findings of this study contribute useful insights for designing effective breeding strategies against viral diseases.

Keywords: Virus, Resistance breeding, F_1 , F_2 , PDI, Genetic variability

Biography:

Ramana Parth M, is a researcher who comes from a farming background, and during farming, and he has faced many problems. He has done his graduation and post-graduation studies related to those problems, and in the future, he also want to work on those issues.

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Estimation of genetic variability and screening of micronutrients (Fe & Zn) in traditional rice (*Oryza sativa* L.) landraces



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Abstract:

The present investigation entitled “*Estimation of Genetic Variability and Screening of Micronutrients (Fe & Zn) in Traditional Rice (Oryza sativa L.) Landraces*” was undertaken to evaluate genetic variability, character association, and micronutrient content in traditional rice landraces. Rice is a major staple food crop, yet polished rice grains are inherently poor in essential micronutrients, particularly iron and zinc, leading to widespread micronutrient malnutrition. Traditional landraces, with their broad genetic base, offer significant potential for improving both yield and nutritional quality. The experimental material consisted of 25 traditional rice landraces evaluated during the kharif season of 2022 at Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The experiment was laid out in a randomized block design, and observations were recorded on thirteen quantitative traits related to growth, yield, and yield components. Analysis of variance revealed highly significant differences among genotypes for all characters studied, indicating the presence of substantial genetic variability.

Estimates of genotypic and phenotypic coefficients of variation, heritability, and genetic advance as a percentage of mean revealed that traits such as grain yield per plant, number of grains per panicle, and biological yield exhibited high heritability coupled with high genetic advance, suggesting the predominance of additive gene action and good scope for improvement through selection. Correlation analysis indicated meaningful associations among yield and its component traits, providing useful information for indirect selection strategies. Grain samples were further analyzed for iron and zinc content using X-ray fluorescence (XRF). Considerable variation was observed among landraces for both micronutrients, with several genotypes showing superior Fe and Zn concentrations. The identified landraces can serve as valuable genetic resources for biofortification and breeding programs aimed at developing high-yielding, micronutrient-rich rice varieties to address nutritional security.

Biography:

She is a master’s student in Genetics and Plant Breeding at Sam Higginbottom University of Agriculture, Technology & Sciences. She has research experience working on the IRRI 3K rice diversity panel, where she was involved in germplasm evaluation. She has also worked on wheat, gaining hands-on experience in field experimentation and trait assessment. She is currently planning to focus her future research on salinity stress, with the objective of understanding plant responses to salinity.

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Harnessing wheat genetic diversity from heat-tolerant, high-yielding varieties for climate-resilient production

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Abstract:

The experimental study on bread wheat included 58 genotypes consisting of 45 F1 hybrids and 10 parental lines, conducted during the Rabi seasons of 2022-23 and 2023-24 at SHUATS in Prayagraj, Uttar Pradesh. Utilizing a randomized block design with three replications, parental lines were involved in a half-diallel cross design. Variance analysis revealed significant differences across all 18 traits under both timely and late sown environments ($\alpha=0.05$), demonstrating substantial genetic variability in bread wheat germplasms and indicating the feasibility of selection-based improvements. Key traits such as plant height, days to first heading, days to 50% flowering, days to maturity, and test weight exhibited minimal differences between genotypic and phenotypic coefficients of variation (GCV and PCV), suggesting that these traits are predominantly under genetic control with lower environmental influence. Conversely, traits like the number of grains per spike and chlorophyll content presented greater GCV-PCV differentials, hinting at a stronger environmental effect. High heritability and significant genetic advance were observed for traits such as test weight, plant height, and days to maturity, underscoring the role of additive gene action and marking these traits as suitable candidates for direct selection in breeding programs. Additionally, days to first heading and days to 50% flowering revealed moderate GCV, high heritability, and moderate genetic advance, indicating promising prospects for genetic enhancement. The pooled mean analysis supported that test weight and days to first heading possessed high genetic variability, heritability, and genetic advance, making them key focuses for wheat improvement initiatives.

Keywords: Genetic Advance, GCV, PCV, Heritability, *Triticum aestivum*.

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Nano pesticides: A modern solution for sustainable plant protection



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Abstract:

Conventional chemical pesticides suffer from low efficiency, with over 90% of the active ingredient lost to the environment through leaching, evaporation, and runoff. This review explores the emergence of nanopesticides as a transformative solution for sustainable agriculture. Also classify various nano-formulations (nanoemulsions, nanocapsules, and metallic nanoparticles), discuss their mechanisms of controlled release, and evaluate their role in reducing the chemical footprint in soil and water. This paper critically evaluates the synthesis of green nanoparticles and their role in improving the photo-stability and target-specificity of pest control agents. Furthermore, the discussion highlights the reduction in the chemical footprint and the mitigation of groundwater contamination. By integrating nanotechnology with Integrated Pest Management (IPM) strategies, nanopesticides offer a high-efficiency, low-dosage pathway to resilient agriculture. The review concludes by addressing the current regulatory hurdles and the toxicity assessments required to ensure the safety of non-target organisms in a sustainable agricultural ecosystem. Furthermore, the paper highlights the current regulatory landscape and the potential of green-synthesized nanoparticles in ensuring global food security by 2030.

Keywords: Nanopesticides, Controlled Release, Sustainable Agriculture, Green Synthesis.

Biography:

Manashvi Dhorajiya, an entomology student at Junagadh Agricultural University with a strong interest in insect pests of crops and their sustainable management. My academic work focuses on fruit flies, insect biology, and integrated pest management strategies. She actively participate in research activities, seminars, and scientific presentations to strengthen both my technical knowledge and communication skills. I have also been involved in academic and cultural events. She aspires to contribute to agricultural development, pest management research, and farmer-oriented solutions in India.

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Effect of natural vitamin E, vitamin C, Choline and herbal liver supplement on serum biochemical parameters in commercial broilers



Sunil Kodler, T.N. Krishnamurthy, H.C. Indresh, and Shilpa M S

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Abstract:

Due to restrictions on the use of certain antibiotics, concerns over their adverse effects, and economic considerations, herbal feed additives are gaining increasing importance in broiler chicken production. Herbs and their bioactive components have been widely investigated as alternative growth promoters because of their ability to stimulate digestion, enhance immune function, reduce inflammation, and provide antimicrobial and antioxidant effects. Considering the above scope in broiler production, a trial was conducted to assess the effect of natural and herbal vitamins and supplements on serum biochemical parameters.

To evaluate the effects of natural (herbal /non synthetic) vitamin E, vitamin C, choline, and a herbal liver supplement on the serum biochemical parameters of commercial broilers, A total of 150 day-old Vencobb broiler chicks were randomly allotted to five treatment groups, each with three replicates of ten chicks. The control group (T1) received a basal diet formulated according to BIS standards, while the treatment groups T2, T3, T4, and T5 received the basal diet supplemented with natural vitamin E, vitamin C, choline, and a herbal liver supplement, respectively, each at a level of 0.1%.

Serum samples were analyzed on 42nd day for serum glutamic pyruvic transaminase (SGPT), serum glutamate oxaloacetate transaminase (SGOT), serum cholesterol, and triglycerides using an automated biochemical analyzer. The results indicated that natural vitamin E and vitamin C supplementation significantly reduced serum cholesterol and triglyceride levels. Choline supplementation had a significant effect on SGPT, serum cholesterol, and triglycerides, while the herbal liver supplement significantly affected SGPT, SGOT and serum cholesterol levels.

Keywords: natural, herbal, serum biochemical

Biography:

Sunil Nagappa Kodler has completed his Master of Veterinary Science (M.V.Sc.) in Poultry Science from Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU). He has qualified the National Eligibility Test (NET) in Poultry Science, demonstrating his strong academic foundation in the discipline. He has been called for an interview for the post of Assistant Professor at KVAFSU and is currently awaiting the selection list. His areas of interest include teaching and research in Poultry Science, with a keen focus on contributing to academic excellence and scientific advancement in the field.

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Persistence and ecotoxicological evaluation of butachlor and its metabolites in different soil order



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Abstract:

Herbicides play an important role in modern agriculture, yet their persistence and transformation in secondary products in the environment often raise environmental concerns. Butachlor, a pre-emergence chloroacetanilide herbicide, is widely used in paddy fields for effective weed management. In soil, it undergoes microbial and chemical degradation, forming several metabolites that may differ in mobility and toxicity. Understanding the environmental behaviour of both the parent compound and its metabolites is therefore essential for assessing potential risks to ecosystem and non-target organisms. In the present study, the persistence and dissipation behaviour of pretilachlor and its six metabolites were investigated in four contrasting soil order Alfisol, Inceptisol, Entisol, and Aridisol, under controlled laboratory conditions. The experiment was conducted at the recommended and double-recommended doses of butachlor. Residues of butachlor and its metabolites were periodically monitored using HPLC. The dissipation of butachlor and its metabolites followed first-order kinetics, with the one of the metabolites exhibiting longer persistence than other metabolites as well as parent compound. Variations in half-lives among soils were influenced by differences in organic carbon content, texture, and microbial activity. The study further evaluated their effect on selected non-target organisms, including algae, honeybees, earthworms, and fish to establish an eco-toxicological link between chemical persistence and biological effects. Overall, the findings emphasize the role of soil properties and environmental factors in governing herbicide fate and toxicity, supporting improved risk assessment and sustainable use of butachlor in rice-based systems.

Keywords: butachlor, metabolites, persistence, toxicity

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Precision allele engineering of FAD2 for enhanced oleic acid content and oil quality improvement in mustard (*Brassica spp.*)



New Muskan Yadav

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Abstract:

Mustard oil quality is a prime target for crop improvement because it contains a high proportion of polyunsaturated and very long-chain fatty acids, which reduce both oxidative stability and nutritional quality. Fatty Acid Desaturase 2 (FAD2) is a key regulator of seed oil composition, catalysing the enzymatic conversion of oleic acid to linoleic acid. Therefore, it is a prime target for genetic modification. This proposal will focus on precision engineering of different FAD2 alleles in seeds to increase oleic acid content while preserving agronomic performance. Both CRISPR-Cas-based mutagenesis and various base-editing approaches will be used to develop a wide range of FAD2 alleles with reduced, fine-tuned enzymatic activity. With this broad set of alleles, fatty acid pathway regulation can be achieved without the penalties of complete gene knockdown. At the same time, complementary genes such as FAE1 will be modified simultaneously to minimise erucic acid content. Fatty acid profiling, gene expression analysis, and phenotypic evaluation will be employed to establish genotype–phenotype relationships and identify superior alleles. The outcomes of this work are expected to deliver high-oleic mustard lines with improved nutritional and industrial value, while providing fundamental insights into lipid metabolic regulation and a scalable allele-engineering framework for oilseed crop improvement.

Keywords: Allele engineering, FAD2, CRISPR, Fatty acid

Biography:

New Muskan Yadav is an M.Sc. student at Central Agricultural University, Imphal, India. His current research focuses on a widely consumed local mustard landrace of Manipur, with emphasis on fatty acid composition and oil quality traits. He has a strong research interest in CRISPR-based functional genomics, fatty acid metabolism, and the development of nutritionally improved oilseed crops. His academic interests lie at the interface of plant molecular genetics and oilseed crop improvement.

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Gender-based farm wage differential: A case study of Indian States



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Abstract:

The objective of the present paper is to examine male-female wage differentials in agriculture sector among Indian states. Gender based time series comparable agriculture-wage data for seventeen states i.e., A.P, Assam, Bihar, C.G, Gujarat, Haryana, H.P, Karnataka, Kerala, M.P, Odisha, Rajasthan, Tamilnadu, Tripura, U.P, U.K, W.B for the period 2012-2023 have been taken from EPWRF. Inter-state and intra-state gender based wage differential and its decomposition have been estimated through econometric models using Shapley Value [Araar A and Duclos JY(2008)]and Lerman - Yitzhaki's (1985) approach.

Empirical results related to Inter-state decomposition of male-female farm wage differential over the years 2012-2023 indicate that Gini coefficient has reduced marginally. Similarly, intra-state decomposition for majority of the states, decomposition parameters as income share, Gini index, absolute contribution and relative contribution have been found higher for male-workers as compared to female-workers. It is significant to observe that at all India level, relative contribution of male workers stood at 0.5201 while it stood 0.4799 for female workers during 2012-23. Thus, empirical results indicate that inter-state as well as intra-state gender based farm wage differences in India still persists and female workers in Indian farm sector are victims and are facing wage discrimination. It is against the spirit of the Indian Constitution which asserts gender equality in terms of opportunity (education, income, wages etc.) as well as empowering women (Sustainable Development Goal 5). The issue must be addressed effectively by the policy makers to rectify such distortions and to ensure women empowerment in Indian agriculture sector.

Keywords: Male-Female Farm Wage, Gini coefficient, Wage Decomposition, Araar A and Duclos JY-Index, Lerman – Yitzhaki-Index.

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From participation to prosperity: Impact of the National Rural Livelihood Mission on livelihood security of rural women



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Abstract:

Livelihood insecurity remains a prime concern for low income households. To provide secured livelihood to rural poor, the government of India has introduced a self-employment poverty alleviation programme namely National Rural Livelihood Mission. NRLM has emerged as a transformative intervention for enhancing livelihood security among rural women in India. Through the Self-Help Group (SHG) model, NRLM has mobilized rural women, creating platforms for their economic empowerment and social transformation.

The present study empirically examines the impact of NRLM on the livelihood security of rural women. Data were collected from 262 respondents (including both beneficiaries and non-beneficiaries) through a structured questionnaire from Pauri and Udham Singh Nagar districts of Uttarakhand state. The impact of the programme has been estimated using propensity score matching (PSM) method. Livelihood security was evaluated through various dimensions, encompassing food, economic, health, educational, social, institutional, and infrastructural security. The findings reveal that a majority of respondents (63.74%) exhibited a medium level of livelihood security. Impact assessment using Propensity Score Matching showed a statistically significant Average Treatment Effect on the Treated (ATT). The average livelihood security score for beneficiaries (48.08) was much higher than that for non-beneficiaries (37.02), with a mean difference of 11.07 and a t-statistic of 3.35. This confirms that being a part of DAY-NRLM has a very positive effect on women's livelihood security. The study also highlights that DAY-NRLM's direct livelihood and financial interventions have had the most pronounced impact on economic and welfare-related dimensions.

Keywords: livelihood security, Impact evaluation, propensity score matching, rural women

Biography:

Pooja Goswami is a committed research scholar at G. B. Pant University of Agriculture and Technology, Pantnagar, with a strong academic background in Agricultural Extension and Communication. She holds an M.Sc. degree in the discipline and is currently pursuing a Ph.D. in the same field. A UGC-NET JRF awardee, she has been actively engaged in research since 2022, focusing on issues related to rural development, women empowerment, and livelihood security. Her academic profile includes participation in national-level workshops and seminars, along with contributions to research publications. Known for her dedication, perseverance, and professional competence, she demonstrates a strong commitment to academic excellence.

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Biofloc technology: Evaluational trajectory, conceptual structure, operating principles and system design – an overview



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Abstract:

Biofloc Technology (BFT) has emerged as a promising and sustainable aquaculture practice aimed at addressing critical challenges such as water scarcity, increasing feed costs, and environmental pollution associated with conventional aquaculture systems. The technology is based on the manipulation of microbial communities, particularly heterotrophic bacteria, to convert nitrogenous metabolic wastes into microbial biomass through effective carbon - nitrogen (C : N) ratio management. This microbial biomass, referred to as biofloc, serves as an additional proteinrich feed source while simultaneously improving water quality. In India, biofloc technology has gained considerable attention due to its suitability for intensive shrimp and fish culture under limited water exchange conditions. Extensive research conducted by ICAR institutes, especially the Central Institute of Brackish water Aquaculture (CIBA), and Indian universities has demonstrated the effectiveness of BFT in improving growth performance, feed conversion efficiency, survival rate, and immune response of cultured species such as *Litopenaeus vannamei* and *Penaeus monodon*. This review summarizes the evaluational trajectory of biofloc technology, its conceptual structure rooted in microbial ecology, key operating principles including aeration and carbon supplementation, and system design considerations under Indian farming conditions. Overall, biofloc technology represents an environmentally responsible and scientifically validated approach with significant potential for sustainable aquaculture development in India.

Keywords: Biofloc technology, Sustainable aquaculture, Microbial nutrient recycling, Carbon - nitrogen ratio, Intensive culture systems, Indian aquaculture.

Biography:

Kumar Siddharth is a postgraduate student of Agriculture, specializing in Agronomy, with a strong passion for sustainable and eco-friendly farming practices. He is deeply interested in sustainable aquaculture, microbial-based farming systems, and modern agricultural technologies that support environmental protection and rural development. Currently, he is working on a research trial titled Effect of Bio-fertilizer and Foliar Application of Zinc on Growth and Yield of Red Rice. He has also published a research paper on the use of smart technologies such as IoT, AI, and precision farming in agriculture. Always curious and motivated, he enjoys exploring new research ideas to improve agricultural productivity and sustainability.

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Parametric growth modelling and instability analysis of Odisha's ragi area, yield, and production

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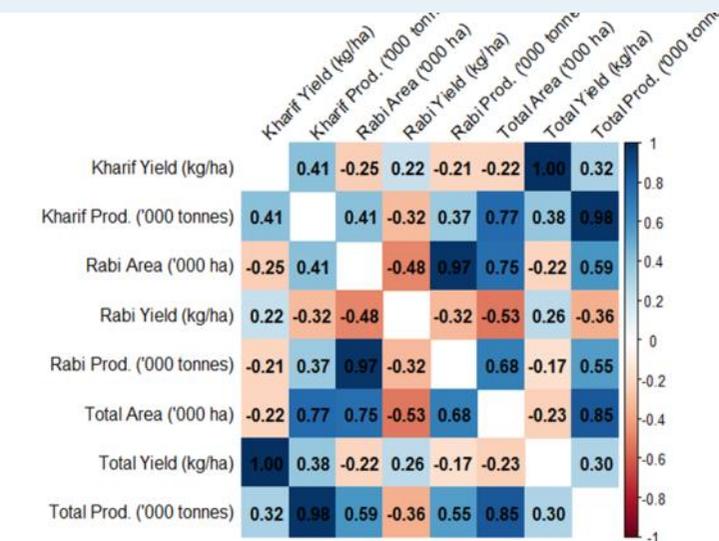
Abstract:

The current study aims to investigate the long-term behaviour of Ragi (finger millet) agriculture in Odisha by applying parametric growth models to assess area, yield, and production over the Kharif and Rabi seasons. This thesis examines the long-term dynamics of Ragi agriculture in Odisha using full parametric growth models of agricultural area, yield, and production data from 1970-71 to 2019-20. The primary objectives include developing and comparing parametric growth models to identify temporal trends in Ragi cultivation, determining the best-fit growth model through rigorous diagnostic criteria and statistical fit indices, and quantifying growth rates as well as the components of instability for the selected variables.

The analyzed dataset encompasses 50 years of Ragi cultivation records from both the Kharif and Rabi seasons in the state of Odisha. The correlation study reveals intricate interdependencies among the variables, showing moderate to strong correlations between total area, yield, and production indicators. Notably, total output exhibits a robust positive correlation with both Kharif and Rabi production figures (0.98 and 0.85, respectively), while total yield demonstrates a moderate positive correlation with Kharif and Rabi yields. Conversely, some negative correlations between area and yield components suggest potential replacement effects or variations in cultivation intensity.

To capture the diverse growth trajectories of the three primary variables, the research employs a range of parametric growth models, including linear, quadratic, exponential, and compound models. Model diagnostic criteria such as the coefficient of determination, standard error, Durbin-Watson statistic, and mean absolute percentage error are utilized to identify the most suitable model for each variable. The selected best-fit models then form the basis for calculating instantaneous growth rates and deconstructing the observed variances into trend-based growth and components of cyclical instability.

Figure: - Correlation Heat Map for Area, Yield and Production of Ragi



This study enhances our understanding of the dynamics of Ragi cultivation in Odisha by offering empirical insights into productivity trends and patterns of area expansion. These findings can inform agricultural policy and production forecasting strategies. The growth models identified, along with the quantified stability indices, equip stakeholders with evidence-based tools to assess sector performance and anticipate future Ragi production capacity in the region.

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Nutritional profiling analysis in Amaranth germplasm

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Abstract:

Amaranth (*Amaranthus* spp.) represents a resilient leafy vegetable with considerable potential to enhance nutritional security under diverse production environments. To establish its leafy use value in India, we evaluated 57 accessions (indigenous and exotic) including three commercial checks for mineral nutrients (N, P, K, Ca, Mg, S, Fe, Zn, Cu, Mn, B) and heavy metals (As, Pb, Cd, Ni, Cr). Plants were grown in an augmented block design, and nutrient profiling was performed using digestion-based methods with microwave plasma atomic emission spectroscopy (MP-AES). Significant variation was observed for most macronutrients (N, P, Ca, Mg, S) and micronutrients (Fe, Zn, Cu, Mn, B). The check cultivar, Pusa Kiran exhibited high content of Ca and Mg concentrations. IIHR-B-AM02 and IC-0647405 showed relatively high concentrations of key macronutrients, particularly N, K, Ca, and Mg, which are vital for metabolic functions and bone health. Principal component analysis (PCA) revealed five principal components explaining >80% of the total variation, while cluster analysis grouped accessions into five nutritional clusters. Strong correlations between macro- and micronutrients indicated shared uptake pathways. High heritability with genetic advance for several traits suggested scope for improvement through selection. The results demonstrate the value of vegetable amaranth germplasm as a rich reservoir of nutritional diversity and highlight the role of multivariate tools in identifying elite lines for future cultivar development.

Keywords: *Amaranthus*, Mineral nutrients, heavy metals, multivariate analysis, genetic analysis, leafy vegetable

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Financial stability- A pictorial perception of migratory farmers



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Abstract:

Agriculture continues to be the backbone of rural livelihoods in many parts of Odisha. However, persistent challenges such as low profitability, small and fragmented landholdings, limited irrigation facilities, and rising costs of cultivation have reduced the economic sustainability of farming. These constraints have forced a considerable number of farmers to migrate to urban areas and other states in search of alternative employment. In Kalamba Gram Panchayat of Buguda Block, Ganjam District, this trend has resulted in large areas of cultivable land remaining unused or poorly managed.

At the same time, farmers possessing relatively larger landholdings face difficulties in fully utilizing their land due to labour shortages and financial constraints. This study explores a commercial farming approach based on land leasing, where idle agricultural land belonging to migrant farmers and large landholders is brought together for collective cultivation. Under this model, landowners receive a fixed and assured lease income, while agricultural operations are carried out using improved agronomic practices, mechanization, and planned crop management linked to market demand.

The proposed framework also creates employment opportunities for landless labourers, women, and returning migrant workers within the village, thereby addressing rural unemployment and reducing migration pressure. The findings demonstrate that this commercial farming model enhances land use efficiency, increases agricultural output, and contributes to more stable rural incomes. Overall, the study highlights the potential of land-leasing-based commercial farming as a sustainable and replicable solution for strengthening rural livelihoods and addressing agricultural underutilization in Buguda Block and similar rural regions.

Keywords: Commercial Agriculture; Land Leasing System; Rural Migration; Employment Generation; Land Use Efficiency; Sustainable Rural Development; Odisha

Biography:

Chandana Pradhan is an MBA student specializing in Agribusiness Management at Sri Sri University. His academic training focuses on understanding rural economic systems, agricultural value chains, and livelihood sustainability. She has a strong research interest in rural livelihoods, tribal culture, and development, with particular emphasis on socio-economic challenges faced by marginalized and migratory farming communities. Through academic coursework and field-based exposure, she has developed an analytical perspective on land-use practices, income stability, and rural transformation. Her work aims to bridge policy, grassroots realities, and sustainable development approaches to enhance rural economic resilience. She actively engages in research-oriented academic activities and aspires to contribute to inclusive and evidencebased rural development strategies.

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Harnessing agritourism to rural economic transformation in India: evidence using emerging case studies with special reference to Odisha

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Abstract:

Agritourism is currently becoming popular in India as a new rural development policy that incorporates agriculture and tourism to improve farm earnings and spur the local economies. The present paper will discuss the economic importance of agritourism in India, and particularly, in the state of Odisha, by reflecting on the emerging projects. Based on the case studies like community-based eco-agritourism in Koraput, tribal farm experiences in Kandhamal, and integrated farm tourism models in Khordha, the study assesses the role of agritourism in diversifying income; creating employment; and entrepreneurship in the rural areas. The discussion emphasizes the role of agritourism in alleviation of dependence on climate-sensitive agriculture by assisting small and marginal farmers and encouraging value addition, through local cuisine and handicrafts and cultural experiences. Economically agritourism creates the multiplier effects as it provides the enhancement of backward and forward integration with other related industries like transportation, hospitality, and local markets. Government efforts, policy support and institutional set ups that enable the development of agritourism are also reviewed in the paper. Nevertheless, infrastructure, skills, exposure to marketing and policy fragmentation are some of the issues that continue to pose significant bottlenecks. The paper suggests that agritourism has a great potential in the future of Odisha and India as it has been provided a specific policy, training assessment for capacity building, online marketing, and sustainable business models, which will aid in inclusive and resilient rural economic development.

Keywords: Agritourism, Rural Economy, Odisha, Income Diversification, Sustainable Development, Agribusiness.

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Heterosis Exploitation in Cotton (*Gossypium* spp.) through Hybrid Seed Production Systems

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Abstract:

Hybrid seed production in cotton (*Gossypium* spp.) constitutes a critical component of contemporary cotton improvement programs, primarily aimed at exploiting heterosis to enhance seed cotton yield, fiber quality and adaptability across diverse agro-climatic environments. Although cotton is predominantly a self-pollinated crop, the successful development and commercialization of hybrids have demonstrated the practical utility of heterosis breeding in this species. This abstract provides a comprehensive overview of the principles, techniques and agronomic significance of hybrid seed production in cotton. Various approaches are employed for hybrid seed production, including conventional hand emasculation and pollination, genetic male sterility (GMS) systems, cytoplasmic male sterility (CMS) systems and the application of chemical hybridizing agents (CHAs). These methods differ in terms of operational efficiency, cost, scalability and the maintenance of genetic purity. Effective hybrid seed production necessitates stringent adherence to agronomic and genetic requirements, such as synchronization of flowering between parental lines, appropriate isolation distances, optimal male to female row ratios, systematic rouging and efficient pollination management. The widespread adoption of hybrid cotton has resulted in significant improvements in productivity, fiber length, strength and uniformity, along with enhanced tolerance to biotic and abiotic stresses. Despite existing challenges, including high labor requirements, elevated seed costs and complexities associated with maintaining male sterility systems, continuous advancements in breeding strategies and seed production technologies are improving efficiency and reliability. Overall, hybrid seed production in cotton remains a sustainable and effective strategy for meeting the growing demand for superior fiber quality and ensuring productivity gains in commercial cotton cultivation.

Keywords: Hybrid Cotton, Heterosis, Male Sterility, Hybrid Seed Production, *Gossypium* spp., Cotton Breeding, Fiber Quality and Agronomic Management.

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Genetic divergence analysis of Maize hybrids for morphological and Quantitative traits under Prayagraj agro-climatic conditions



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Abstract:

The present investigation entitled “Evaluation of Maize Hybrids for Morphological and Quantitative Traits under Prayagraj Agro-Climatic Conditions using D² Analysis” was conducted during the Rabi 2024 season at the Crop Research Farm, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. A total of 26 diverse maize hybrids were evaluated to assess the extent of genetic variability and divergence using analysis of variance (ANOVA), variability parameters (genotypic and phenotypic coefficients of variation, heritability, and genetic advance), and Mahalanobis D² statistics. The analysis of variance revealed highly significant differences among hybrids for all 15 quantitative and qualitative traits, indicating the presence of substantial genetic variability. Traits such as field weight, grain weight per plant, biological weight, and grain yield per hectare exhibited high GCV, PCV, heritability, and genetic advance, suggesting strong genetic control and greater scope for improvement through selection. In contrast, days to maturity showed low variability and heritability, indicating a greater influence of environmental factors.

Based on D² analysis, the hybrids were grouped into five distinct clusters, reflecting considerable genetic diversity. Cluster IV, although consisting of a single hybrid, exhibited maximum genetic divergence along with superior yield and agronomic performance, indicating its potential use in hybridization programs. Cluster III was characterized by higher grain weight and kernel number, while Cluster I showed early maturity and desirable ear traits. Traits contributing most to genetic divergence included field weight, biological weight, and grain yield components. The study identified VH171310, ZH22698, Commercial Check-1, ZH20379, and VH183007 as superior hybrids. These genetically diverse and high-yielding hybrids can be effectively utilized for direct cultivation or as parental lines in future maize breeding programs to enhance productivity and adaptability under Prayagraj agroclimatic conditions.

Biography:

Sachin Rajesh Awachar is an agricultural researcher pursuing a Ph.D. in Genetics and Plant Breeding at the Naini Agriculture Institute, SHUATS, Prayagraj. He completed his M.Sc. (GPB) from ITM University, Gwalior, and B.Sc. Agriculture from VNMKV, Parbhani. His doctoral research focuses on Genotype × Environment interaction and identification of high-yielding, stable maize (*Zea mays* L.) hybrids for stress-vulnerable agro-ecologies of Eastern Uttar Pradesh. He is actively collaborating with CIMMYT on multi-environment trials and hybrid evaluation, aiming to develop climate-resilient maize and strengthen sustainable agriculture in India.

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Identification of SSR marker linked fruit flavour QTL flv1.4 aiding for marker-assisted selection in muskmelon (*Cucumis melo* L.) flavour trait



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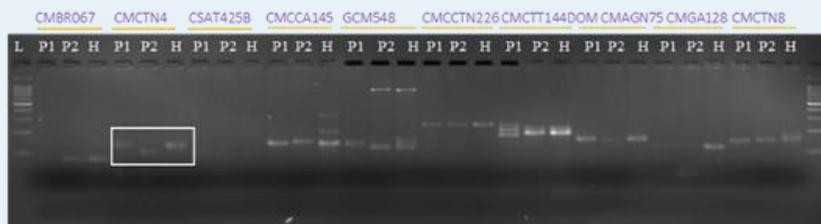
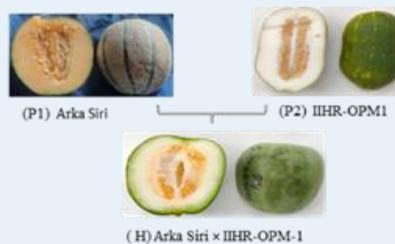
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Abstract:

Improvement of fruit flavour in melon (*Cucumis melo* L.) remains a major breeding challenge, as conventional selection has historically emphasized yield, uniformity, and shelf life at the expense of sensory quality. This constraint is primarily due to the complex and polygenic inheritance of flavour, which is governed by interactions among sugars, organic acids, and volatile aroma compounds, coupled with the lack of rapid and reliable phenotyping methods for consumer preference. Marker-assisted selection (MAS) provides an efficient approach for flavour improvement by facilitating the precise and selection of identified favourable alleles. In the present study, SSR markers were evaluated in the parents and their hybrid derived from an intraspecific cross between Arka Siri (*Cucumis melo* var. *reticulatus*) and IIHR-OPM-1 (*Cucumis melo* var. *conomon*), characterized by a strong musky aroma and high total soluble solids (TSS) but possesses low fruit firmness, whereas IIHR-OPM-1 is an odourless, low-TSS genotype with high fruit firmness. Among the SSR markers screened, the CMCTN4 found to be polymorphic for muskmelon fruit flavour trait, the QTL-linked marker *flv1.4* showed a clear association with fruit flavour. The identified CMCTN4 marker can effectively deployed fruit flavour improvement through marker assisted selection in elite breeding backgrounds to accelerate the development of aromatic melons.

Keywords: Cucumis, fruit flavour; intraspecific cross, MAS, melo



Biography:

Sowbiga Rangaraj, Research Scholar at ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka, Indian working on “Genetic improvement of muskmelon for fruit quality traits”.

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Livelihoods vulnerability of farmers in flood affected agro-ecosystems in Ganjam, Odisha



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Abstract:

Agriculture and farming communities have distinct significance in the Indian context as far as socio-economic development is concerned. There are several risks which continue to plague agriculture as well as farmers. Of late, the threat of climate change vulnerability looms larger. Planned adaptation, right kind of technologies and policies for farming and communities are highly essential to increase the household resilience to climate change. This study was designed to examine the farmers' coping behaviour, adaptation strategies, comparative vulnerability of different social groups and communities, field level impact of climate change, and role of extension system in the changing scenario. The present study was conducted in the Ganjam district of Odisha. The major contributors in livelihood vulnerability of Ganjam, were number of natural disasters (11.98 %), annual family income (9.53 %), damage of house due to natural disaster (5.98 %), land-holding (5.59 %), possession of water purification system (5.34 %), possession of transportation means (5.34), extent of crop loss due to natural disaster (4.51 %), etc. Ganjam district scored 0.492 in LVI with the highest exposure to natural disasters (index value = 0.515). The exposure to natural disasters (25.6 %) was found as the top contributor in the LVI score. The contribution of financial capital (about 20 %) and physical capital (about 19 %) were also considerably high in Ganjam. Farmers perceived barriers for effective adaptation to current climatic risks in Ganjam were lack of knowledge about adaptation strategies (mean = 4.71), poor economic status of farmers (mean = 4.64), less community initiatives (mean = 4.51), labour constraints (mean = 4.34).

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Effect of organic nutrient sources and enriched Banana *Pseudostem* Sap on growth, yield, quality and economics of green gram (*Vigna radiata* L.) under organic farming

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Abstract:

A field experiment was conducted during the rabi season of 2020–21 at the certified Organic Farm of Navsari Agricultural University, Navsari, Gujarat, to evaluate the effect of different organic nutrient sources on growth, yield, quality and economics of green gram (*Vigna radiata* L.). The experiment was laid out with twelve treatments comprising recommended dose of nitrogen (RDN) supplied through NADEP compost, vermicompost and Ghan-jivamrut–jivamrut combinations, with and without foliar application of Enriched Banana *Pseudostem* Sap (EBPS), cow urine and vermiwash. Results revealed that growth and yield attributes such as plant height, number of branches per plant, number of pods per plant, grain yield, stover yield and crude protein yield were significantly influenced by organic nutrient management practices. Application of 100% RDN through vermicompost combined with EBPS @ 1% (T6) recorded the highest plant height at harvest, number of pods per plant, grain yield (11.2 q ha⁻¹), stover yield (22.7 q ha⁻¹) and crude protein yield (203.9 kg ha⁻¹), which was statistically on par with treatments receiving NADEP compost or vermicompost along with EBPS or vermiwash. Crude protein content was not significantly affected by the treatments. Economic analysis indicated that the highest gross (₹1,05,704 ha⁻¹) and net returns (₹64,001 ha⁻¹) were obtained with T6, whereas the maximum benefit–cost ratio (1.62) was recorded under 100% RDN through NADEP compost + EBPS @ 1% (T2). The study concluded that integration of solid organic manures with liquid organic formulations, particularly EBPS, enhances productivity and profitability of green gram under organic farming systems.

Keywords: Organic farming, organic nutrients, Enriched Banana *Pseudostem* Sap, growth, yield and economics of the crop.

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Variation in auxin induced rooting response of tomato genotypes and its association with fruit yield

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Abstract:

Tomato (*Solanum lycopersicum*L.) is the most important horticultural crop worldwide. The demand for the crop is year-round, owing to the versatility of its usage in both fresh and processed food preparation. Newly developed crop genotypes need field trials for selection of high yielding genotypes. These trials involve considerable effort and expenditure. In the present investigation an attempt has been made to study variation in auxin response of tomato genotypes and establish relationship between auxin sensitivity and yielding ability. The experimental material comprised of 22 tomato genotypes. In field experiment observations were recorded on plant height, fruits/plant, weight of fruit, polar and equatorial diameter of fruits and fruit yield/plant. Auxin response of the genotypes was studied by treating stem cuttings in 500 ppm of IBA solution for 45 seconds and observations were recorded on root length, number of lateral roots, fresh root weight and frequency of rooted cuttings on 10th day after treatment. Results on field data revealed significant variation among the genotypes in respect of all the characters under study. Fruit yield/plant varied from 718.50 to 2437.00 g with an average of 1496.64 g. Arka Rakshak recorded the highest yield of 2437.00 g. Pusa Ruby recorded the lowest yield (718.50 g). Results on laboratory study revealed that the longest root in case of IBA treated stem cuttings was recorded in BT 10 (4.17 cm) and the shortest in BT 306-1-2 (1.21 cm). Number of lateral roots of IBA treated stem cuttings varied from 12.23 (BT 429-2-2) to 47.53 (BT 317) with an average of 27.07. Fresh root weight of IBA treated stem cuttings ranged from 0.020 (BT 429-2-2, BT 306-1-2, BT 17) to 0.120 g (BT 10) with an average of 0.060 g. Frequency of rooted cuttings ranged from 0.30 to 1.00. Auxin response of the genotypes was expressed in terms of auxin sensitivity index. ASI parameter in case of IBA treated stem cuttings exhibited significant and positive correlation with yield (0.562). The present study reveals that auxin sensitivity of tomato genotypes could be used as an indicator for screening of high yielding tomato genotypes at seedling stage.

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Identification of superior best performing advanced breeding lines of pole beans derived from the cross Arka Sukumol × Arka Arjun for pod yield and resistance to rust disease & suitable for evaluation in Odisha

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Abstract:

French bean (*Phaseolus vulgaris* L.) is an important vegetable crop cultivated in many agroclimatic zones in India. French beans are broadly classified as Bush bean and Pole bean based on their determinate and indeterminate growth habits, respectively. ICAR-Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bangalore had developed a variety 'Arka Sukumol', which is characterized by indeterminate growth habit/pole bean, photo-insensitive, green coloured oval shaped stringless pod with 20–23 cm length and resistant rust disease. Arka Arjun has determinate growth habit/bush bean photo-insensitive, pods are green coloured round or pencil type pods, stringless and tolerant to high temperature upto 36 °C. We have effected the crosses between Arka Sukumol × Arka Arjun and developed 84 pole type advanced breeding lines (F11 generation) and evaluated for in kharif, rabi and summer seasons resulting in the identification of promising advanced breeding lines for high pod yield and rust resistance. The SCAR marker assay for rust resistant governing Ur genes showed many advanced breeding lines showed the presence of many Ur genes such as Ur-3, Ur-4, Ur-6, Ur-7 and Ur-14 combined with high pod yield and varying degrees of resistance to rust disease.

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Screening for YVMV resistance in Okra hybrids at natural hotspot area at CHES, Bhubaneswar North East region of Odisha

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Abstract:

Okra (*Abelmoschus esculentus* [(L.) Moench]) is an important traditional as well as commercial vegetable. Biotic stresses such as Yellow Vein Mosaic Virus (YVMV), Enation Leaf Curl Virus (ELCV), and Tobacco Streak Virus (TSV) are major constraints in okra cultivation. Among these, YVMV and ELCV are the most destructive diseases, causing severe yield losses ranging from 90 to 100%, depending on the stage of infection. Chemical management of viral diseases results in pesticide residues in produce, development of insect resistance and environmental pollution. Therefore, cultivation of virus-resistant varieties or hybrids remains the most effective and sustainable management strategy. The present study aimed to screen newly developed okra hybrids for resistance to YVMV along with yield and quality performance under natural hotspot conditions in the North-East region of Odisha. The experimental material comprised 183 hybrids, three commercial checks (Sarnesh, Radhika, and Arka Nikita), and one susceptible check (ACC 1685), which were evaluated during summer 2025 at ICAR-IIHR-CHES, Bhubaneswar. Among the hybrids evaluated, 25 showed complete resistance with 0% YVMV incidence, 16 were moderately resistant, 17 were moderately susceptible, and 125 were highly susceptible. The susceptible check ACC 1685 recorded 100% YVMV incidence. Among the commercial checks, Sarnesh was resistant (0% incidence), while Radhika and Arka Nikita recorded 30% and 60% incidence, respectively. Among all hybrids, IIHR-385 × IIHR-1747 recorded the highest yield (21.34 t/ha) with complete resistance to YVMV, followed by IIHR-299 × IIHR-1747 (19.35 t/ha, 0% incidence). Notably, resistant hybrids originated from diverse geographical regions, indicating wide genetic diversity. These resistant R × R combinations possess unique alleles/genes that can help broaden the genetic base and aid in developing superior YVMV-resistant okra hybrids in future breeding programs.

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Metagenomics Insights into microbial biodiversity of wild Brinjal (*Solanum* spp.) relatives



Satyapriya Singh*, Gobinda Chandra Acharya, Manas Ranjan Sahoo, and Deeptismita Nayak

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Abstract:

Brinjal (*Solanum* spp.) wild relatives host diverse microbial communities that significantly influence plant health, stress tolerance, and resistance to pests and diseases. In this study, we examined the microbial biodiversity associated with five brinjal wild relatives namely *Solanum mammosum*, *S. sysimbrifolium*, *S. torvum*, BRS-6, and CHB-5 along with cultivated variety Arka Neelachal Shyama using a metagenomics approach. These species represent a wide genetic and ecological spectrum within the genus *Solanum*. Metagenomic profiling revealed marked variation in microbial community composition and structure among the studied species. *S. mammosum*, *S. sysimbrifolium*, *S. torvum* were predominantly associated with the order Enterobacterales, with *Enterobacter* as the major genus. However, *S. mammosum* exhibited a distinct microbial signature characterized by dominance of the order Burkholderiales, primarily represented by the genus *Burkholderia*. In contrast, *S. sysimbrifolium* and *S. torvum* harboured microbial communities enriched with taxa associated with the order Solanales. Moreover, CHB-5 showed relatively higher diversity of *Burkholderia*, whereas Arka Neelachal Shyama displayed a more even distribution of multiple bacterial orders, suggesting a stable and diverse microbiome. A considerable proportion of sequences were classified as “Unclassified” or “Other,” particularly at lower taxonomic levels, indicating the presence of novel or poorly characterized microbial taxa. Overall, the study demonstrates distinct, host-specific microbial assemblages shaped by genetic and ecological factors, highlighting the potential of wild *Solanum* species as reservoirs of beneficial microbes for sustainable brinjal improvement.

Keywords: Solanum, metagenomics, microbial diversity, wild relatives, plant microbiome

Biography:

Dr. Satyapriya Singh is an accomplished entomologist with a Ph.D. from ICAR-IARI, New Delhi, specializing in sustainable pest management, invasive pest ecology, toxicology, and insect molecular biology. He has published 40+ peer-reviewed papers in high-impact journals and made seminal contributions by elucidating phosphine resistance mechanisms in *Tribolium castaneum*. He has been associated with over 20 ICAR and externally funded projects, contributed to invasive pest management, indigenous knowledge documentation, and farmer outreach. Recipient of several national awards, Dr. Singh is an active academic mentor, peer reviewer, and scientific leader in eco-friendly agriculture.

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Life cycle–based sustainability assessment of Litchi-based integrated farming systems toward carbon neutral agriculture



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Abstract:

The transition toward carbon-neutral agriculture requires farming systems that enhance productivity while minimizing environmental burdens. Litchi-based Integrated Farming Systems (IFS), widely practiced in eastern India, offer a promising pathway by synergistically combining perennial orchards with complementary enterprises. This study presents a life cycle–based sustainability assessment of litchi-based IFS in Bihar, India, with a specific focus on their potential to achieve carbon neutrality. Using a cradle-to-farm-gate life cycle assessment (LCA) framework, we quantified energy inputs, greenhouse gas (GHG) emissions, carbon sequestration, and economic outputs across multiple farming system configurations, including (i) litchi + field crops, (ii) litchi + vegetables, (iii) litchi + livestock, (iv) litchi + fishery, and (v) litchi + mixed enterprises. Results indicate substantial inter-system variability in energy efficiency, carbon footprint, and net carbon balance. Systems integrating livestock and fishery components exhibited higher gross energy outputs and improved nutrient recycling, but also higher direct emissions, particularly from enteric fermentation and manure management. In contrast, litchi–crop and litchi–vegetable systems demonstrated lower emission intensities but comparatively weaker carbon sequestration potential. The mixed IFS configuration showed the most favorable sustainability performance, achieving the lowest emission intensity per unit of economic output and the highest net carbon sink due to enhanced biomass accumulation and soil organic carbon build-up. Overall, selected litchi-based IFS in Bihar approached or achieved near carbon-neutral status when on-farm carbon sequestration was accounted for. The findings highlight the critical role of enterprise diversification, biomass recycling, and optimized input management in reducing agricultural carbon footprints. This study provides empirical evidence to support litchi-based IFS as a climate-smart strategy for sustainable and carbon-neutral orchard-based agriculture in eastern India.

Keywords: Life cycle assessment, carbon neutral, litchi, IFS, Bihar

Biography:

Dr. Bhagya Vijayan is a Scientist –Senior Scale (Agricultural Extension) at ICAR–National Research Centre on Litchi. She specializes in extension strategies for sustainable litchi production, integrating life-cycle assessment, energy budgeting, and carbon footprint mitigation into farmer-centric practices. Dr. Vijayan leads participatory research and capacity-building programs for litchi growers in Bihar, translating scientific findings into practical technology packages, training modules, and policy recommendations. Her work emphasizes enterprise diversification, soil health, and climate-smart orchard management to enhance productivity and livelihoods. She has authored peer-reviewed articles, contributed to national projects, and collaborates with stakeholders to scale resilient, low-carbon litchi systems, and mentors young researchers across India.

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Changes in Carbon sequestration with age of trees in Guava orchards at different locations in a tropical climate on alfisols

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Abstract:

Understanding changes in carbon (C) fluxes resulting from land-use change patterns is essential for formulating effective climate change mitigation strategies. This study conducted at two different locations focuses on the dynamics of carbon sequestration in guava orchards as a function of tree age, land-use type that is increasingly prevalent in agricultural regions. Through comprehensive sampling in different agro-climatic zones, the carbon content stored in tree biomass, litter, weeds and soil layers was assessed, the evaluation of which provided insights into carbon levels in different environmental contexts. Carbon sequestration was observed to increase with guava orchard age, with mean carbon stocks of 106.84 t C/ha in Dhenkanal and 114.35 t C/ha in Rayagada. In guava orchard above-ground carbon accounted for 21.22% and 22.38% of total carbon sequestered per hectare at the recommended spacing of 6 m x 6 m in Dhenkanal and Rayagada, respectively. Our findings provide critical baseline data on carbon stocks in guava orchards as a function of tree age, contributing to the understanding of the carbon cycle in these cultivated ecosystems. This study highlights the importance of region-specific data and suggests future research to include in guava orchards in other regions with larger sample sizes to comprehensively assess carbon sequestration potential nationwide.

Keywords: carbon sequestration; guava; litter biomass; root biomass; soil carbon stock; tree biomass

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Effect of processing techniques on *In vitro* protein digestibility, antinutrients, and functional properties of selected plant-based foods



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Abstract:

According to WHO reports 2018, approximately 150 million children under 5 years of age are stunted, 50 million wasted, and 38 million are found to be overweight. Low quality diet patterns rank as the leading risk factors for protein energy malnutrition (PEM), higher death rate and disability-adjusted life years (DALYs) lost. This study aimed to assess the effect of nutrition-sensitive, and sustainable food processing technologies viz. soaking, germination, dehulling, and roasting, on protein quality of locally consumed crops (Joha rice, finger millet, chickpea, green gram, and peanut). Advanced analytical tools like Fourier-transform infrared (FTIR) spectroscopy and sodium dodecyl sulfate–polyacrylamide gel electrophoresis (SDS-PAGE) were used to understand the protein profile. Soaking had no significant effect on the protein content of rice. Germination increased protein content in finger millet (+13.2%), green gram (+14.41%), and chickpea (+20.75%), with dehulling further enhancing chickpea protein (+14.88%). Food processing significantly improved IVPD. Soaking enhanced Joha rice IVPD (+9.50%), while germination increased IVPD in finger millet (+11%), green gram (+19.34%), and chickpea (+11.57%). Dehulling improved chickpea IVPD (+11.47%), and wet roasting significantly increased IVPD in chickpea (+23.11%) and peanut (+30.78%). All processing methods significantly reduced tannins and phytic acid. The processing-induced changes were revealed through FTIR, with amide I band changes suggesting protein hydrolysis and denaturation, correlating with improved IVPD. SDS-PAGE analysis indicated protein degradation and structural changes, correlated to improved IVPD. These findings give insights into the role of traditional yet scalable food processing methods in enhanced protein quality and nutritional security, which might contribute to nutrition policies and public health interventions.

Keywords: Food processing, Plant-based proteins, Protein digestibility, Antinutrients, FTIR spectroscopy, SDS-PAGE

Biography:

Doli Saikia is a dedicated research scholar in the field of maternal and child health nutrition. She holds a postgraduate degree in Food Technology. During her postgraduate studies, she worked on the utilization of underutilized crops, with a focus on elephant apple, for sustainable new product development. Currently, her research focuses on improving the quality and nutritional efficiency of plant-based proteins using appropriate food processing technologies for the development of nutritionally enhanced weaning food products, contributing to sustainable food security and child nutrition.

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Role of Interspecific Grafting in Modulating Flood Stress Tolerance in Tomato (*Solanum lycopersicum* L.)



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Abstract:

Tomato (*Solanum lycopersicum* L.) is highly sensitive to flooding stress, which severely restricts its growth, physiological functioning, and yield. Interspecific grafting has emerged as an effective strategy to enhance tolerance against abiotic stresses. The present study evaluated the potential of three eggplant (*Solanum melongena* L.) rootstocks—Swarna Shakti, Swarna Shymali, and Utkal Anushree to enhance flood tolerance in tomato hybrid Arka Rakshak. The experiment was conducted under controlled conditions during the rabi season (2019–2020) using a factorial completely randomized design. Both grafted and non-grafted plants were subjected to short-term waterlogging stress for 3 and 6 days at the flowering stage. Waterlogging significantly affected morphological, physiological, biochemical, and yield attributes in tomato. However, grafted plants exhibited superior tolerance compared to non-grafted controls. Among the rootstocks, Swarna Shakti-grafted plants recorded the highest survival rate, lower wilting and leaf chlorosis, enhanced adventitious root formation, and improved recovery after stress. Grafting minimised reductions in chlorophyll, carotenoid, protein, and calcium content while enhancing proline accumulation and lycopene content. Yield and yield components such as number of fruits, average fruit weight, and total yield per plant were significantly higher in grafted plants, especially with Swarna Shakti rootstock. Overall, interspecific grafting, particularly using Swarna Shakti as rootstock, effectively mitigated the adverse effects of flooding stress and improved growth, physiological stability, and productivity of tomato. This approach offers a promising and sustainable strategy for tomato cultivation in flood-prone regions

Keywords: Flooding stress; Interspecific grafting; Tomato; Eggplant rootstock; Adventitious roots; Physiological tolerance; Yield stability

Biography:

Madhusmita Bal is a Research Scholar in the Department of Plant Physiology at Odisha University of Agriculture and Technology (OUAT), Bhubaneswar. Her academic interests focus on plant stress physiology, particularly the physiological and biochemical mechanisms underlying abiotic stress tolerance in crop plants. She is actively involved in research related to improving crop resilience against environmental stresses such as flooding and drought through physiological, agronomic, and biotechnological approaches. Her work aims to contribute toward sustainable agricultural production under changing climatic conditions. She is keenly interested in advancing scientific knowledge and applying research findings to enhance crop productivity and stress adaptation strategies.

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Metagenomics insights into microbial biodiversity of wild Brinjal (*Solanum* spp.) relatives



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Abstract:

Brinjal (*Solanum* spp.) wild relatives host diverse microbial communities that significantly influence plant health, stress tolerance, and resistance to pests and diseases. In this study, we examined the microbial biodiversity associated with five brinjal wild relatives namely *Solanum mammosum*, *S. sysimbrifolium*, *S. torvum*, BRS-6, and CHB-5 along with cultivated variety Arka Neelachal Shyama using a metagenomics approach. These species represent a wide genetic and ecological spectrum within the genus *Solanum*. Metagenomic profiling revealed marked variation in microbial community composition and structure among the studied species. *S. mammosum*, *S. sysimbrifolium*, *S. torvum* were predominantly associated with the order Enterobacterales, with *Enterobacter* as the major genus. However, *S. mammosum* exhibited a distinct microbial signature characterized by dominance of the order Burkholderiales, primarily represented by the genus *Burkholderia*. In contrast, *S. sysimbrifolium* and *S. torvum* harboured microbial communities enriched with taxa associated with the order Solanales. Moreover, CHB-5 showed relatively higher diversity of *Burkholderia*, whereas Arka Neelachal Shyama displayed a more even distribution of multiple bacterial orders, suggesting a stable and diverse microbiome. A considerable proportion of sequences were classified as “Unclassified” or “Other,” particularly at lower taxonomic levels, indicating the presence of novel or poorly characterized microbial taxa. Overall, the study demonstrates distinct, host-specific microbial assemblages shaped by genetic and ecological factors, highlighting the potential of wild *Solanum* species as reservoirs of beneficial microbes for sustainable brinjal improvement.

Keywords: *Solanum*, metagenomics, microbial diversity, wild relatives, plant microbiome

Biography:

Dr. Satyapriya Singh is an accomplished entomologist with a Ph.D. from ICAR-IARI, New Delhi, specializing in sustainable pest management, invasive pest ecology, toxicology, and insect molecular biology. He has published 40+ peer-reviewed papers in high-impact journals and made seminal contributions by elucidating phosphine resistance mechanisms in *Tribolium castaneum*. He has been associated with over 20 ICAR and externally funded projects, contributed to invasive pest management, indigenous knowledge documentation, and farmer outreach. Recipient of several national awards, Dr. Singh is an active academic mentor, peer reviewer, and scientific leader in eco-friendly agriculture.

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Network-based identification of Chitin Synthase–Associated targets for antifungal Intervention in *Magnaporthe oryzae*



Raghunath Satpathy

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Abstract:

The fungal pathogen *Magnaporthe oryzae* causes rice blast disease, which is one of the biggest threats to rice production around the world. Synthetic fungicides are commonly used for the disease management. However, their negative impact on environmental and health have intensified the exploration of safer alternatives. This study is an in-silico approach to identify potential antifungal targets in *M. oryzae*. A comparative proteomic analysis of *Oryza sativa* ssp. japonica and *M. oryzae* revealed 116 essential proteins specific to the pathogen. Four chitin synthase enzymes (CHS1, CHS5, CHS6, and CHS7) were chosen for further analysis as their importance in cell wall synthesis of the pathogen. An analysis of protein–protein interaction networks showed a group of common partners that interact with each other that has been preserved. These partners are MGG_03122, MGG_01084, MGG_12005, MGG_06162, and MGG_00625. These proteins of the shared interactions are involved in vesicle transport, cytoskeletal dynamics, enzyme processing, and cell wall stress response. The conserved interactions between different chitin synthase isoforms suggest that these proteins could be used as the effective target, hence presenting novel opportunities for the sustainable management of rice blast disease.

Keywords: *Magnaporthe oryzae*; Rice blast disease; Chitin synthase; Protein–protein interaction network; Antifungal targets; Bioinformatics analysis; Phytochemical-based fungicides; Cell wall biosynthesis

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Orientation responses of neonate *Spodoptera litura* larvae (Fab.) (Lepidoptera: Noctuidae) to plant leaves



Pragati Rawat, Deepika Chandila*, Rupom Pathori, Nida, Ankur, Alka Gupta, and Sanjiv Mullick
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Abstract:

The development and survival of herbivorous insects depend on choice of appropriate host plants. In order to understand the behavioral mechanisms and how host choice is influenced by olfactory signals, laboratory bioassays were conducted to study orientation behavior of tobacco cutworm, *Spodoptera litura* larvae towards volatiles released from leaves of three plants: castor, (*Ricinus communis*); rose, (*Rosa indica*) and china rose, (*Hibiscus rosa-sinensis*). The neonate larvae showed positive orientation responses or attraction towards whole leaves of all test plants, indicating innate behavioral response. In no-choice tests, the whole leaves of castor and rose were significantly ($P < 0.05$) more attractive to neonate larvae compared with hibiscus whole leaves. Further, maceration of leaves significantly enhanced the orientation responses of neonate larvae ($P < 0.05$). In two-choice test, whole leaves of castor attracted highest percentage of larvae followed by rose and hibiscus. In addition, to understand color preference of the larvae, visual bioassays were conducted, which showed orientation response of larvae more towards hibiscus leaves followed by castor and rose. Our study suggests significant role of visual and olfactory stimuli of plant leaves in host plant selection by *S. litura*. Moreover, the above results also indicate presence of kairomonal components in the leaves of all three plants. Such attractants can be extracted, isolated and identified for their use in eco-friendly and sustainable pest management program of *S. litura*.

Keywords: Orientation behavior, *Spodoptera litura*, leaf volatiles, larval attraction, sustainable agriculture

Biography:

Ms. Deepika Chandila holds a B.Sc. (Hons) and M.Sc. degrees in Zoology and is currently pursuing a Ph.D. course in Applied Entomology in the Department of Zoology, University of Delhi. She is a CSIR-UGC NET-JRF qualified researcher. Her research focuses on insect-plant interactions, with particular emphasis on insect pest biology, bioassays, and eco-friendly pest management strategies, including plant-based and botanical extracts. Through her work, she aims to contribute to sustainable and environmentally safe alternatives to conventional chemical pesticides.

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Hydroponic cultivation as a sustainable alternative for enhanced growth and resource use efficiency in medicinal and aromatic plants



Sanjeeda Iqbal and Sameera Mansuri*

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Abstract:

Hydroponics, a soil-less cultivation technique, holds significant promise for advancing research on medicinal plants by enabling precise control over plant growth conditions. With the growing global demand for medicinal plants, the need for sustainable cultivation practices and conservation strategies has become increasingly critical. This paper comprehensively examines the potential of hydroponic systems as an effective tool for studying the growth, development, and biochemical characteristics of medicinal plants.

The study explores the integration of hydroponic cultivation into plant biology research, highlighting its ability to enhance our understanding of physiological responses, secondary metabolite production, and overall plant health. Key aspects addressed include optimization of growth conditions, improved yield and consistency of bioactive compounds, and the contribution of hydroponics to sustainable and resource-efficient cultivation practices.

By systematically analyzing these factors, the paper emphasizes hydroponics as a promising approach for advancing medicinal plant research, improving the synthesis of valuable secondary metabolites, and promoting efficient management of water and nutrients. The findings support the adoption of hydroponic systems as a sustainable alternative to conventional cultivation methods, with significant implications for plant science research and the commercial production of medicinal plants.

Keywords: Hydroponics, Medicinal plants, Sustainable cultivation, Secondary metabolites, Controlled environment agriculture

Biography:

Sameera Mansuri is a Ph.D. research scholar at Government Holkar (Model, Autonomous) Science College, Indore, Madhya Pradesh, India. Her research focuses on sustainable agriculture and horticulture, with emphasis on hydroponic cultivation systems, nutrient management, and growth performance of medicinal and aromatic crops under controlled environments. She has actively presented her research at national and international conferences. She is a recipient of the Young Scientist Award from the Madhya Pradesh Council of Science and Technology (MPCST) and secured Second Prize at SRIJAN 2025, a flagship innovation initiative under the Innovate MP Mission launched by Rajiv Gandhi Pradyogiki Vishwavidyalaya (RGPV), Bhopal. She also achieved First Position in Oral Presentation at the 6th World Environment Summit 2025 held in Bangkok, Thailand.

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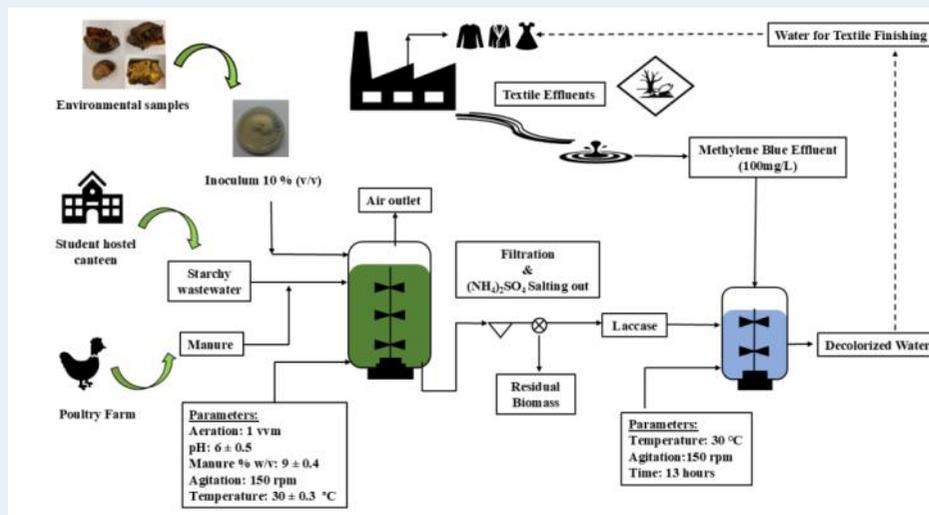
Agro-industrial-driven design for remediation of textile effluents: A sustainable circular economy model


Rokesh Radhakrishnan
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Abstract:

Globally, the market size of fast-fashion industries is trumping its growth with an expected surge of $\approx 10\%$ by 2035. The finishing of 1 ton of textile garments demands 449 kg of chemical dyes and 2 trillion tons of water. The major dyes utilized in fabric finishing processes are ranges of azo-dyes that potentially threat the environment, if released directly. Here, in this study, the proof-of-concept of an agro-industrial-waste driven enzyme-assisted design is proposed for the remediation of xenobiotic-dye effluent. An addition of agro-industrial waste like rice straw, sugar cane baggase, and poultry manure with starchy wastewater were explored for the production of enzyme laccase. The agro-industrial residues were collected from Kharagpur, West Medinipur, India were utilized as feedstock to produce white-rot-basidiomycete laccase in the first stage. Consequently, the poultry manure showed an improved yield in laccase production. Furthermore, with the statically optimized parameters determined through response surface methodology, scaling-up potency in a bioreactor was investigated. The benchscale operation showed a ≈ 12 fold in maximum laccase activity when compared with starchy wastewater as sole substrate at the optimized physio-chemical parameters; also a $\approx 90\%$ reduction of organic waste matters were detected. The laccase extracted from the renewable feedstocks were evaluated for the decolorization of azo dye, methylene blue (MB) as model compound in the second stage at sub-optimal conditions. Subsequently, the partially purified laccase was used for the decolorization of MB, achieving 50% decolorization at ambient conditions. The MB dyes in both aqueous and non-aqueous solvent system were decolorized by partially purified laccase in second stage. A decolorization efficiency of 50% was achieved at ambient temperature within 3 hours of laccase within 1000 U/L of laccase. Worthwhile, the heterocyclic aromatic structures of MB linkages were disrupted to arrays of intermediate compounds such as CO₂, N₂, and H₂O. Conclusively, a cost-cutting integrated biosustainable cleaner solution mediated via agro-industrial setting of

partially purified laccase was used for the decolorization of MB, achieving 50% decolorization at ambient conditions. The MB dyes in both aqueous and non-aqueous solvent system were decolorized by partially purified laccase in second stage. A decolorization efficiency of 50% was achieved at ambient temperature within 3 hours of laccase within 1000 U/L of laccase. Worthwhile, the heterocyclic aromatic structures of MB linkages were disrupted to arrays of intermediate compounds such as CO₂, N₂, and H₂O. Conclusively, a cost-cutting integrated biosustainable cleaner solution mediated via agro-industrial setting of



poultry farms are presented for concomitant management of textile-dye discharge and agro-waste, thus paving futuristic lower-carbon footprint pathway.

Keywords: Multicopper oxidases, Starchy wastewater, poultry manure, Stirred Tank Bioreactor, dye decolorization.

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Great concepts for reunderstanding of food processing



Kashish Gohil* and Ram Reddy

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Abstract:

Objective: Post-harvest losses persist as a major hindrance to food security, agricultural sustainability, and farmer prosperity, particularly in underdeveloped regions. To tackle these problems, food processing has evolved into a critical strategy. This research endeavors to evaluate the effectiveness of food processing techniques in enhancing food security, reducing post-harvest losses, and boosting farmers' earnings.

Method: The research employs a mixed-method approach, integrating policy document analysis, secondary data examination, and a few case studies from the food processing sector. Technologies like dehydration, preservation, and modern packaging methods are assessed based on their ability to be scaled up, their economic feasibility, and their effectiveness in small-scale and rural settings. The study reveals that the systematic application of food processing techniques significantly reduces post-harvest losses and improves the storage duration, quality, and safety of agricultural goods. Processing enhances value, thereby boosting market competitiveness and enabling farmers to command higher prices. Moreover, the rise of rural agricultural enterprises and the establishment of employment opportunities are both promoted by the growth of food processing facilities.

Originality/value: This research contributes to the existing body of literature by providing a comprehensive solution for post-harvest management and rural economic development through food processing. Its focus highlights the industry's capability to promote equitable and sustainable agricultural development, thereby enhancing food security.

Keywords: Enhancing product worth, ensuring food sufficiency, minimizing post-harvest waste, boosting farmer earnings, rural economic development, and food processing innovations.

Biography:

An aspiring professional with a strong interest in the food processing and agribusiness sector. Her academic background has helped me develop an understanding of post-harvest management, value addition, and rural development. She is keen on exploring sustainable solutions that improve food security while enhancing farmer incomes. She enjoys learning through research, practical exposure, and industry interaction, and I am motivated to contribute meaningfully to agricultural and food-based industries through innovation and continuous learning.

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Microgreens as emerging dietary tools for metabolomic health: Insights from recent research



Minijuli Basumatary*, and Sucharita Sen Maiti

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Abstract:

Microgreens are young seedlings harvested at the cotyledon stage that has concentrated vitamins, minerals, polyphenols, glucosinolates, and antioxidants in a compact form. Their rapid growth and high density of bioactive-compound make them promising functional food. In vitro and in vivo studies indicate that extracts from fenugreek, broccoli, and barley microgreens inhibit α -amylase, boost insulin-stimulated glucose uptake, and lower blood glucose, along with good effect from abundant phenolics and flavonoids present in them. Hydroponic cultivation of chicory and lettuce in potassium-free media produces low-potassium greens without sacrificing overall nutrition, offering a safe option for chronic kidney-disease patients. Brassicaceae microgreens (radish, broccoli, kale, mustard) are rich in carotenoids and glucosinolates; their bio-accessible fractions triggers antiproliferative effects like ROS generation, G2/M cell-cycle arrest, and apoptosis in colon-cancer cells. Inclusion of microgreens in high-fat diets reduces body weight, LDL-cholesterol, hepatic triglycerides, and inflammatory cytokines, reflecting improved lipid metabolism and reduced inflammation. Polyphenol extracts from licorice and broccoli microgreens suppress pro-inflammatory markers and modulate gut short-chain fatty acids. Broccoli-microgreen juice diminishes adipose tissue mass and enhances insulin sensitivity in diet-induced obesity, implicating gut-microbiota pathways. Fenugreek microgreens also deliver higher iron concentration being more bio-accessible and support anemia prevention. Collectively, these pre-clinical findings position microgreens as nutrient-dense, low-cost suitable intervention for multiple metabolic disorders, warranting further clinical validation.

Keywords: Microgreens, Metabolic health, Bioactive compounds, Inflammation, Diabetes, Obesity, Cardiovascular risk, Iron deficiency.

Biography:

Minijuli Basumatary is a PhD scholar in Food Science and Technology, with research interests focused on the nutritional and sustainable agriculture. Her work encompasses cultivation optimization, nutritional profiling and bioactive compounds of microgreens with broader interest in phytochemicals and nutraceuticals.

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Deciphering plant volatile-mediated host selection and oviposition in *Cnaphalocrocis medinalis* (Guenée) using behavioural bioassay, chemical signature and antennal electrophysiology



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Abstract:

The rice leaf folder (RLF), *Cnaphalocrocis medinalis* (Guenée), relies on plant-emitted volatiles for host location and oviposition, but the volatile signals underlying its differential responses to resistant and susceptible rice genotypes remain underexplored. Hence, the study was undertaken in six rice genotypes to examine how constitutive and herbivore-induced volatile organic compounds (VOCs) shape female moth host selection. Headspace volatiles from uninfested and RLF-infested rice plants were analysed using GC–MS, olfactory active compounds were identified through Gas Chromatography–Electroantennographic Detection (GC–EAD) and Electroantennogram (EAG), and behaviourally relevant cues were validated through the Y-tube olfactometer assays. VOC profiling and metabolomics revealed distinct patterns between resistance classes. Susceptible plants released higher proportions of green-leaf volatiles and short-chain hydrocarbons, whereas resistant genotypes emitted more quantities of terpenoids and benzenoid compounds that increased further after RLF infestation. GC–EAD identified 42 olfactory active volatile organic compounds across the genotypes, while Electroantennogram (EAG) recordings quantified the strength of antennal depolarisation to each compound. EAG showed high antennal sensitivity to 2-hexanol, 1-octen-3-ol, (Z)-3-hexenyl acetate indicating their strong olfactory relevance. Behavioural assays further demonstrated that (Z)-3-hexenyl acetate, 1-octen-3-ol, xylene and 2-hexanol acted as attractants, whereas methyl jasmonate, geraniol, ocimene and α -phellandrene elicited repellence. Overall, the study demonstrates that *C. medinalis* differentiates resistant and susceptible rice genotypes through distinct constitutive and induced volatile signatures, with resistant rice plants displaying stronger defence-related emissions upon infestation. The identified behaviourally relevant VOCs provide an insight for developing semiochemical-driven approaches for rice leaf folder suppression.

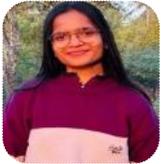
Keywords: *Cnaphalocrocis medinalis*, rice volatiles, HIPV, GC–EAD, EAG, olfactometer

Biography:

P. Bhavana is a Ph.D. Scholar in Agricultural Entomology at the Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, and a recipient of the prestigious Biju Patnaik Research Fellowship. Her doctoral research focuses on volatilomics for the eco-friendly management of the rice leaf folder (*Cnaphalocrocis medinalis*), a major rice pest. She secured first rank in M.Sc. Agricultural Entomology (2017–2019) at SHUATS, Prayagraj

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Role of Morphological Traits in Yield Expression of Chilli : A Genotypic and Phenotypic Perspective



Ramana Parth, Anjali Singh*, Sahil Bhadange, Nandini Singh, Prashant Kumar Rai, and Vaidurya Pratap Sahi

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Abstract:

Chilli (*Capsicum annum* L.) is one of the most important spice and vegetable crops worldwide, valued for its pungency, color, nutritional quality, and economic significance. Improving yield potential in chilli is a major breeding objective, and understanding the association between morphological traits and yield is crucial for effective selection strategies. The present study aimed to estimate genotypic and phenotypic correlations among key morphological characters and yield traits to identify traits contributing significantly to yield performance in chilli. Diverse genotypes were evaluated under field conditions, and observations were recorded on important morphological traits such as plant height, number of branches, leaf traits, and yield-related traits including fruit yield per plant and its components. Genotypic and phenotypic correlation coefficients were computed to assess the magnitude and direction of associations among traits. The results indicated that genotypic correlation coefficients were generally higher than phenotypic correlations, suggesting a strong genetic control of trait associations with comparatively lower environmental influence. Fruit yield per plant exhibited significant positive correlations with traits such as plant vigor, and fruit related traits at both genotypic and phenotypic levels, highlighting their importance as indirect selection criteria. Some traits showed negative correlations with yield, indicating potential trade-offs during selection.

Keywords: Correlation, Genotypic, Phenotypic, Yield

Biography:

Anjali Singh is a postgraduate student pursuing M.Sc. in Genetics and Plant Breeding at Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, India. Her academic interests include plant breeding, crop improvement, and the study of morphological traits influencing yield. She is actively involved in research related to genotypic and phenotypic variability in chilli.

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In-vitro screening of chilli (*Capsicum annuum* L.) genotypes under osmotic stress



Prathamesh Deshmukh, Vishnu Raj*, Kumar Abhishek, Harsh Kumar, Ashwini Prakash, Keshri Prakash, Keshri Nandan, Ayush Kumar, Ramana Parth M, Prashant Kumar Rai, and Vaidurya Pratap Sahi

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Abstract:

Early-stage screening for stress tolerance is an effective approach for identifying promising genotypes for use in crop improvement programs. The present study was conducted to evaluate the response of twenty-eight genotypes to different levels of moisture stress induced by polyethylene glycol (PEG-6000) at the seedling stage. Five PEG-6000 treatments, including a control, were imposed to simulate varying intensities of drought stress under controlled conditions. Seedlings were evaluated for five morpho-physiological traits related to growth and stress response, which provided a basis for comparing genotype performance under stress. Significant variation was observed among genotypes across PEG-6000 treatments, indicating differential sensitivity to induced drought stress at the seedling stage. Increasing PEG concentration resulted in a gradual reduction in seedling growth and vigor; however, certain genotypes maintained comparatively better performance even under higher stress levels. These genotypes showed superior expression of key traits, suggesting inherent tolerance to moisture stress during early growth stages. The interaction between genotypes and PEG treatments highlighted the importance of evaluating stress responses across multiple stress intensities rather than relying on a single screening level. Based on overall performance and consistency across treatments, a set of best-performing genotypes was identified for further evaluation. These selected genotypes will be advanced to subsequent growth stages and field-based studies to confirm their drought tolerance under natural conditions. The findings of this study demonstrate the usefulness of PEG-6000-based seedling screening as a rapid and reliable method for identifying drought-tolerant genotypes. The selected material provides valuable genetic resources for future breeding and physiological studies aimed at improving drought resilience.

Keywords: Drought stress, PEG-6000, Stress tolerance selection, Genetic variability

Biography:

Vishnu raj is a UG student in SHUATS college in Prayagraj who comes from farming background . He is from Bikram Patna, Bihar . She has done his schooling 10th and 12th from Patna.

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Pearson correlation analysis of yield and its component traits in faba bean



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Abstract:

Understanding the association among yield and its component traits is an important step in improving selection efficiency in faba bean (*Vicia faba* L.). The present study was undertaken to assess the relationship between seed yield and related agro-morphological traits using Pearson correlation analysis. Twenty-five faba bean genotypes were evaluated for nineteen characters under field conditions. Data were recorded on growth, phenological, and yield related traits and subjected to statistical analysis to determine the nature and strength of associations with seed yield per plant. Pearson correlation analysis revealed that seed yield per plant was significantly and positively associated with plant height, number of flowers per plant, number of pods per plant, pod length, seed index, biological yield, and days to maturity. These associations indicate that improvement in seed yield can be achieved through indirect selection for these traits. The strong correlation between biological yield and seed yield suggests that overall biomass production plays a major role in yield determination. Similarly, reproductive traits such as the number of flowers and pods per plant were found to be important contributors to yield, emphasizing their relevance in selection strategies. Days to maturity showed a significant association with seed yield, indicating that crop duration influenced yield performance under the experimental conditions. The observed relationships among traits provide useful insights into the complex nature of yield expression in faba bean. Overall, the findings suggest that plant height, reproductive attributes, seed index, and biological yield can serve as reliable selection criteria for improving seed yield in faba bean breeding programs.

Keywords: Pearson correlation, Selection, Improvement

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Evaluation of exotic elite germplasm of Durum wheat (*Triticum turgidum* Desf. var. durum) under terminal heat stress conditions using stress indices



Rohil Yadav, Kriti Gupta*, Priyanka, Sanabam Ambika Devi, Prashant Kumar Rai, and Vaidurya Pratap Sahi

Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, India

Abstract:

Fifty-five genotypes of durum wheat were evaluated for study entitled “**Evaluation of exotic elite germplasm of Durum wheat (*Triticum turgidum* Desf. var. durum) under terminal heat stress conditions using stress indices**”. High GCV and PCV was recorded for flag leaf width. While Moderate GCV and PCV were recorded for peduncle length, spikelets per spike, grains per spike under timely sown conditions. High GCV along with high heritability coupled with high genetic advance as percent of mean was observed for flag leaf width. Moderate GCV along with high heritability coupled with moderate genetic advance as percent of mean was observed for peduncle length and spikelets per spike under timely sown conditions. This pointed out the fact that these characters have appreciable genetic potential and are comparably less influenced by environment, hence desirable for simple selection in breeding programmes. High GCV along with high heritability coupled with high genetic advance as percent of mean was observed for SPAD reading, plant height and grain yield. Moderate GCV along with high heritability coupled with moderate genetic advance as percent of mean was observed for flag leaf width under late sown conditions. This pointed out the fact that these characters have appreciable genetic potential and are comparably less influenced by environment, hence desirable for simple selection in breeding programmes. Genotype DBW 187 had highest yield under optimal conditions followed by CAPEITI-8, CAPAROI, PORTO-8, QUADRATO and HI-8627. Genotype GDP QUASERL-1 reported to have highest yield under stress conditions followed by DBW-187, HI-1531, HI-8627. Relative change was found to be highest in genotype IARI HD 4713 followed by PLATA-16, PORTO-15, CAPEITI-8. Tolerance was reported to be high in genotype DBW-187 followed by CAPEITI-8, QUADRATO, PORTO-15, PLATA-16. Stress tolerance index was found to be highest in genotype DBW-187 followed by HI 1531, KUNKUMI, HI 1531, HI 8267.

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Screening of promising gamma ray-induced mutants in cowpea (*Vigna unguiculata* L. Walp) for growth and yield traits



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¹Odisha University of Agriculture and Technology, Bhubaneswar, India

²Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, India

³ICAR-CHES (IIHR), Bhubaneswar

Abstract:

Cowpea (*Vigna unguiculata* L. Walp), a member of the Fabaceae family ($2n = 22$), is a major leguminous crop of considerable socio-economic importance, particularly in Southern Africa. Valued for its ability to fix atmospheric nitrogen, its rich protein content, and essential micronutrients, cowpea contributes significantly to food security, soil fertility enhancement, and the sustainability of agricultural systems. However, hybridization in cowpea is constrained by its predominantly self-pollinating nature and limited genetic diversity, which restrict opportunities for crop improvement. Conventional breeding offers little scope for generating further variation, making mutagenesis a promising approach to rapidly induce useful genetic variability through gamma radiation. This study aimed at characterization and identification of putative mutant lines for growth and yield traits in M₂ generation laid out in plant-row method in RBD. After evaluating the plant population, a total of eight mutant lines (five mutant lines for Kashi Kanchan and three mutant lines for Medinipur local) were selected on the basis of morphological and yield characteristics. In Kashi Kanchan, exposure to 300 Gy of gamma radiation was found to be the most satisfactory dose, as it produced plants with desirable fruit characters, yield, days to 50% flowering, peduncle length, and plant stature and the same dose connoted closely to the LD₅₀ dose of 299 Gy for this variety. Similarly, for Medinipur local irradiated at 350 Gy dose show better result in characters like no. of seeds per plant, pod weight whose LD₅₀ values was 413 Gy. Desirable agronomic traits were more pronounced around the LD₅₀ values in both the genotypes, indicating their potential for inclusion in future breeding programmes.

Keywords: Cowpea, putative mutants, Gamma radiation, LD₅₀, radio sensitivity

Biography:

Aurolipsa Panda is a PhD scholar, doing her PhD in Department of Vegetable Science, OUAT, Bhubaneswar. Her recent studies is going on for Development and Evaluation of CGMS based F₁ hybrids for fruit yield and leaf curl disease resistance in chilli under the Chairmanship of Dr. Gobinda Chandra Acharya at CHES, Bhubaneswar. During her MSc at BCKV, West Bengal, she worked on Putative mutants in Cowpea to develop a suitable disease and climate resistant variety for farming community.

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Biofuels production from agro-waste: Enhancing efficiency and environmental sustainability



Jubuli Sahu*, Pinki Seth, Sarita Barla, Meera Mahanty, Deepanjali Dugal and Sanjukta Mohapatra

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Abstract:

With the growing threat of climate change, the world is searching for a clean and more sustainable energy sources. Among the most promising options biofuel is an important renewable energy source that is gaining attention for its potential to mitigate carbon emissions, reduce dependency on fossil fuels and pave the way for a greener future. Biofuels like biodiesel, bioethanol and biogas from agricultural biomass offer renewable energy, reduced emissions and energy security but their sustainability hinges on using waste/non-food sources (like crop residues) to avoid food vs. fuel conflicts, manage land/water uses and ensure economic viability. With advanced biofuels from second/third-generation feedstock (algae, lignocellulosic waste) promising better environmental and resource efficiency than first-generation crops. Biofuels revolve around increasing production efficiency, moving away from food-based crops and reducing environmental impact. As the global population grows and energy demand increases, biofuel offer a solution that can meet future energy needs without exhausting natural resources. Another key benefit of biofuels is their ability to enhance energy security. By producing biofuels from locally grown crops and organic waste, countries can reduce their reliance on imported oil. This not only strengthens national energy independence but also stabilizes energy prices by reducing vulnerability to global oil market fluctuations. For nations like India, which imports a significant portion of its oil, the widespread adoption of biofuels could lead to substantial savings and greater economic stability. As for any form of agriculture, expanded biofuel production may threaten land and water resources as well as biodiversity and appropriate policy measures are required to minimize possible negative effects.

Keywords: Biofuel, Agricultural Waste Management, Energy Security, Environmental Safety

Biography:

Jubuli Sahu is a young academicians and researcher in the subject area of Agricultural Meteorology and Allied Sciences. She is presently employed as Jr. Agrometeorologist at RRTTS, Chiplima under OUAT and former Subject Matter Specialist (Agomet) KYK, Banka under BAU, Sabour, Bhagalpur from 2018-2023. She completed her B.Sc (Ag) from OUAT, Bhubaneswar in 2015. She received her M.Sc. degree with specialization in Agrometeorology from the University of (IGKV), Raipur, Chhattisgarh and qualified ICAR-NET in the year of 2017. She is the author of more than 10 Research Papers, more than 5 popular articles, 2 books, more than 5 book chapters and recipient of four awards.

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Biofuel & agro-waste based energy: global strategies, geopolitical shifts and sustainable futures



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Abstract:

As global energy markets face volatility due to geopolitical tensions, climate imperatives, and shifting trade patterns, biofuels and agro-waste based energy have emerged as pivotal alternatives to fossil fuels. This work explores advanced biofuel production pathways, international policy frameworks, and the potential to transform rural economies while weakening dependency on crude oil. Special focus is given to the United States' dominance in crude exports, India's tariff-led strategy to diversify away from Russian crude, and the rise of next-generation bio-refineries. Beyond traditional bioethanol and biodiesel, this poster proposes innovative concepts such as carbon-capture enhanced biofuel systems, waste-to-hydrogen conversion, and distributed rural micro-bio-grids. Prospects, limitations, and strategies for global scalability are discussed in the backdrop of climate commitments and energy security.

Biofuel and agro-waste based energy systems provide a multi-dimensional solution for energy security, environmental sustainability, and economic restructuring. In the face of oil-market dominance by major producers, tariffs, and geopolitical instability, bioenergy diversification is both a strategic necessity and a climate imperative. With forward-looking policies and innovation, biofuel technologies can transform global energy and empower rural economies.

Biography:

Gupteswar Mohanty is an undergraduate student of B.Sc. Agriculture with a strong academic and research interest in renewable energy, biofuels, and sustainable agricultural systems. His work focuses on the utilization of agricultural waste for bio-energy production, energy security, and rural development. He actively follows current affairs, global energy geopolitics, and climate policy, linking them with agriculture-based solutions. Through conferences and academic activities, he aims to explore innovative biofuel production models that support farmer income, reduce fossil fuel dependency, and promote environmental sustainability.

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Comparative performance of lettuce cultivars under different media in an aggregate hydroponic system

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Abstract:

Lettuce (*Lactuca sativa* L.) has emerged as a highly significant salad crop owing to its short growth cycle, rising consumer demand and excellent suitability for protected cultivation systems. As food production increasingly shifts toward resource-efficient technologies, soilless agriculture particularly hydroponics has gained considerable attention. Hydroponic systems offer multiple advantages, including enhanced water-use efficiency, uniform plant growth, reduced soil-borne diseases and improved nutritional quality of produce. Despite these benefits, research on hydroponics has predominantly focused on non-aggregate systems such as nutrient film technique (NFT) and deep-water culture (DWC). Consequently, there remains limited scientific information regarding plant performance in aggregate hydroponic systems, where solid substrates support the root zone. A key knowledge gap exists in understanding how lettuce cultivars respond to different aggregate substrates, especially when compared to traditional soil-based cultivation. Substrates such as cocopeat and perlite possess favorable physical properties like aeration, moisture retention and structural stability. However, their effectiveness relative to soil has not been comprehensively evaluated across multiple cultivars. This lack of systematic comparison emphasizes the need for targeted research to identify suitable media-cultivar combinations for efficient aggregate hydroponic production. To address this gap, the present study was conducted during the Rabi season 2024 in a naturally ventilated polyhouse under the climatic conditions of eastern Odisha. The experiment aimed to assess the growth, yield and quality of three lettuce cultivars grown in two contrasting media: conventional soil, cocopeat and cocopeat-perlite mixture. A factorial completely randomized design (FCRD) was employed and observations were recorded on various vegetative traits, yield performance and quality attributes. Findings from the study revealed distinct and consistent advantages of the cocopeat-perlite medium over soil. Across all the cultivars, this substrate significantly improved seedling establishment, plant height, leaf development, biomass accumulation and overall yield. In conclusion, the study clearly establishes cocopeat combined with perlite as a substantially better growing medium than soil for aggregate hydroponic production of lettuce. Its positive influence on plant growth, enhanced quality and improved economic viability highlights its potential for wider adoption in protected and soilless farming systems.

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MYCOTRON: A mycelium-based living biofabric for heavy metal immobilization and soil reclamation using *Pleurotus ostreatus*



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Abstract:

The pervasive contamination of agricultural soils by heavy metals (e.g., Cd^{2+} , Pb^{2+} , Cr^{6+}), stemming from mining, industrial discharge, and unregulated agrochemical use, presents a critical ecological and agronomic challenge. Existing remediation strategies, such as excavation or chelate-assisted phytoextraction, are often cost-prohibitive, labour-intensive, and unsuited for decentralized, low-input environments. This paper introduces MYCOTRON, an innovative, low-cost, and fully biodegradable biofabric engineered from the mycelium of *Pleurotus ostreatus* (Oyster mushroom) cultivated on lignocellulose agro-waste.

Unlike conventional mycoremediation techniques, MYCOTRON harnesses the intrinsic structural properties of mycelial networks to form flexible, cohesive mats that function as living detoxification membranes for direct soil application. The scientific efficacy of MYCOTRON is rooted in the proven biosorption and bioaccumulation capacities of *P. ostreatus*. Its chitin-rich cell walls and abundant functional groups ($-\text{OH}$, $-\text{COOH}$, $-\text{NH}_2$) efficiently bind heavy metals through ion exchange, complexation, and precipitation. Furthermore, *P. ostreatus* secretes potent ligninolytic enzymes, like laccases and manganese peroxidases, which oxidize metal chelates and foster organic matter decomposition, thereby enhancing soil structure and microbial recovery.

To optimize performance, the MYCOTRON sheet incorporates biodegradable slow-release biobeads encapsulating seaweed extract for root growth stimulation, microencapsulated neem oil for natural biocontrol, and cellulase/amylase enzymes to accelerate substrate breakdown and carbon turnover. The system supports two operational modes: Phytostabilization, where the sheet decomposes to immobilize metals and enrich soil organic carbon; and Phytoextraction, where the metal-laden mycelial biomass is harvested before full degradation for off-site disposal, facilitating genuine remediation.

Preliminary lab-scale trials on simulated Cr^{6+} and Pb^{2+} -contaminated soils demonstrated MYCOTRON's capacity to reduce bioavailable metal fractions by 40–70% within six weeks, alongside significant improvements in soil microbial biomass and respiration. Estimated at ₹60-65 per m^2 , MYCOTRON is a modular, scalable, and entirely biodegradable solution (30–45 days), offering a practical, climate-resilient approach to land restoration. This technology critically addresses pressing needs in sustainable agriculture, environmental detoxification, and the circular bioeconomy.

Biography:

A B.Sc., (Hons) Agriculture student from Kumaraguru Institute of Agriculture, after completing schooling at Velammal Vidyalaya, Chennai, Tamil Nadu. His works include Mycotron (fungal detox tech), Biochar soil rescue, and AI-driven weed detection. I earned 2nd prize at TNAU AGRONOVA 2025 and presented at an international workshop, showcasing my drive for sustainable agri-tech and scientific impact. Certified in AI tools and fuses them in research, technology, and agribusiness leadership cum innovations.

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Drone robotics and imaging technologies for smart and sustainable precision agriculture

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Abstract:

Digital Technologies are changing farming in the 21st Century. Much of this change is driven by the rapid development and increasing availability of Drone Technologies, combining advanced robotic capabilities with sophisticated imaging systems for allowing non-invasive, non-destructive, and rapid assessment of crops to allow for improved data-based decision-making by farmers. Overview: The role of Drone Robotics and Imaging Technologies in facilitating more efficient, smarter, and sustainable resource usage in agriculture. Through the flying of drones with RGB, Multispectral, Hyperspectral, and Thermal Sensors, it is possible to create a 'Photo Map' of the entire farm in minutes, depicting an accurate visual condition of their crops, which might reveal evidence not easily seen through the naked human eye. These images are used in identifying crops that show early Stress, Nutrient Deficiencies, Insects, and Water Shortages, usually well before any physical symptoms become apparent. From the NDVI and NDRE vegetation index data acquired from the images, farmers can perceive the health of their crops correctly and obtain the information they need to take timely action. Robotics introduce yet another level of efficiency through the use of Autonomous Flight Control, Real-Time Data Collection, and Intelligent Route Planning. This helps farmers minimize Manual Field Visits, hence saving time and reducing Labor Costs. AI-Based Image Processing in conjunction with Drone Technologies further enables actionable maps that present Site-Specific Fertilizer Application, Precision Pesticide Application, and Adaptive Irrigation Scheduling to reduce Input Use and help environmental sustainability.

Keywords: Drone technology, UAV, precision agriculture, crop monitoring, multispectral imaging, hyperspectral sensing, thermal imaging, NDVI, NDRE, AI-based image analysis, autonomous flight control, digital agriculture, resource optimization, sustainable farming, smart irrigation.

Biography:

Sarmineswary is an engineering student with a strong academic interest in electronics, signal processing, and programming. He has deeply focused on developing a clear conceptual understanding supported by practical and application-oriented learning. He is actively engage in technical projects and academic activities to strengthen my analytical and problem-solving skills. He values continuous learning and adaptability, and I am motivated to enhance my technical expertise through hands-on experience and collaboration. He is committed to professional growth and contributing meaningfully to technical and academic environments.

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Grey2Green: Solar-powered nutrient recovery system for sustainable fertigation in rural agriculture

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Abstract:

Traditional grey water use in agriculture poses significant risks due to pathogens, surfactants, and specific phytotoxic contaminants like Boron (B) and Sodium (Na), while conventional treatment is energy-intensive. This paper presents the Grey2Green system, a decentralized, solar-powered solution designed for rural households to transform kitchen, bathroom, and laundry grey water into safe, nutrient-enriched fertigation water, promoting a circular economy model. The process leverages a cascaded, gravity-driven flow initiated by an initial lift from a low-power Solar Pump (approx 0.2 kWh/day), achieving a 75% energy reduction over conventional methods. The treatment train includes a CSTR series for Flocculation (using mild Alum/FeCl₃) and sedimentation for initial solids and heavy metal removal. The core innovation is the Algae-Based Membrane Bioreactor (MBR), which uses algae for efficient N, P recovery and the submerged membrane for superior filtration of pathogens. A final Charcoal Packed Bed ensures polishing by adsorbing trace phytotoxins and odor. The system achieves 90%-95% BOD reduction and 75%-85% water recovery. Techno-economic analysis shows a strong 3-year payback period for households, validating Grey2Green as an economically and ecologically resilient model for Sustainable agricultural water management.

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Handheld crop pest sensor using binary catalyst-loaded nano- SnO₂ particles for oxidative signal amplification



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Abstract:

The increasing global food demand requires advanced techniques to increase food production in a sustainable way. Advanced techniques like Internet of Things (IoT) frameworks supported by real-time sensors can help achieve this goal. In recent times, volatile organic compound (VOC) sensors have been considered important tools for human medical diagnosis, but their application in the agriculture sector introduces a transformative method for the early detection of crop diseases and pest infestations. Plants release different types of volatiles in case of multiple biotic and abiotic stresses, and sensing these volatile signals at a very early stage will make prevention smoother. In this research, we present a high-performance chemoresistive sensor based on a SnO₂ nanocomposite. The sensor is functionalized with binary catalysts so that the required high sensitivity in the presence of multiple volatiles can be achieved by significantly amplifying the signals of target volatiles. Additionally, a molecular sieve was introduced in this process to minimise false signals from non-targeted VOCs, ensuring high selectivity. This system was used for early-stage detection of *Tuta absoluta* infestation in the tomato crop. The process requires low-power systems, so integration with standard mobile power banks was done, resulting in a lightweight, handheld sensor device. This device eliminates the gap between laboratory-scale VOC analysis and practical, field-deployed IoT agriculture, providing a robust solution for early-stage crop stress management.

Keywords: Crop infection, biotic stress, VOCs, gas sensor, SnO₂

Biography:

Ankita Dadhich is a PhD Scholar at the Institute of Nanoscience and Technology (INST), Mohali, specialising in advanced pest management. With a Master's degree in Zoology (Entomology), her current research integrates biotechnology and nanotechnology to develop smart pesticide delivery systems. Her work also explores volatile sensing technologies for the early detection of pest infestations, aiming to create more sustainable and efficient agricultural solutions.

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Comparative evaluation of conventional and ultrasound-assisted extraction of natural antioxidants from wild Himalayan fruits

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Abstract:

The ability of wild fruits to generate bioactive compounds has substantial nutritional and therapeutic potential. The main objective of this research was to analyse the efficiency of conventional solvent extraction and ultrasound-assisted extraction for the extraction of bioactive constituents from the hawthorn berries, the fruit of *Rosa webbiana* and wild pomegranate. The physicochemical properties, phytochemical components (qualitative), total phenolic content (TPC), and total flavonoid content (TFC), as well as antioxidant activities (DPPH and ABTS), were evaluated. There were significant variations among the fruits. The maximum phenolic and flavonoid contents and antioxidant activity were found in *Rosa webbiana*. The UAE increased yield by 35 %, TPC and TFC by 51 and 41 % respectively and radical scavenging activity by 21%, compared to conventional extraction. This enhancement was due to the higher power input used to disrupt cell walls as well as improved mass transfer. The results of the study show that ultrasound-assisted extraction is effective, and these wild fruits contain nutraceutical properties.

Keywords: wild fruits, bioactive compounds, ultrasound-assisted extraction, nutraceutical potential.

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Systems analysis of climate adaptation in smallholder agriculture: Interlinking technological innovations, ecophysiological responses, socioeconomic conditions, and agricultural policy ecosystems



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Abstract:

Climate change poses increasing risks to agricultural systems, particularly for smallholder farmers who operate under resource and climate constraints. In India, where over 86% of farmers manage small and fragmented holdings, climate variability contributes significantly to productivity losses and livelihood insecurity. Addressing these challenges requires moving beyond isolated interventions toward an integrated, systems-based understanding of climate-resilient agriculture.

This paper presents a conceptual systems framework that links four interdependent dimensions influencing climate resilience in smallholder farming systems: agricultural technologies, ecophysiological crop adaptation, socioeconomic realities, and emerging policy landscapes. The framework highlights how technologies such as micro-irrigation, climate-resilient crop varieties, bio-based inputs, and digital advisory tools interact with crop-level ecophysiological processes including heat tolerance, water-use efficiency, root system plasticity, and pest-climate dynamics. These interactions are further shaped by socioeconomic factors such as landholding size, access to credit and insurance, labour availability, and farmer risk perception, which strongly influence adoption and long-term sustainability of interventions.

The study also situates climate-resilient agriculture within broader policy and sustainability contexts, emphasizing the role of supportive policy ecosystems in enabling scalability and equitable outcomes. Integrated ecosystem-based approaches, when effectively aligned across system layers, have the potential to enhance value creation at the farmgate, generating up to \$76 billion annually, with a substantial share accruing directly to farmers.

By framing climate resilience as a multi-layered, interconnected system, this conceptual approach offers insights applicable beyond India, contributing to global food security, climate adaptation efforts, and the development of sustainable and inclusive agricultural systems.

Biography:

Sanmhidha is a recipient of the Mahatma Gandhi Merit Scholarship and is been selected for abstract presentation at the DDD Conference in Israel and the Go Green Summit in Thailand. Pavin krishan have participated in one-health international symposium and is a student researcher at kumaraguru institute of agriculture. Cibinandan, a Mahatma Gandhi Merit Scholar, is committed to sustainability research and engaged in the One Health Symposium.

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Microbial valorization of poultry feather waste: A proposed keratinase based approach for sustainable biofertilizer production



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Abstract:

Poultry processing industries generate substantial amounts of feather waste, which poses a major environmental challenge due to its highly resistant keratin structure. Existing studies demonstrate that microbial degradation using keratinase producing *Bacillus* species offers a promising circular solution by converting this waste into agriculturally valuable products. Building upon these scientific findings, the present study aims to develop and evaluate a microbial keratinase based process to transform chicken feather waste into a nutrient-enriched organic biofertilizer.

The proposed work will involve the preparation of feather meal, followed by controlled fermentation using selected keratinolytic strains of *Bacillus*. The resulting hydrolysate will be characterized for keratinase activity, amino acid profile, essential nutrients, and storage stability. Plant growth assays will then be conducted to assess the biofertilizer's effect on seed germination, vegetative growth, biomass accumulation, and overall soil health.

Expected outcomes include the development of a standardized, eco-friendly feather valorization protocol and the formulation of a high-quality biofertilizer rich in organic nitrogen and peptides. The study is anticipated to contribute significantly to sustainable waste management, reduction of environmental pollution, and promotion of low-cost organic fertilization strategies. By converting an abundant waste stream into a valuable agricultural input, this research aligns strongly with global initiatives in green chemistry, circular bioeconomy, and climate-smart agriculture.

Keyword: Feather waste valorization, keratinase biodegradation, bacillus fermentation, organic biofertilizer, circular bioeconomy

Biography:

Sanmhidha is a recipient of the Mahatma Gandhi Merit Scholarship and is been selected for abstract presentation at the DDD Conference in Israel and the Go Green Summit in Thailand. Pavin krishnan have participated in one-health international symposium and is a student researcher at kumaraguru institute of agriculture. Cibinandhan, a Mahatma Gandhi Merit Scholar, is committed to sustainability research and engaged in the One Health Symposium.

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Green Biotechnology: Alternative to traditional agriculture



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Abstract:

Green biotechnology, a branch of biotechnology focusing on agricultural processes, offers innovative solutions to the challenges faced by traditional agriculture. Traditional farming methods, which often rely heavily on chemical inputs, extensive land use and water resources, have raised concerns about environmental degradation, loss of biodiversity and climate change. In response, Green biotechnology aims to develop sustainable, eco-friendly agricultural practices. One of the key approaches in green biotechnology is the development of genetically modified crops with enhanced traits like drought resistance, pest tolerance and improved nutritional content. These advancements reduce the need for chemical pesticides and fertilizers, lowering the environmental impact while maintaining or increasing crop yields. For example, Bt crops, which are genetically engineered to produce proteins toxic to specific insects of order Lepidoptera, Coleoptera, Hymenoptera, Diptera & Nematoda, have significantly reduced the reliance on chemical pesticides. Another promising area is the application of biofertilizers and biopesticides, to promote plant growth and protect crops from pests and diseases. These alternatives to synthetic chemicals offer a more sustainable and less harmful approach to manage agricultural ecosystems. Additionally, techniques such as In-Vitro Culture and marker-assisted selection enable more precise cultivation of crops, ensuring better yields and adaptability to changing environmental conditions. These methods shorten the breeding process and improve crop quality while conserving genetic diversity. By integrating Green biotechnology, agriculture can become more resilient, efficient, and environmentally friendly. These biotechnological innovations not only mitigate the negative impacts of traditional agriculture but also helps to address global food security challenges, making Green biotechnology a vital component of future sustainable farming systems.

Keywords: Green Biotechnology, Sustainable Agriculture, Biodiversity, Biofertilisers, Biopesticides, GM Crops, In-Vitro Culture

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Salinity-induced physiological and biochemical changes during seedling establishment in Brinjal (*Solanum melongena* L.)

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Abstract:

Brinjal (*Solanum melongena* L.), the second most important crop of the Solanaceae family after potato, is widely cultivated in tropical and subtropical regions. However, soil salinity an increasing concern in coastal agro-ecosystems due to climate change significantly limits its productivity. India has over 7,500 km of coastline, including about 460 km in Odisha, where salinity poses a major challenge to vegetable cultivation. Understanding the physiological and biochemical responses of brinjal to salinity stress is therefore essential for identifying salt-tolerant genotypes. An experiment titled “Salinity-Induced Physiological and Biochemical Changes During Seedling Establishment in Brinjal” was conducted at the Department of Plant Physiology, College of Agriculture, OUAT, Bhubaneswar. Three cultivars—Utkal Tarini (V₁), Utkal Anushree (V₂), and Utkal Madhuri (V₃)—were evaluated under NaCl-induced salinity stress using a completely randomized design. Increasing NaCl concentrations significantly reduced germination percentage, seedling growth, biomass, and vigor indices across all cultivars. Utkal Tarini showed the highest mean germination (71.29%), while Utkal Madhuri performed better under higher salinity levels, exhibiting superior seedling length, shoot and root length, fresh weight, and dry weight. Salinity stress caused significant biochemical changes, including reductions in chlorophyll and carotenoid content. Utkal Madhuri maintained higher total chlorophyll and recorded maximum proline (46.68 $\mu\text{mol g}^{-1}$ FW) and protein content (6.03 mg g^{-1} FW), indicating better osmotic adjustment and stress tolerance. Based on overall morpho-physiological and biochemical responses, Utkal Madhuri was identified as the most salt-tolerant cultivar, followed by Utkal Anushree, while Utkal Tarini was the most sensitive at the seedling stage.

Keywords: Salinity stress, germination, morpho-physiological, Solanaceae, biochemical

Biography:

Nikita Mandala, Ph.D. Research Scholar of Department of Plant Physiology, OUAT, Bhubaneswar and completed my M.Sc. in Plant Physiology from Department of Plant Physiology OUAT itself. I have the experience of doing research in All India Crop Research Project on Vegetable Crops, OUAT, Bhubaneswar under the guidance of Seed Production Officer and Senior Scientist of AICRP.

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Beekeeping: A promising non-farm and off-farm approach as employment generation

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Abstract:

Beekeeping is a promising agri-allied activity that offers significant non-farm and off-farm employment opportunities, particularly in rural and semi-urban areas. As an alternative livelihood, it requires minimal land and investment while providing sustainable income through honey production, beeswax harvesting, and pollination services.

The expansion of beekeeping-based enterprises has facilitated job creation beyond honey production, including value-added industries such as cosmetics, medicine, and artisanal food products. Many individuals are also involved in hive construction, equipment manufacturing, and beekeeping training programs, contributing to rural industrialization. Government initiatives, including financial subsidies, skill development programs, and global trade partnerships, have played a crucial role in supporting beekeepers and ensuring market accessibility. For instance, in India's Sundarbans region, beekeeping has provided alternative livelihoods for communities affected by rising sea levels and declining agricultural productivity, reducing migration rates and enhancing local economies. Additionally, Ethiopia's honey sector has created employment for thousands, with small-scale beekeepers contributing significantly to the country's agricultural exports and rural development.

Despite its benefits, beekeeping faces challenges such as climate fluctuations, colony health risks, and market competition. Sustainable practices, improved disease management, and innovative pollination techniques are essential to overcoming these obstacles and ensuring stability within the industry. With continuous advancements, beekeeping is expected to play an increasingly vital role in non-farm and off-farm employment by strengthening rural economies and promoting environmental sustainability. Encouraging more individuals to adopt beekeeping as a profession will not only enhance economic opportunities but also contribute to global efforts in pollinator conservation and food security.

Keywords: Beekeeping, agri-allied activity, honey, beeswax, pollination

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Value addition in tropical tuber crops: An approach towards income generation and waste reduction

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Abstract:

Tropical tuber crops such as cassava (*Manihot esculenta* Crantz), sweet potato (*Ipomoea batatas* (L.) Lam.), yams (*Dioscorea* spp.), taro (*Colocasia esculenta* (L.) Schott), elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) and other minor root crops play a significant role in ensuring food, nutritional and livelihood security in tropical and subtropical regions. These crops are characterized by high productivity, adaptability to marginal soils, tolerance to abiotic stresses and rich starch reserves, making them vital components of climate-resilient agricultural systems. However, their bulky nature, high moisture content and rapid post-harvest deterioration result in substantial quantitative and qualitative losses, limiting their commercial potential and farmer income. Value addition has emerged as an effective strategy to overcome these constraints by transforming fresh tubers into diversified, shelf-stable and high-value products. Processing technologies enable the conversion of tropical tuber crops into flours, starches, chips, flakes, extruded snacks, noodles, bakery ingredients, fermented foods and ready-to-cook products, thereby extending shelf life, improving market access and catering to changing consumer preferences. In recent years, increasing demand for gluten-free, functional and plant-based foods has further enhanced the relevance of tuber-based products, particularly those enriched with bioactive compounds such as dietary fiber, β -carotene, anthocyanins and resistant starch. In addition to food applications, tuber crops are gaining prominence as raw materials for non-food industrial uses. Starch derived from cassava and sweet potato is increasingly utilized in biodegradable packaging, bio-ethanol production, pharmaceuticals, adhesives and textile industries, contributing to the development of sustainable bio-based economies. The efficient utilization of processing by-products, including peels and fibrous residues, for animal feed, composting and bio-energy production further supports waste reduction and circular resource use. Recent advancements in processing equipment, product standardization, improved packaging and quality control have facilitated the establishment of small and medium-scale enterprises, particularly at the rural and cottage levels. These enterprises provide income-generating opportunities for farmers, women and rural youth, while strengthening value chains and reducing dependency on raw tuber markets. Institutional support, capacity building and technology dissemination play a crucial role in enhancing adoption of value addition practices. Value addition in tropical tuber crops represents a holistic approach to income generation and waste reduction. By integrating improved processing technologies, diversified product development and sustainable utilization of by-products, tropical tuber crops can be transformed from underutilized staples into economically viable and environmentally sustainable resources, contributing significantly to rural development and food system resilience.

Keywords: Tropical tuber crops, Value addition, Income generation, Post-harvest loss reduction, Functional foods

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Agro-tourism as an emerging agriprenurship model for rural livelihood



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Abstract:

Agro-tourism has become an important Agriprenurship option that combines agriculture with tourism to increase farmers' income and improve rural livelihoods. With growing problems such as unstable farm income, climate change, and market uncertainty, agro-tourism provides farmers with an additional source of income by using their farms for recreational, educational, and experiential activities. This study reviews existing research on agro-tourism and explores its role in diversifying rural livelihoods from an agricultural extension point of view. The study follows an exploratory and descriptive research design and is based on secondary information collected from research journals, government reports, policy documents, and extension-related literature. Content analysis was used to organize findings related to income generation, employment creation, entrepreneurship development, and institutional support. The review shows that agro-tourism helps farmers earn extra income, creates employment opportunities for rural youth and women, strengthens direct interaction between farmers and consumers, and increases awareness about sustainable farming practices. Agricultural extension agencies play a key role in promoting agro-tourism by creating awareness, building skills, providing training, and supporting market linkages. However, problems such as low awareness, poor infrastructure, and lack of promotional support limit its wider adoption. The study concludes that agro-tourism can be an effective Agriprenurship and extension approach for sustainable rural development if supported by suitable policies and strong institutional support.

Keywords: Agro-Tourism, Agriprenurship, Agricultural Extension, Rural Livelihood

Biography:

Badigi Pavan Naik is currently pursuing Doctoral research in the Department of Extension Education, Odisha University of Agriculture and Technology. He has qualified ICAR-NET-2023. He has also qualified UGC-NET 2023. He has completed his Graduation from Acharaya NG Ranga Agriculture University, Andhrapradesh. He joined Mahatma Phule Krishi Vidhyapeeth, Maharashtra for Post Graduation through ICAR entrance exam as a National Talent Scholar (NTS). So far he has published four book chapters, five popular articles and three research papers in NAAS rated national and International Journals.

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Influence of graded macronutrient supply on growth, physiology, and biochemical attributes of early-duration rice varieties

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Abstract:

In terms of output, rice (*Oryza sativa* L.) is next to maize worldwide and is essential to food and nutritional security. Due to its broad flexibility to various soil types and water regimes, rice a key cereal crop in India and a member of the Gramineae family, is grown under a variety of agroclimatic situations. However, unbalanced nutrient management techniques have frequently been linked to deteriorating rice grain output and nutritional quality. Therefore, increasing rice growth, yield, and grain quality especially in early-duration varieties requires optimizing the availability of macronutrients (Fageria et al., 2011). In this regard, the current study, "Influence of Graded Macronutrient Supply on Growth, Physiology, and Biochemical Attributes of Early-Duration Rice Varieties," was carried out at the AICRP on Seed (Crops)–QSP research plots, OUAT Central Research Station, Bhubaneswar, during the Rabi season of 2024–2025. Four early-duration rice varieties *Nabanna* (V₁), *Parijat* (V₂), *Pathara* (V₃), and *Vandana* (V₄) as well as four graded macronutrient levels T₁ (30:15:15), T₂ (60:30:30), T₃ (90:45:45), and T₄ (0:0:0, control) were used in sixteen treatment combinations in the split-plot design with three replications. Plant height, number of tillers, days to 50% flowering, flag leaf length, leaf area index, grain yield, straw yield, 1000-grain weight, and harvest index were among the morpho-physiological parameters that were measured, as were biochemical parameters like protein, amylose, zinc, iron, carotenoid, and chlorophyll content. The findings showed that all physiological, biochemical, and yield-attributing variables varied significantly between cultivars and macronutrient levels. *Vandana* under T₃ (90:45:45) had the best grain yield (53.20 q ha⁻¹) among the treatment combinations, while *Pathara* under T₃ had the highest straw yield (94.52 q ha⁻¹). *Pathara* had the highest 1000-grain weight (28.80 g) under T₂ and the highest amylose content (44.09%) under T₃, while *Vandana* (17.58%) and *Nabanna* (17.64%) under the control treatment had the lowest amylose content. Under T₁, *Nabanna* had the highest protein level (11.93%), whereas *Vandana* had the lowest protein content (7.99%). Under control conditions, *Nabanna* had the highest zinc level (29.29 ppm), while *Parijat* had the lowest zinc content (14.62 ppm) under T₃. These findings indicate that nutrient levels significantly influence both yield and nutritional quality of rice grains, consistent with earlier reports (Yoshida, 1981). Overall, the study showed that early-duration rice varieties' growth, physiological characteristics, biochemical composition, and yield were all strongly impacted by graded macronutrient supply. *Pathara* demonstrated superior canopy development, grain weight, and amylose content; *Vandana* displayed superior vegetative growth and grain production; *Nabanna* displayed superior nutritional quality in terms of protein, zinc, and iron content; and *Parijat* demonstrated superior tillering and harvest index. The findings highlight the significance of balanced macronutrient management in conjunction with varietal selection for enhancing early-duration rice yield and grain quality.

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Potential crops in Indian agriculture: Prospects and challenges

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Abstract:

Potential crops, often found to be underutilized, neglected, or minor varieties, are located at a strategic position in Indian agriculture because of their adaptability under a wide range of agro-ecological conditions, nutritional richness and capacity to increase the resilience of the farm. In the face of increasing population pressure, climatic variability, declining natural resources and constraints inherent in the cereal centric agricultural production systems, crop provides viable alternatives for sustainable and inclusive agricultural development. Indian agriculture encompasses a wide range of potential crops like millets, pseudo cereals, grain legumes, oilseeds, tubers, and indigenous leafy vegetables, which were, in the past, grown mostly in rainfed, tribal, and marginal areas. The prospects with potential crops in India are multi facet in nature. Agronomically, they have shown tolerance of drought, heat, salinity, and low soil fertility which make them fit for climate stressed and resource constrained environments. From nutritional point of view, potential crops constitute rich sources of proteins, dietary fibre, essential amino acids, minerals, vitamins, and bioactive compounds and, thus, play a significant role in nutritional and health security. Economically, the low input requirement and their suitability for mixed and intercropping systems provides the opportunity for risk minimisation and income diversification among small and marginal farmers. From the ecological perspective, agro-biodiversity conservation, soil health, and the reduction of the dependency on chemical inputs all play a role with these crops. Recent policy initiatives - promotion of millets and nutri-cereals, inclusion in public distribution and mid-day meal schemes, focussed research programmes, etc - have given their relevance in national agricultural planning a further impetus.

Despite these promising prospects, various challenges still stand in the way of large scale adoption and mainstreaming of potential crops into the Indian agriculture. Limited investment in systematic research and breeding has resulted in a limited range of high yielding, location specific and stress tolerant varieties. Weak seed systems, poor agronomic packages, and poor mechanisation options limit the productivity and scalability. Post-harvest constraints - e.g. processing and absence of value addition infrastructure, short shelf life, etc., further reduce market competitiveness. Additionally, inadequate market linkages, price fluctuation, lack of consumer awareness and lack of assured procurement are disincentives for farmers to grow these crops on commercial scale. Policy support while improving, is still fragmented and uneven across regions. The conclusions of the abstract are that to realize the full potential of these crops an integrated approach that includes targeted research and development work, strengthening of seed and value chains, policy coherence, and consumer-centric promotion of markets is needed. Mainstreaming of potential crops in the agricultural systems of India is thus necessary, not only to augment farm incomes and nutritional security, but also to achieve long term sustainability and resilience in the face of climate change and socio economic challenges.

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Mobile-based agrometeorological advisory dissemination of climate resilient verticals for enhancing rice and mustard productivity

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Abstract:

Digital technologies play a vital role in strengthening climate-smart and information-driven agricultural extension systems. The Agromet Field Unit (AMFU), Regional Research and Technology Transfer Station (RRTTS), Ranital adopted Raghunathpur village of Maitapur block of Baleswar district, from 2023 onwards under a village adoption programme to enhance farmers' access to timely and actionable agricultural information. As part of this initiative, WhatsApp was utilized as an Information and Communication Technology (ICT) platform for disseminating agrometeorological advisories, including short- and medium-range weather forecasts, pest and disease outbreak alerts generated from surveillance, and real-time market price information. During the Kharif and Rabi season of 2024-25, the timely dissemination of advisories enabled farmers to undertake prompt crop management interventions in rice and rapeseed-mustard, particularly during the Cyclone DANA event (22–28 October), thereby minimizing weather-induced crop losses. An impact assessment survey conducted in the first week of July 2025 involved 50 farmers, comprising 25 adopters and 25 non-adopters of WhatsApp-based agromet advisories. The results showed that advisory adopters recorded an average yield increase of 2.2 quintals per acre and an additional net return of ₹5,861 per acre in rice cultivation and 14% yield enhancement in mustard variety Sampurna compared to non-adopters. The study demonstrates that mobile-based ICT tools, supported by digitally generated weather and pest intelligence, effectively function as smart advisory systems and complement IoT-enabled data streams. The findings highlight the potential of scalable digital platforms in enhancing farm-level decision-making, productivity and resilience under increasing climatic variability.

Keywords: ICT in agriculture, Agrometeorological advisories, WhatsApp-based extension, weather forecast, Rice, Rapeseed-Mustard

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Response of rice varieties to different levels of irrigation under aerobic condition

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Abstract:

The field experiment was conducted West Central Table Zone, Odisha during summer season of 2019 & 2020 to study effect of medium duration rice varieties with varying irrigation regimes under aerobic condition. The experiment was laid out in split plot design having four irrigation regimes (Irrigation at IW/CPE = 1.0, 1.5, 2.0, 2.5) in main plot treatments and four varieties (Naveen, MTU-1010, CR Dhan-201 and CR Dhan-204) in subplot treatments. The result showed that higher grain yield was recorded at IW/CPE = 2.5 (4.07 t/ha), which was significantly superior to rest of other irrigation regimes except IW/CPE = 2.0 (3.90 t/ha) that was at par with IW/CPE = 2.5. Whereas, in case of cultivars, higher grain yield was obtained with CR-Dhan 201 (3.54 t/ha) which was significantly superior to rest of other cultivars except Naveen (3.30 t/ha) which was at par with CR-Dhan 201. The FWUE at IW/CPE 1.5 (40.71 kg/ha-cm) was recorded higher which was at par with other irrigation regimes except IW/CPE 2.5. The higher B:C ratio (1.74) was observed at IW/CPE 2.0 and it was at par with IW/CPE 2.5 (1.73) and significantly superior to rest other irrigation regimes. Whereas in cultivars, FWUE of 41.60 kg/ha-cm and B:C ratio (1.62) were observed with CR Dhan 201 and significantly superior to rest of other cultivars. It may be concluded that rice grown under aerobic culture, variety 'CR Dhan 201' was found optimum as it has resulted in highest growth of aerobic rice and realizing higher productivity besides enhancing economically profitability at irrigation regimes at IW/CPE 2.0 in West Central Table Land Zone of Odisha under aerobic condition.

Keywords: Aerobic rice, Water use efficiency, IW/CPE ratio, Yield attributes, Growth parameter, B:C ratio

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Exogenous melatonin dipping mitigation of pericarp browning and oxidative deterioration in 'Shahi' Litchi (*Litchi chinensis* Sonn.) during ambient storage

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Abstract:

Shahi' litchi (*Litchi chinensis* Sonn.) is highly susceptible to rapid post-harvest deterioration, primarily due to physiological weight loss (PLW) and enzymatic pericarp browning under ambient conditions. This study evaluated the efficacy of exogenous melatonin dipping at various concentrations (0.5, 1.0, 1.5, and 2.0 mM) on the shelf-life and physico-chemical properties of 'Shahi' litchi stored in punnet boxes. One-way ANOVA revealed that while Total Soluble Solids (TSS) and Titratable Acidity (TA) remained relatively stable across treatments throughout the 5-day storage period, melatonin significantly influenced Vitamin C retention, PLW, and browning index ($p < 0.05$).

By Day 5, the control (S1) exhibited the highest degradation, with Vitamin C levels dropping to 6.67 ± 0.58 mg/100g and the browning index reaching a peak of 3.00 ± 0.06 . In contrast, melatonin treatments significantly mitigated these losses. The 1.0 mM melatonin dip (S3) emerged as the most effective treatment, recording the lowest browning index 1.70 ± 0.02 and significantly higher Vitamin C retention 16.67 ± 0.58 mg/100g compared to the control. Although physiological weight loss (PLW) generally increased across all treatments by Day 5, reaching up to 22.84% in S5, the moderate concentration of 1.0 mM (S3) maintained a superior balance between biochemical stability and visual appeal. These results demonstrate that an exogenous melatonin dip of 1.0 mM effectively delays senescence and suppresses pericarp browning, providing a viable post-harvest strategy for extending the shelf-life of 'Shahi' litchi under ambient storage conditions.

Keywords: Shahi Litchi, Melatonin, Post-harvest life, Pericarp browning, Vitamin C,.

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In vitro screening and morpho-biochemical studies on herbicide tolerance in Indian Mustard (*Brassica juncea* (L.) Czern and Coss)

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Abstract:

Different stresses including abiotic (high temperature, salinity and drought) and biotic (weed, insect pests and pathogen) affect growth, reproduction and productivity of crop plants by altering their biochemical circuits. Weed is a major problem in Indian mustard (*Brassica juncea*, $2n=AABB=36$) which reduces its productivity due to crop-weed competition for resources (water, nutrient, space and light) during initial vegetative phase. Herbicides minimize losses due to weed but by jeopardizing environment in the long run. Therefore, development of herbicidal tolerant (HT) mustard is an important goal of mustard breeding programme. In this investigation, an attempt is made to identify the herbicide tolerant mustard genotypes deploying in vitro screening of 40 genotypes of mustard in MS-agar medium with varying concentrations of pre-emergence herbicide pendimethalin and the post-emergence herbicide quizalofop-ethyl. Significant genotypic variability was recorded across morpho-biochemical parameters such as germination percentage, seedling length, root and shoot growth, shoot-root ratio, seedling vigour index, and chlorophyll (a, b, and total) content. Tolerant genotypes consistently maintained higher germination rates, greater seedling elongation, balanced shoot-root allocation, and superior chlorophyll stability compared to susceptible lines, which exhibited severe growth retardation and pigment loss under herbicide stress. Among all the genotypes, ORM 2019-31 recorded higher level of tolerance to pre-emergence herbicide pendimethalin and post-emergence herbicide quizalofop-ethyl while JD6 recorded susceptible response in in vitro screening & morpho-biochemical studies. All these findings would be helpful in the development of HT-mustard for minimizing yield loss under weed pressure in changing climate.

Keywords: Indian Mustard, Herbicide Tolerance, Yield loss, in vitro screening

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Impact of insecticide seed treatment during storage on seedling health, vigour, and physio-biochemical traits of Green Gram (*Vigna radiata* (L.) R. Wilczek)

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Abstract:

Vigna radiata (L.) R. Wilczek, or green gram, is a significant pulse crop that is valued for its high protein content and contribution to sustainable farming. However, seed viability, vigor, and eventual crop establishment are negatively impacted by insect infestation-induced seed degeneration during storage. Insecticide treatment of seeds has been widely used to safeguard stored seeds; nonetheless, their possible impact on the physiological and biochemical characteristics of seedlings necessitates rigorous assessment to guarantee the absence of phytotoxic effects (Copeland & McDonald, 2001). Developing safe and efficient seed care and storage techniques requires an understanding of these reactions (Bewley et al., 2013). The goal of the current study was to determine how new pesticide treatments affected green gram (*Vigna radiata* (L.) R. Wilczek) seeds that were preserved, as well as to analyze the physiological, biochemical, and morphological characteristics of the seedlings that affected their vigor, growth, and health. In 2024–2025, the experiment was conducted in a lab at the Department of Seed Science and Technology and in a net house at the Department of Plant Physiology, College of Agriculture, OUAT, Bhubaneswar. In a completely randomized design with three replications, eight insecticide treatments and an untreated control were assessed. During storage, seed germination was greatly enhanced by insecticide treatments. Flupyradifurone 200 SL @ 8 ppm showed the highest germination rate among the treatments (88.00% at 3 months after treatment [MAT] and 87.00% at 6 MAT) in comparison to the untreated control (76.67% and 76.33%, respectively). At 3 MAT and 6 MAT, the mean germination of treated seeds was 86.3% and 85.3%, respectively, demonstrating efficient pest control without phytotoxic effects. Insecticide treatments significantly increased seedling vigor indices; at 3 and 6 MAT, Pyriproxyfen 10 EC @ 2 ppm recorded the highest Seedling Vigour Index-I (3,783.01 and 3,590.66) and Spinetoram 11.7 SC @ 3 ppm recorded the highest Seedling Vigour Index-II (22,635.00 and 19,397.33). Untreated seeds, on the other hand, showed reduced vigor, indicating diminished establishment potential. When compared to the control, treated seedlings exhibited considerably better morphological characteristics, including shoot length (22.8–23.1 cm), root length (15.2–16.5 cm), plant height (45.0–66.3 cm), and seedling dry weight (0.23–0.25 g). Healthier seedling growth was further demonstrated by increased internode elongation, branching, and leaf area. With greater mean protein (25.4% at 3 MAT; 22.5% at 6 MAT), carbohydrate (59.5% at 3 MAT; 56.7% at 6 MAT), starch (34.1% at 3 MAT; 29.7% at 6 MAT), and ash levels, biochemical analysis demonstrated improved seed reserve preservation in treated seeds. Treated seedlings also recorded higher chlorophyll content (chlorophyll a: 0.826–1.188 mg g⁻¹ at 30 DAS and 0.752–0.892 mg g⁻¹ at 45 DAS; chlorophyll b: 0.087–0.139 mg g⁻¹ at 30 DAS and 0.071–0.131 mg g⁻¹ at 45 DAS), indicating sustained photosynthetic capacity. Overall, the results demonstrate that insecticide seed treatments effectively protect stored green gram seeds from insect damage while preserving germination, vigor, growth, and biochemical integrity. The findings provide a scientific basis for integrating insecticide seed treatments into storage and crop management practices to ensure robust seedling establishment and enhanced productivity.

Comparative evaluation of morpho-physiological and biochemical traits in diverse potato (*Solanum tuberosum* L.) genotypes

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Abstract:

One of the most significant tuber crops in the world, the potato (*Solanum tuberosum* L.), belongs to the Solanaceae family and is highly valued for its high starch content, nutritional value, and suitability as a food crop. A Comparative Evaluation of Morpho-Physiological and Biochemical Traits in Diverse Potato (*Solanum tuberosum* L.) Genotypes was carried out at the Research Farm of the All India Coordinated Research Project on Potato, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, during the rabi season of 2024–2025. A Randomized Block Design with four replications was used to assess five potato genotypes: Kufri Ganga (G_1), Kufri Thar-1 (G_2), Kufri Sinduri (G_3), Kufri Uday (G_4), and Atlantic. Different biochemical parameters like chlorophyll a, chlorophyll b, total chlorophyll, starch, protein, ascorbic acid, and reducing sugars, which are known to vary significantly among potato genotypes (Ezekiel et al., 2013) were assessed and also evaluations were carried out based on many morpho-physiological characteristics such as plant height, number of leaves per plant, number of leaflets per leaf, number of shoots per plant, root length, dry matter content, and chlorophyll content (SPAD value). At harvest, yield attributes were recorded, including the number of tubers per plot, the weight of tubers in various size categories (<20 g, 20–50 g, and >50 g), and the overall yield of tubers. Significant genotypic variance among the assessed cultivars was found in the results. With the highest number of tubers per plot, tuber weight across all size grades, total tuber yield (24.35 t ha^{-1}), plant height (40.38 cm), number of leaves per plant (7.00), number of leaflets per leaf (6.32), number of shoots per plant (4.36), and dry matter content (18.1%), Kufri Ganga demonstrated superior performance for the majority of yield and growth parameters. The genotype Atlantic had the largest root length (9.70 cm), SPAD chlorophyll value (40.35), and chlorophyll a content ($1.76 \text{ mg g}^{-1} \text{ FW}$). Kufri Uday had the highest reducing sugar concentration ($105.08 \text{ mg } 100 \text{ g}^{-1} \text{ FW}$), while Kufri Sinduri had the highest protein ($2.54 \text{ g } 100 \text{ g}^{-1} \text{ FW}$), ascorbic acid ($16.84 \text{ mg } 100 \text{ g}^{-1} \text{ FW}$), and starch content (17.38%), while Kufri Uday exhibited the highest reducing sugar content ($105.08 \text{ mg } 100 \text{ g}^{-1} \text{ FW}$) and chlorophyll b content ($0.84 \text{ mg g}^{-1} \text{ FW}$). Kufri Thar-1 showed the maximum total chlorophyll content ($1.97 \text{ mg g}^{-1} \text{ FW}$). Overall, the study highlights considerable genotypic variability in morpho-physiological, biochemical, and yield traits of potato, with Kufri Ganga emerging as the most promising genotype under the agro-climatic conditions of Bhubaneswar. The observed variability among genotypes indicates substantial scope for selection of superior potato cultivars based on morpho-physiological and biochemical traits for enhanced productivity and quality

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Physico – chemical properties of wild Jujube (*Ziziphus oenoplia* L.) fruits as influenced by pre and post harvest conditions



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Abstract:

The investigation entitled “Physico-Chemical Properties of Wild Jujube (*Ziziphus oenoplia* L.) Fruits as Influenced by Pre- and Post-Harvest Conditions” provides valuable insights into the nutritional quality and potential health benefits of Kanteikoli fruits, focusing on the effects of storage and the collection of fruits from different locations in Odisha. The fruits were analyzed for ascorbic acid, phenolic compounds, sugars, and other biochemical parameters. Bharatpur-sourced fruits exhibited higher levels of ascorbic acid & phenolic compounds, suggesting better antioxidant properties compared to samples from Bhawanipatna and Kamthana. Vitamin C content (ascorbic acid) declined with increased storage duration, consistent with known degradation during storage. Fresh fruits retained the highest nutritional values across all locations. Fruit quality and weight varied significantly across different maturity stages, in line with natural ripening processes. The fruits are rich in minerals and antioxidants, indicating potential as a functional food. Antioxidant and antimicrobial properties suggest therapeutic applications. Study Period was 2020-2022. Experiment was conducted in PG Laboratory, Department of Horticulture, Siksha ‘O’ Anusandhan University, Bhubaneswar, Odisha. The study uses Randomized Block Design (RBD) with 9 treatments (T1-T9) and 6 replications and collection sites were Bhawanipatna, Kamthana, Bharatpur with three storage durations: Fresh (0 weeks), 1-week storage, 2-week storage. The fruits have high antioxidant content and nutrient density highlight their role in promoting health and combating oxidative stress-related diseases. It has potential for developing health supplements or functional food products, explore therapeutic properties, focusing on antioxidant and antimicrobial activity. It investigates domestication and cultivation practices to optimize production and quality. It evaluates the fruits’ role in enhancing food security and addressing malnutrition. Wild jujube fruits present promising avenue for nutritional enhancement and therapeutic applications. Continued research and development could unlock their full potential, contributing significantly to both public health and agricultural innovation.

Keywords: Wild ber, Anti-oxidant, Nutritional, Anti-microbial, Therapeutic.

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Precision horticulture as a climate-smart pathway for sustainable agri food systems



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Abstract:

The world food system is facing pressures from climate variation, natural resource depletion and growing demand for safe, nutritious foods. Precision horticulture combined with climate smart agriculture (CSA) principles, provides a transformative avenue to construct resilient and sustainable agri-food systems. Precision agriculture use technologies like remote sensing, geographical information systems (GIS), internet of things (IoT), artificial intelligence and data driven decision support tools to optimize input uses, maximizing crop productivity and minimizing environmental footprints. When integrated with CSA approaches that mainly include climate adaptation, mitigation and productivity enhancement precision horticulture has potential to significantly help namely climate adaptation, mitigation, and productivity enhancement—precision horticulture can significantly improve resource-use efficiency, reduce greenhouse gas emissions, and strengthen resilience against climate-induced stresses. Climate smart interventions in horticulture, including precision irrigation, site-specific nutrient management, protected cultivation, stress-tolerant varieties, and real-time pest and disease monitoring, contribute to sustainable intensification while conserving soil, water, and biodiversity. These approaches not only stabilize yields under erratic climatic conditions but also improve produce quality, nutritional value, and market competitiveness. Furthermore, the integration of precision technologies across the value chain from production to post-harvest management supports traceability, reduces post-harvest losses, and promotes circular and low carbon agri-food systems. Emphasis is placed on technological innovations, policy support, capacity building, and inclusive adoption strategies necessary for scaling precision-based solutions, particularly in smallholder-dominated production systems. Advancing precision horticulture within a climate-smart framework is crucial for ensuring food and nutritional security, environmental sustainability, and economic viability in the face of future climate challenges.

Keywords: Precision, horticulture, adaptation, management, mitigation, and productivity

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Assessment of Potato (*Solanum tuberosum* L.) physiology under conservation (zero) and conventional tillage

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Abstract:

One of the most significant tuber crops in the world, potatoes (*Solanum tuberosum* L.) are essential to food and nutritional security. While conservation techniques like zero tillage enhance soil structure, water-use efficiency, and crop performance, conventional tillage techniques, despite being widely used, frequently result in increased production costs, soil degradation, and moisture loss. By increasing soil moisture and nutrient availability, zero tillage with residue retention has been shown to improve crop productivity and physiological efficiency (Lal, 2015). However, there is a lack of data regarding the physiological and biochemical reactions of potato genotypes under zero tillage systems, which calls for a methodical assessment. The present investigation entitled “Assessment of Potato (*Solanum tuberosum* L.) Physiology Under Conservation (Zero) and Conventional Tillage” was conducted to evaluate the influence of zero tillage on physiological, biochemical, and yield parameters of potato. The experiment was carried out during the Rabi season of 2024–2025 at the research farm of the All India Coordinated Research Project on Potato, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar. Five potato genotypes—Kufri Lohit, Kufri Uday, Kufri Ganga, Kufri Sinduri, and Atlantic—were used as sub-plot treatments in the split-plot design of the field experiment, which was repeated four times. The main plot treatments were zero tillage and conventional tillage. To evaluate the relative effectiveness of tillage regimes and genotypes, growth, physiological, biochemical, and yield characteristics were measured. The findings showed that, in comparison to conventional tillage, zero tillage considerably increased plant height, the number of shoots per plant, the number of leaves and leaflets per plant, root length, root weight, and shoot weight. Under zero tillage, biochemical characteristics such as chlorophyll a, chlorophyll b, total chlorophyll, glucose content, starch content, ascorbic acid, and protein content were also greater, suggesting improved photosynthetic activity and physiological efficiency (Hobbs et al., 2008). Kufri Uday and Kufri Ganga were the genotypes with the highest tuber yield under zero tillage (24.07 t ha^{-1}), while Atlantic had the lowest yield under conventional tillage (16.34 t ha^{-1}). Under zero tillage, Kufri Uday had the most marketable tubers ($>50 \text{ g}$ and $20\text{--}50 \text{ g}$), while Atlantic had the fewest under conventional tillage. On the other hand, with conventional tillage, Kufri Uday had more tiny tubers (less than 20 g). Overall, by improving potato physiological performance, biochemical composition, and tuber production, zero tillage in conjunction with straw mulching outperformed conventional tillage. According to the study, zero tillage is a practical conservation strategy for raising profitability and productivity, especially for small and marginal farmers. Kufri Uday and Kufri Ganga were found to be the best suited cultivars under zero tillage circumstances among the genotypes that were studied.

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Effect of nano-fertilizers in enhancing mustard productivity in Odisha

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Abstract:

Indian Mustard (*Brassica juncea*) is the 3rd important edible oilseed crop of India next to groundnut and soybean. India has 12-15% of the world's area under oilseed but account for less than 6-7 % of world's production to meet the need of about 17% of world population. Indian Mustard is a potential oilseed crop grown in the rice-based cropping system of Odisha. This trial was conducted in Rabi season of 2024-25 at RRTTS, Ranital farm with need-based recommended agronomic practices & intercultural operations. The experiment was laid out in a factorial RBD design with the treatments comprised three fertility levels (F1-100% RD-NP, F2-75% RD-NP and F3-75% RD-NP) in main factors and three sub factors (N1- 2 spray of nano-urea, N2-2 spray of nano-DAP, N3- 2 spray of nano-urea & 2 spray of nano-DAP) and one absolute control(water spray). The treatments were replicated thrice. The fertility level with 100% RD-NP was significant superior over other fertility levels in term of growth attributes (height of plant, number of branches, dry matter accumulation and relative growth rate) and yield attributes. Among the nano fertilizers, N3- 2 spray of nano-urea & 2 spray of nano-DAP (1092 kg/ha) resulted highest yield which is statistically at par with 100% RD-NP+2 spray of nano DAP(1020 kg/ha) and having significantly superior impact over all other treatments with respect of growth factors (plant height, number of branches/plant), yield attributes and yield.

Keywords: Brassica juncea, Nutrient, Nano fertilizers

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Millets for nutrition and climate action: An integrative review of agronomy, processing, and nutritional outcomes



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Abstract:

Millets are traditional C4 crops that in recent years have returned to the scientific and policy agenda due to an uncharacteristic capability of managing the type of climate stress that is currently affecting the larger cereals. Reading the literature, it was apparent that the research on agronomy, nutrition, and processing of millets has expanded rapidly not necessarily in a linked manner. These small-seeded cereals have repeatedly been demonstrated to survive within the drought, high temperature and poor soils environment, which is most likely to occur due to their characteristics such as deep rooting and effective pathways of stress-response. Meanwhile, biofortification advancement particularly in pearl millet has boosted the levels of grain iron and zinc to amounts that may have importance to the nutrition of the population, albeit not always consistently across environments. The nutritional data is positive but subtle. Minerals and bioactive compounds are present in good quantities in the millets, but the usefulness of this depends on the processing method since phytates and other antinutrients may inhibit the absorption. Fermentation, decortication and extrusion methods are regularly shown to enhance bioavailability, though the vast majority of the outcome is due to small and controlled studies instead of actual food systems.

This field is promising but scattered. In this review I present a three-node, field-to-plate strategy that links climate resilient nutrient enriched staples, nutrient preserving processing and institutional procurement pathways to bring an integrated approach in positioning millet as a climate resilient, nutrient dense staple in future food system.

Keywords: Climate-resilient cereals, Millets, Biofortification

Biography:

Devyani Ramola is a third year B.Sc. Agriculture student at GB Pant University of Agriculture and Technology, Pantnagar, India. She has worked as a student research assistant on forage oat quality and yield traits, and forage sorghum genetic variability and diversity analysis, contributing to three research papers and a book chapter currently under review. She also developed a digital service platform connecting over 200 beekeeping farmers, supporting government registrations, training access, and apiary management. Her research interests focus on improving crop nutritional quality and resilience to advance sustainable agriculture and future food security.

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Crop water budgeting and spatial estimation for different establishment methods of Rice (*Oryza sativa* L.) under canal command using remote sensing and GIS



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Abstract:

Water scarcity and inefficient use of irrigation resources in canal command areas necessitate the development of sustainable rice cultivation strategies. This study was undertaken to assess the impact of different crop establishment methods and irrigation schedules on crop water budgeting and to spatially estimate rice area and water requirement using remote sensing (RS) and GIS technologies.

Field experiments were conducted on sandy clay loam soils at the Agricultural Research Station, Kampasagar, Telangana, using a split-plot design with three establishment methods—dry direct seeding (DDSR), wet direct seeding (WDSR) and transplanting (TPR)—and three irrigation schedules: continuous submergence (CS), saturation and alternate wetting and drying (AWDI). WDSR showed significant improvements in plant growth, yield attributes, nutrient uptake and energy efficiency, with a mean grain yield of 6446 kg ha⁻¹, while DDSR recorded the lowest performance. Irrigation schedules showed no significant effect on most growth and yield parameters, but AWDI exhibited the highest irrigation water use efficiency (6.93 kg mm⁻¹) and economic viability.

Remote sensing data from SkySat and Sentinel-2A were used to classify rice area with accuracies of 98.33% and 85%, respectively. The SEBAL-GEE model estimated crop water requirements as 5.12 TMC in 2021 and 4.56 TMC in 2022. Replacing TPR with DDSR and adopting shorter-duration varieties could save up to 15% and 14.6% of water, respectively, enabling irrigation of an additional 2,908 to 2,760 ha.

This study highlights the critical role of combining agronomic practices with geospatial tools for effective water budgeting and planning in rice-based canal command areas. The findings provide robust evidence for scaling sustainable establishment methods and irrigation strategies to improve water productivity, energy use and climate resilience in irrigated rice ecosystems.

Keywords: Rice, Water budgeting, WDSR, AWDI, Remote sensing, SEBAL, GIS, Water productivity

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Innovative technologies for the effective management of wild herbivores in the semi-arid agricultural landscape of Jodhpur, Rajasthan

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Abstract:

In present times, demand for agricultural produce has increased manifold; to meet this challenge, we are expanding the area under cultivation, which in turn reduces the natural habitats of wild animals. This reduction in the natural habitat of wild herbivores has forced these animals to move into our crop fields and other human setups.

Wild herbivores are becoming pests in agricultural landscapes. As these wild herbivores, such as nilgai, wild boar, chinkara, hare, etc, are protected under Section III of the Wildlife Protection Act of India, management efforts are more challenging. To manage these wild herbivores, traditional methods used are not very effective and also not very efficient. Therefore, the need for the Development and Refinement of Management Technologies and tools has emerged, which provides economic, effective management of these wild herbivores, besides complying with the Wildlife Protection Act of India.

In the present study, we evaluated some of these technologies with ecological considerations, such as communication, smell, etc. These traits were exploited to develop various tools like bio-acoustic tools, e-canon, olfactory repellents, and solar fencing for effective and non-lethal management of these wild herbivores in crop fields. Their efficacy was evaluated in the villages located around the Jodhpur district. The damage (by all three wild herbivore species) before the use of these management technologies was quite alarming in the kharif crops, such as Bajra, Moong, and Guar ranged between 1.6 to 37%, 2.7- 15.7% and 1.0 – 12.3, respectively.

Damage in these crop fields was effectively contained up to 0% in these crops by using the comparative analysis of bio-acoustic gadget, e-canon, olfactory repellent, and solar fencing alone and in integrated fashion, also revealed that these technologies are very effective. The best management technology found during this study was the integration of olfactory repellent and solar fencing, it provided 100% relief from any of these wild herbivores. Result shows that these non-lethal technologies provide effective management of wild herbivores in the crop fields.

Keywords: Human-Wildlife Conflict, Wildlife Protection Act of India, pest, nilgai, wild boar, kharif, e-cannon, bio-acoustic, olfactory repellent, solar fencing

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Impact of heat Stress on anti-nutritional compounds in Garden Pea (*Pisum sativum* L.)



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Abstract:

Anti-nutritional factors such as phytic acid and tannins are naturally present in legumes and can adversely affect nutritional quality by reducing mineral bioavailability and protein digestibility. Phytic acid chelates essential micronutrients, while tannins interfere with nutrient utilization, making their assessment under abiotic stress conditions particularly important. Heat stress during reproductive development is known to influence metabolic pathways, potentially altering the accumulation of these compounds and thereby affecting nutritional outcomes.

With this objective, a field experiment was conducted at Vegetable Research Centre, G.B.P.U.A&T, Pantnagar during the rabi season of 2024–2025 to evaluate the effect of heat stress on phytic acid and tannin content in garden pea (*Pisum sativum* L.). An augmented block design with eight blocks was used to evaluate twenty genotypes and two checks under normal season (November 2024) and heat stress (February 2025) conditions. Independent analysis of variance revealed highly significant genotypic differences ($p \leq 0.01$) for both traits under each environment. Under normal conditions, phytic acid content ranged from 639.75 to 1113.25 mg/100 g with a mean of 922.76 ± 28.52 mg/100 g, whereas under heat stress the mean decreased to 897.44 ± 26.98 mg/100 g (range: 631.14–1095.33 mg/100 g). In contrast, tannin content increased from 158.71 ± 3.30 mg/100 g (range: 136.05–178.07 mg/100 g) under normal conditions to 186.24 ± 3.91 mg/100 g (range: 160.99–210.47 mg/100 g) under heat stress.

The findings indicate that heat stress can alter the accumulation of major anti-nutritional factors in garden pea, with a modest reduction in phytic acid and a marked increase in tannin content. Such responses have implications for the nutritional quality of pulses under future climate scenarios and should be considered when selecting genotypes for heat resilience and improved nutritional profiles.

Keywords: Garden pea (*Pisum sativum* L.), Heat stress, Abiotic stress conditions, Antinutritional factors, Phytic acid, Tannin

Biography:

Vatsala Tewari is a Ph.D. candidate in Horticulture (Vegetable Science) with a minor in Genetics and Plant Breeding at the College of Post-Graduate Studies, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India. She is working under the supervision of Dr. Alka Verma, Junior Research Officer, Department of Vegetable Science. She has 18 research publications to her credit. Her research interests include plant breeding, genetic improvement of vegetable crops, germplasm evaluation, selection strategies, and the application of quantitative genetics in crop improvement programmes with a focus on improving vegetable crop performance under abiotic stress conditions.

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Agronomic biofortification for improving nutritional security in cereal crops



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Abstract:

India has 189.2 million people i.e. 14% of the population as undernourished. The percentage of children under the age of five who are stunted, wasted and are underweight are 38.4, 21.0 and 42.5 per cent respectively. 53.1 per cent of women of reproductive age between 15 to 49 years are Anaemic. These findings highlight the prevalence of chronic malnourishment in India. Malnutrition are more prevalent in the underdeveloped and developing countries, which unfortunately overlaps with soil nutrient status and socio-economic conditions. The continued negligence of micronutrient fertilizers in the fertilizer program and the indiscriminate application of the high-analysis micronutrient-free fertilizers under intensive agriculture led to imbalance of nutrients in the soil resulting in micronutrient deficiencies. The micronutrient deficiencies in soils reduce crop yields and produce poor nutritional quality of the edible parts of crops, resulting in malnutrition in human populations. Currently, there is sufficient evidence available to say that biofortification will improve nutritional quality of crops, where it aims to enhance the contents of micronutrients in the edible parts of crops. Biofortification of crops is the cost-effective approach where the increased nutrients in staple crops will alleviate the issue of malnutrition. The Government of India has taken an important step in linking agriculture and nutrition with biofortification. In recent years, ICAR and allied institutions have released 152 nutrient-rich and biofortified varieties across major crops, including cereals, millets, pulses, oilseeds and horticultural crops, to strengthen nutritional security. Agronomic biofortification emerges as a rapid and practical strategy for enhancing micronutrient levels in food crops. Strategies like selection of efficient genotypes, seed treatment/priming with micronutrients and microbes, fertilizer application and irrigation management techniques and nano-formulations improve the grain nutrient contents. The availability of low amounts of micronutrients in edible parts of food crop is “hidden hunger” being neglected so far, which need to be addressed properly to achieve hunger and malnutrition free world in 2030.

Biography:

Dr. Jakku Prasanna is an Agronomist with a PhD in Agronomy from Tamil Nadu Agricultural University, Coimbatore. Her research focuses on agricultural nanotechnology, moisture-responsive controlled-release herbicides, sustainable weed management, and climate-resilient crop production, particularly in rainfed and dryland systems. She is an inventor of an Indian patent on nano-composite-based herbicide delivery systems and has published extensively in peer-reviewed journals, books, and book chapters. She has worked with ICAR–CRIDA under national research programs and is a recipient of the Vice Chancellor’s Fellowship for Excellence in Research and the Young Agricultural Researcher Award.

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Irrigation water quality index–based assessment of marigold industry effluent and its phytotoxic bioassay



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Abstract:

Marigold processing industry effluent was evaluated for irrigation suitability using the Irrigation Water Quality Index (IWQI) based on physical, chemical, and biological parameters. The IWQI values of treated (TMFE) and untreated marigold flower effluents (UMFE) were 10.508 and 45.262, respectively, indicating their potential suitability for irrigation. An *in vitro* seed germination bioassay was conducted using tomato (*Solanum lycopersicum* L.) to assess growth responses across a concentration gradient (0.05–25 mg mL⁻¹). Phytotoxic and stimulatory effects were evaluated after 14 days for Relative Seed Germination, Relative Radicle Growth, Germination Index (GI), Seedling Vigor Index (SVI), Phytotoxicity Index (PI), Relative Toxicity, and Tolerance Index. Boltzmann sigmoidal fitting identified a growth inhibition threshold >0.1 mg mL⁻¹, with a sharp decline in shoot and root length. Both effluents showed a biphasic response: low concentrations (≤ 0.1 mg mL⁻¹) enhanced GI and SVI (GI = 153.26% and 99.12%; SVI = 1898.62 and 1046.31 for TMFE and UMFE, respectively), while higher concentrations (>5 mg mL⁻¹) caused complete germination failure and 100% phytotoxicity (PI ≈ 1). Pearson's correlation revealed strong positive relationships between growth indices and negative correlations with toxicity indices. Principal component analysis explained 98.8% of total variance, distinguishing growth-promoting and toxic treatments. Hierarchical clustering and minimum spanning tree analyses categorized treatments into non-toxic (0–0.1 mg mL⁻¹), moderately toxic (1–5 mg mL⁻¹), and highly toxic (10–25 mg mL⁻¹) groups. Overall, the study identifies 0.1 mg mL⁻¹ as the optimal bio-stimulatory concentration, emphasizing effluent concentration as a key determinant for safe agricultural reuse.

Keywords: Marigold effluent, Phytotoxicity, Irrigation water quality Index, Stimulatory effect, Multivariate Analysis

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Assessment of genetic variability among mango cultivars of Telangana through SSR markers

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Abstract:

Mango (*Mangifera indica* L.) is one of the most economically important tropical fruit crops, valued for its nutritional quality, flavor, and wide adaptability. Understanding the extent of genetic variability among cultivated mango germplasm is essential for effective conservation and crop improvement programmes. The present investigation assessed the genetic diversity among fifty commercially important mango cultivars cultivated in Telangana, India, using simple sequence repeat (SSR) markers. Sixty SSR primers were screened, of which forty-two produced reproducible and polymorphic amplification patterns. These primers generated a total of 109 alleles, including 93 polymorphic alleles, with allele sizes ranging from 100 bp to 330 bp and an average of 2.21 alleles per locus. Polymorphic information content (PIC) values varied from 0.24 to 0.80, with a mean of 0.53, indicating moderate to high marker informativeness. Major allele frequency, observed heterozygosity, and gene diversity ranged from 0.357–0.940, 0.000–0.980, and 0.11–0.73, respectively. Cluster analysis performed using the Unweighted Pair Group Method with Arithmetic Mean (UPGMA) grouped the cultivars into three major clusters at a similarity coefficient of 0.62, reflecting substantial genetic divergence within the studied germplasm. The observed molecular diversity highlights the usefulness of SSR markers in mango genetic studies and provides valuable insights for the identification of diverse parental combinations for future mango breeding and improvement programmes.

Keywords: Mango (*Mangifera indica* L.), Genetic diversity, SSR markers, Molecular characterization, Cluster analysis.

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Role of biofertilizers in improving nutrient use efficiency and soil health in crop production

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Abstract:

Declining nutrient use efficiency (NUE) and progressive soil degradation associated with intensive chemical fertilizer use pose significant challenges to sustainable crop production. Biofertilizers, comprising functionally diverse and metabolically active microbial inoculants such as symbiotic and non-symbiotic nitrogen fixers, phosphate- and potassium-solubilizing microorganisms, arbuscular mycorrhizal fungi, and plant growth-promoting rhizobacteria (PGPR), have emerged as critical tools for enhancing nutrient acquisition efficiency and restoring soil health. These microorganisms enhance nutrient bioavailability through nitrogen fixation, mineral solubilization, chelation, enzymatic processes, and rhizosphere modification, leading to more efficient nutrient supply to crops. Biofertilizer application enhances root system architecture, rhizospheric microbial activity, and stimulation of root nutrient absorption processes, leading to improved uptake efficiency and reduced nutrient losses via leaching, volatilization, and fixation. Biofertilizers also improve soil health by increasing soil organic carbon, enhancing enzyme activity, raising microbial biomass, and improving soil aggregate stability, while supporting diverse and beneficial microbial communities. Use of biofertilizers in integrated nutrient management practices has resulted in improved agronomic efficiency, partial factor productivity and recovery efficiency of applied nutrients across diverse agro-ecosystems. Despite their proven potential, variability in field performance due to soil-climate interactions and microbial survival remains a constraint. This abstract demonstrates the importance of biofertilizers in improving nutrient efficiency and maintaining soil function in sustainable cropping systems

Keywords: Biofertilizers, Nutrient use efficiency, Soil health, Integrated nutrient management, PGPR, Sustainable agriculture.

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Fertilizer supply regulation and its influence on nutrient scheduling in cropping systems

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Abstract:

Fertilizer supply continues to be a crucial factor in determining crop yield, nutrient usage efficiency, and overall cropping system stability in agronomic production systems, especially in areas where domestic nutrient resources are insufficient to meet agricultural demand. As a result, export-import laws controlling the flow of fertilizer serve purposes beyond traditional trade and function as significant policy tools influencing patterns of nutrient application, agronomic choices, and production results. Fertilizer mobility across borders is seen from the standpoint of agronomy policy as a strategic interaction between crop production goals and macroeconomic control. Fertilizer access at the farm level is mostly determined by policy mechanisms such import dependence management, export limits, subsidy allocation, price stabilization, and public-sector procurement. Fertilizer use efficiency, yield stability, and soil nutrient balance are all impacted by these regulatory interventions, which also affect the timing, amount, and composition of nutrient inputs used within cropping systems. Farmers may be forced to modify fertilizer application schedules or rates due to disruptions caused by uneven or reactive trade policies during crucial crop growth stages, which frequently has a negative impact on crop performance and resource-use efficiency. The vulnerability of agronomic nitrogen management to concentrated fertilizer trade and inflexible legislative frameworks has been further highlighted by recent disruptions in the worldwide supply chain. These difficulties highlight the necessity of understanding fertilizer trade's agronomic consequences for crop response, nutrient scheduling, and sustainable intensification rather than just its economic ramifications. For timely nutrient availability, an integrated agronomy policy framework that supports adaptive measures like strategic reserves, diversified sourcing, and responsive distribution systems is crucial. This framework should match fertilizer trade regulation with crop-specific nutrient demand. Maintaining production, increasing the effectiveness of nutrient management, and guaranteeing long-term food security all depend on acknowledging fertilizer transportation as an agronomic variable rather than just a trade issue.

Keywords: Fertilizer movement regulation, cropping system stability, nutrient scheduling, resource-use efficiency, export import laws

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Use of drones in agriculture

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Abstract:

Rapid advancements in unmanned aerial vehicle (UAV) technology have transformed agricultural management by enabling precise, timely, and spatially explicit monitoring of crop and field conditions. The use of drones in agriculture has emerged as a key component of precision farming, providing high-resolution multispectral, hyperspectral, and thermal imagery for assessing crop growth, nutrient status, water stress, pest and disease incidence, and yield variability. Drone-based data acquisition allows for accurate spatio-temporal analysis of crop performance, facilitating site-specific management practices and optimized use of inputs such as fertilizers, water, and pesticides. Integration of UAV imagery with geographic information systems (GIS), machine learning algorithms, and decision support tools enhances the ability to detect early stress signals, improve yield prediction, and support real-time farm decision making. Compared to conventional ground-based and satellite methods, drones offer higher spatial resolution, operational flexibility, and cost-effectiveness, particularly for small and heterogeneous agricultural landscapes. Despite challenges related to data processing, regulatory constraints, and technical expertise, continued advances in sensor technology, artificial intelligence, and automation are expanding the scope of drone applications in agriculture. This abstract highlights the critical role of drones in improving resource use efficiency, productivity, and sustainability, positioning UAV technology as a cornerstone of smart and climate-resilient agricultural systems.

Keywords: Unmanned aerial vehicles (UAVs); Precision agriculture; Remote sensing; Crop monitoring; Sustainable agriculture

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Impact of herbicide intensification on soil health and microbial diversity in Indian Soybean (*Glycine max*) systems

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Abstract:

Soybean (*Glycine max*) serves as a foundational pillar of India's oilseed economy, spanning an estimated cultivation area of 12.27 million hectares. In the pursuit of maximizing yield and mitigating competitive pressures from weed flora, contemporary agronomic practices have become heavily reliant on intensive herbicide regimes, encompassing diverse pre-emergence and post-emergence chemical applications. While these strategies have successfully bolstered short-term productivity by suppressing weed-crop competition, the escalating and continuous influx of synthetic compounds into the agroecosystem raises critical concerns regarding the long-term health of the pedological environment. This study investigates the deleterious consequences of herbicide intensification on the biological and biochemical properties of the soil. Central to this inquiry is the disruption of the soil microbiome, particularly the rhizosphere-associated communities. High chemical loads often lead to the inhibition of essential nitrogen-fixing bacteria, such as *Rhizobium* species, which are vital for the symbiotic fixation of atmospheric nitrogen in soybean nodules. By altering microbial enzymatic activities and community composition, excessive herbicide use compromises key nutrient cycling processes, leading to a decline in soil fertility and a potential increase in pathogen susceptibility. Furthermore, the study posits that such shifts in microbial dynamics catalyze a trajectory toward soil degradation, ultimately undermining the ecological and economic sustainability of soybean-based cropping systems. The findings highlight a critical tension between immediate weed control efficacy and the preservation of the soil's biological capital. Consequently, there is an urgent need to re-evaluate current weed management paradigms. This paper advocates for a transition toward Integrated Weed Management (IWM) strategies that harmonize effective botanical protection with the conservation of microbial diversity, ensuring the resilience and long-term viability of India's agricultural landscapes in the face of intensifying production demands.

Keywords: *Glycine max*, Herbicide Intensification, Soil Health, Rhizosphere Microbiome, Nitrogen Fixation, Sustainable Intensification, India

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Fertilizers and their effects on soil, water and ecosystems

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Abstract:

Fertilizers are vital in modern agriculture, supplying essential nutrients such as nitrogen, phosphorus and potassium that significantly enhance crop growth and yields. Yet, the extensive and often imbalanced use of both inorganic and organic fertilizers has far reaching environmental consequences affecting soils, water systems and ecosystems. In soils, over application can alter pH, disrupt microbial diversity, reduce populations of beneficial organisms and deplete organic matter ultimately impairing soil fertility, nutrient cycling and overall soil health. Excessive nutrient accumulation, particularly nitrates further destabilizes soil nutrient balance undermining long-term agricultural sustainability. In aquatic systems, nutrient runoff and leaching transport high concentrations of nitrogen and phosphorus into rivers, lakes and coastal zones where they drive eutrophication, promote harmful algal blooms and create hypoxic “dead zones” that threaten aquatic biodiversity and degrade water quality. These nutrient inputs may also contaminate groundwater, posing human health risks through elevated nitrate levels in drinking water. Beyond soil and water, altered nutrient cycles and habitat modifications can reduce biodiversity, disrupt ecosystem services and increase greenhouse gas emissions including nitrous oxide linking fertilizer use to climate change challenges. To mitigate these impacts, sustainable nutrient management strategies such as optimizing fertilizer application rates, incorporating organic amendments and implementing integrated soil water conservation practices are essential. Such approaches are critical for maintaining agricultural productivity while preserving soil quality, protecting water resources and supporting overall ecosystem resilience, emphasizing the urgent need to balance food production with environmental stewardship.

Keywords: Fertilizers, Soil fertility, Nutrient runoff, Eutrophication.

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Economics of foxtail millet (*Setaria italica* L.) as influenced by different fertilizer levels and row spacings

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Abstract:

Foxtail millet belongs to poaceae and is one among the six millets and is called by different names such as Navani, Kangni, Tenai, Korra and Rala in many regional names in different parts of the country. It is one of the millets that can withstand droughts fairly well. It can be planted as a short-term catch crop because of its rapid growth. Foxtail millet's low seed output is typically linked to genetic, physiological, agronomic and seed production issues. In addition to them, the potentiality of the cultivars, the optimum plant density and nutrient management are key factors in determining the maximum yield of foxtail millet. It is an elite drought-tolerant crop due to its high water use efficiency and short life cycle (Zhang et al., 2012). Millets are nutritionally superior to other major cereals as they are rich in dietary fibers, resistant starches, vitamins, essential amino acids, storage proteins and other bioactive compounds (Amadou et al., 2013).

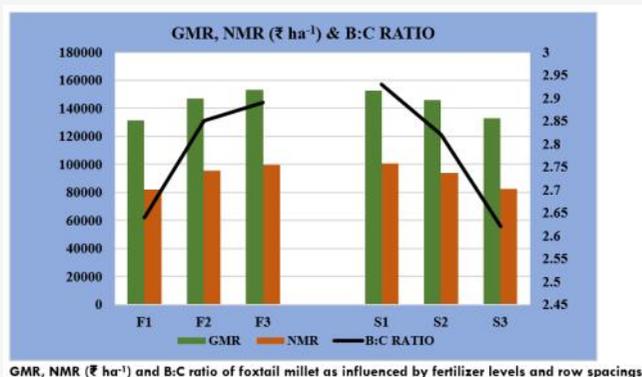
The yield potential of foxtail millet is very low because of inadequate application of fertilizers, conventional cultivation of low yielding cultivars and lack of good management practices. Application of fertilizers has become essential for high yielding varieties of foxtail millet to realize their maximum yield potential. Intra and inter row spacing is one of the important components of systematic cultivation and manipulation, that could enhance productivity of this important crop. Therefore, there is a need to understand the relationship between plant density and yield so as to identify the optimum population. In the view of above facts, the present research was conducted to find out the effect of fertilizer levels and row spacings on yield and economics of foxtail millet.

Experimental Details:

1. Name of crop: Foxtail millet (*setaria italica* L.), 2. Variety: DHft -109-3, 3. Design: FRBD, 4. No. of treatments: 09, 5. No. of replications: 03, 6. No. of plots: 27, 7. Plot size: Gross: 5.4 m × 4.5 m Net: as per treatment 8. Seed rate: 10 kg ha⁻¹, 9. Spacing: S1: 22.5 cm × 10 cm S2: 30 cm × 10 cm S3: 45 cm × 10 cm, 10. RDF: 40:20:20 N, P2O5, K2O kg ha⁻¹ F1: 75 % RDF F2: 100 % RDF F3: 125 % RDF, 11. Date of sowing: 08/07/2023 and 12. Year of experiment: Kharif, 2023.

Table:1 Grain yield (kg ha⁻¹), gross monetary returns (₹ ha⁻¹), net monetary returns (₹ ha⁻¹), and B:C ratio of foxtail millet as influenced by fertilizer levels and row spacings.

Treatments	Grain yield (kg ha ⁻¹)	Gross monetary returns (₹)	Net monetary returns (₹)	B:C ratio
Fertilizer levels (F)				
F ₁ : 75 % RDF	2433	131369	81823	2.64
F ₂ : 100 % RDF	2727	147257	95616	2.85
F ₃ : 125 % RDF	2833	153008	99840	2.89
S. E m ±	70	3787	3787	-
CD at 5%	210	11351	11351	-
Row spacings (S)				
S ₁ : 22.5 cm × 10 cm	2829	152775	100848	2.93
S ₂ : 30 cm × 10 cm	2703	145943	93965	2.82
S ₃ : 45 cm × 10 cm	2461	132916	82465	2.62
S. E m ±	70	3787	3787	-
CD at 5%	210	11351	11351	-
Interaction (F × S)				
S. E m ±	122	65586	65586	-
CD at 5%	NS	NS	NS	-



Conclusion: The application of 125 % RDF proved to be effective for getting higher yield and economics followed by 100 % RDF. Among row spacings, 22.5 cm × 10 cm was found to be more remunerative for getting higher yield and economics, followed by 30 cm × 10 cm.

Remote sensing and GIS applications in Indian agriculture: Current capabilities and future directions



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Abstract:

Through advancements in Geographic Information Systems (GIS) and Remote Sensing (RS) technologies, an ever-expanding world of possibilities is opening up for growers and agri-businesses across the globe. Today, precision agriculture is achieved through the continuous measurement and assessment of crop health, resource optimization, and development of climate-resilient management practices. Recent published research examined RS and GIS as primary technologies in the evolution of Precision Agriculture, providing empirical evidence to support the ability of these technologies to deliver quantifiable results related to yield predictions and production efficiency on a national scale. For example, using RS-based soil and vegetation indices, researchers have been able to achieve accuracies of up to 98% in predicting yields for winter wheat in the Northern Climate (Islamov et al., 2023) while other studies have shown that application of satellite-based data to precision agriculture has increased yield by 5% – 15% while reducing fertilizer requirements by 10% – 20% without losing production (Agridigital Journal, 2024).

Through integration of multispectral RS and machine-learning classifiers, researchers in India have achieved accuracies greater than 90% overall for crop-type mapping in India and have shown that RMSE (Root Mean Square Error) for yield validation studies using Sentinel-2 data on 946 hectares (ha) of rice fields is as low as 0.572 t/ha (Kaur et al., 2023, *Agronomy*, Springer, 2025), attesting to the capability and potential effectiveness of GIS-RS (22) for large-area yield modelling. Quantitative results and trends are clear evidence that continuous advancements in GIS-RS technologies are increasing the capabilities of these systems to provide region-wide, accurate data and evidence that farmers can leverage for such activities as the early detection of crop stress, determining soil moisture levels, managing nutrient inputs, and establishing forecasts for growing seasons.

The next steps include opportunities for automating yield forecasts through the use of AI applications, using hyperspectral imaging to detect plant diseases, enabling UAVs (Unmanned Aerial Vehicles) to conduct high-resolution phenotyping of crops, and smart-farming decision support systems that integrate IoT (Internet of Things) sensors with geospatial analytics. Together, GIS and RS technologies will provide an evidence-based, scalable foundation for sustainable intensification, improving input-use efficiency and ultimately transforming, adapting and building upon India's emerging Agri-Tech Sector through the establishment of climate-responsive policies that will enable growers to compete effectively and thrive both locally and globally.

Keywords: GIS, Remote Sensing, Precision Agriculture, Vegetation Indices, Crop Yield Estimation, Machine Learning; Sentinel-2, UAV Imagery, Soil Moisture Mapping, Climate-Resilient Agriculture.

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Decentralized value addition of agricultural residues: A missing link in achieving rural sustainability



Farhat Umra* and Ayushi Negi

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Abstract:

India generates approximately 480 million tons of agricultural residue annually, yet nearly 60% is burned in fields, causing severe environmental pollution, nutrient loss, and health hazards affecting 400 million rural people. Decentralized value addition offers an economically viable solution by converting crop residues into premium products—bioethanol, bio-CNG, organic fertilizers, and biomaterials—at village and cluster levels. This approach reduces transportation costs by 40–50%, strengthens farmer incomes by Rs. 15,000–25,000 per hectare, and aligns with India's net-zero targets. Recent government schemes (Pradhan Mantri JI-VAN Yojana extended to 2028-29, Crop Residue Management Guidelines 2023-24) provide financial support, technology access, and supply chain infrastructure. However, adoption remains limited due to awareness gaps, technological barriers, and inadequate farmer participation in decentralized processing models. This article explores how decentralized value addition, combined with government support and community involvement, can transform agricultural residues into a foundation for rural sustainability, livelihood enhancement, and circular economy development across Indian villages.

Keywords: Agricultural residue, bioenergy, circular economy, decentralized processing, rural sustainability

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Packaging-based interventions for value addition of Chironji oilseeds and tribal income enhancement



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Abstract:

Chironji (*Buchanania lanzan* Spreng.) is a nutritionally rich, underutilized oilseed predominantly collected and processed by tribal communities in central and eastern India, serving as an important source of seasonal income and livelihood security. However, significant post-harvest losses due to poor storage conditions, lipid oxidation, and microbial spoilage severely limit its market value and income potential for forest-dependent households. In this context, emerging packaging technologies offer a practical and cost-effective solution to improve the quality, shelf life, and marketability of chironji oilseeds, thereby directly supporting tribal livelihoods.

This study highlights the role of innovative packaging systems—such as vacuum packaging, modified atmosphere packaging, active packaging, and eco-friendly biodegradable materials—in preserving the physicochemical, oxidative, and microbiological quality of chironji during storage. Improved barrier properties against oxygen, moisture, and light help reduce rancidity and quality deterioration, enabling longer storage periods and better price realization. Adoption of appropriate packaging interventions can facilitate decentralized processing, reduce distress sales by tribal collectors, and improve access to organized markets. Furthermore, emerging smart packaging tools that enable quality monitoring present future opportunities for value addition and traceability in tribal supply chains.

Overall, packaging-based technological interventions represent a sustainable and inclusive approach to reducing post-harvest losses, enhancing income stability, and strengthening livelihood resilience among tribal communities engaged in chironji collection and processing. Promoting such technologies through capacity building and policy support can contribute significantly to rural development, forest-based entrepreneurship, and sustainable utilization of non-timber forest produce.

Keywords: Chironji, tribal livelihood, oilseeds, emerging packaging technologies, post-harvest losses, non-timber forest produce, income enhancement

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Bridging the skill gap in Bundelkhand: A sustainable model for integrating drone technology and solar solutions in rural agriculture

Dileep Singh Rajput

The Rath Tech Hub

Abstract:

The rapid advancement of "New Age Technologies" like agricultural drones and solar-powered irrigation systems offers a transformative solution to food security challenges. However, in regions like Bundelkhand (Uttar Pradesh), the adoption of these technologies is hindered by a significant "Skill Gap" and a lack of local maintenance infrastructure. This paper presents the model of 'The Rath Tech Hub,' a specialized center of excellence designed to empower rural youth and farmers through technical proficiency and financial literacy. The methodology focuses on a dual-pronged approach: firstly, providing DGCA-aligned drone pilot training and solar technician certification to local youth; and secondly, leveraging banking expertise to facilitate credit access through government schemes like PMEGP and PM-KUSUM. By acting as a localized Maintenance, Repair, and Overhaul (MRO) hub, the center ensures the long-term sustainability of high-tech equipment, which is often abandoned due to a lack of regional service support. Preliminary observations indicate that localized training hubs not only reduce the operational costs for farmers by 20-30% through precision spraying but also create a new cadre of 'Agri-Preneurs' capable of generating sustainable rural livelihoods. The study concludes that integrating technical skill development with financial consultancy is essential for the successful transition of Indian agriculture into the digital era, ensuring that technology reaches the last mile effectively.

Keywords: Precision Agriculture, Drone Technology, Skill Development, Agri-Entrepreneurship, Rural Finance.

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A study on strategies to enhance the public brand perception of Lushan Yunwu tea



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Abstract:

Public regional agricultural brands with deep historical and cultural heritage often face a paradox: immense latent brand equity yet disappointing market outcomes. Taking the Chinese tea “Lushan Yunwu” as a qualitative single-case study, we examine how governance failures translate into a consumer perception crisis. Although the brand has millennia of heritage, terroir-based quality, and an estimated theoretical value of nearly RMB 5 billion, its perceived brand image in China’s national market remains vague, fragmented, and sometimes negative. We triangulate in-depth interviews with government officials, producers, distributors, and consumers, alongside focus groups, field observations, and textual analysis. Findings identify four tightly coupled mechanisms of perception decay: (1) a systemic signal crisis, where weakened hard signals (e.g., certification, traceability) and disordered soft signals (e.g., pricing, packaging) undermine trust; (2) a fractured customer journey, in which mythicized online narratives clash with prosaic offline realities; (3) the inertialization of cultural capital, whereby rich historical-cultural signifiers devolve into hollow labels rather than memorable experiences; and (4) a negative digital feedback loop between official endorsement and social proof, where unfavorable user-generated content overwhelms historical authority. The study proposes and substantiates a process model linking governance failure to signal breakdown and experiential fracture, culminating in perception collapse, and provides a diagnostic framework and actionable guidance to revitalize similarly situated public regional agricultural brands.

Keywords: agricultural, brand management, marketing

Biography:

Siyang Liu, affiliated with Khon Kaen University in Thailand. Her research focuses on agricultural product brand management and marketing, with particular interest in developing branding strategies and leveraging consumer insights to enhance the competitiveness and value of agricultural brands.

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Cold chain deficit and food security in India: Bridging the post-harvest loss gap

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Abstract:

India ranks among the world's leading producers of fruits and vegetables, yet a substantial share of this output never reaches consumers due to inadequate cold chain infrastructure. Post-harvest losses in horticultural commodities remain alarmingly high, with nearly one-third of produce wasted annually. These losses translate into economic damages exceeding ₹92,000 crore, reflecting inefficiencies across storage, transportation, and handling systems. Although India possesses approximately 31.8 million tonnes of cold storage capacity, this meets barely half of the estimated national requirement, exposing a critical infrastructure gap. The problem is further intensified by severe shortages of pack houses, refrigerated transport, and ripening chambers, which operate far below required levels.

This structural deficit disrupts agricultural value chains, forcing farmers into distress sales during peak harvest periods and reducing their income stability. The absence of temperature-controlled logistics accelerates quality deterioration, limiting market access for small producers and restricting price realization. Beyond economic losses, food wastage imposes serious environmental costs by squandering water, energy, and land resources while contributing to greenhouse gas emissions.

The review highlights that strengthening integrated cold chain systems is central to improving food security, enhancing farmer welfare, stabilizing market prices, and promoting sustainable agriculture. Policy initiatives such as PM Kisan SAMPADA Yojana provide financial support, yet implementation challenges persist due to financing barriers and energy constraints. A systems-based approach incorporating public-private partnerships, digital monitoring, renewable energy solutions, and institutional coordination is essential to optimize infrastructure utilization. Strengthening cold chains emerges as a strategic pathway to reduce food losses and ensure nutritional security in a changing climate.

Keywords: Food security; Cold chain infrastructure; Post-harvest losses; Agricultural logistics; Farmer income stabilization

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Enhancing soil health and plant growth with Jeevamrit: A guide to beneficial bacteria in organic farming

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Abstract:

Exploring beneficial bacteria in jeevamrit is essential for enhancing agricultural productivity and sustainability. Jeevamrit is a traditional liquid organic formulation rich in diverse microorganisms that promote plant growth through multiple mechanisms. These beneficial bacteria solubilize essential nutrients such as phosphorus and potassium, fix atmospheric nitrogen, produce plant growth-regulating hormones, suppress phytopathogens, improve soil structure, and accelerate organic matter decomposition. Understanding these microbial functions is crucial for optimizing jeevamrit as a plant probiotic, thereby supporting organic farming and reducing dependence on chemical inputs. Jeevamrit samples were collected from farmers' fields in Hamirpur and Nadaun districts of Himachal Pradesh to isolate and evaluate beneficial bacterial populations. A total of 112 bacterial isolates were obtained and screened for key plant growth-promoting traits, including phosphate solubilization, potassium solubilization, nitrogen fixation, and antagonistic activity against phytopathogens. Results showed that 66.96% of the isolates were positive for phosphate solubilization, 16.96% for potassium solubilization, and 66.96% for nitrogen fixation. The isolates exhibited varying degrees of pathogen inhibition, with the highest inhibition observed against *Alternaria* (63.39%). Eighteen promising isolates were further characterized for phosphate solubilization and indole-3-acetic acid (IAA) production. Sixteen of these isolates effectively inhibited all tested fungal pathogens. Filter paper assays revealed improved tomato seed germination, seedling vigor, and growth parameters. As a liquid organic bioformulation, jeevamrit acts as a microbial consortium that enhances nutrient availability and plant protection, highlighting its potential for development as an effective biofertilizer and biocontrol agent in sustainable and integrated agriculture.

Keywords: Plant growth promoting bacteria, Phosphate solubilization, Antagonistic activity, Indole-3-acetic acid

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Effects of butachlor and its transformation products on soil enzyme activities in contrasting soils



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Abstract:

Soil enzyme activities are sensitive indicators of changes in soil biochemical functioning following agrochemical inputs. This study investigated the effects of butachlor and its major transformation products on dehydrogenase, urease, alkaline phosphatase, and β -D-glucosidase activities in contrasting soils under controlled laboratory conditions. Treatments were imposed at the recommended field dose and at twice the recommended dose, and enzyme activities were monitored at different incubation intervals. Enzymatic responses varied significantly with soil type, application rate, and exposure duration. Dehydrogenase activity showed the highest sensitivity, exhibiting both stimulation and inhibition depending on soil characteristics and metabolite identity, reflecting differential effects on microbial activity. Urease activity was generally suppressed during the early stages after application, particularly at the higher dose, followed by partial recovery at later incubation periods, indicating temporary disturbances in nitrogen mineralization. Alkaline phosphatase activity was largely stimulated across treatments, suggesting enhanced phosphorus mineralization potential under herbicide and metabolite exposure. In contrast, β -D-glucosidase activity showed comparatively moderate responses, with short-term inhibition at higher doses and a tendency toward stabilization over time. Overall, the study demonstrates that butachlor and its transformation products exert enzyme-specific and soil-dependent effects, emphasizing the importance of considering both parent compounds and metabolites when assessing the ecological implications of herbicide use on soil nutrient cycling.

Keywords: Butachlor; Herbicide metabolites; Soil enzyme activity; Dehydrogenase; Urease; Alkaline phosphatase; β -D-glucosidase; Soil health.

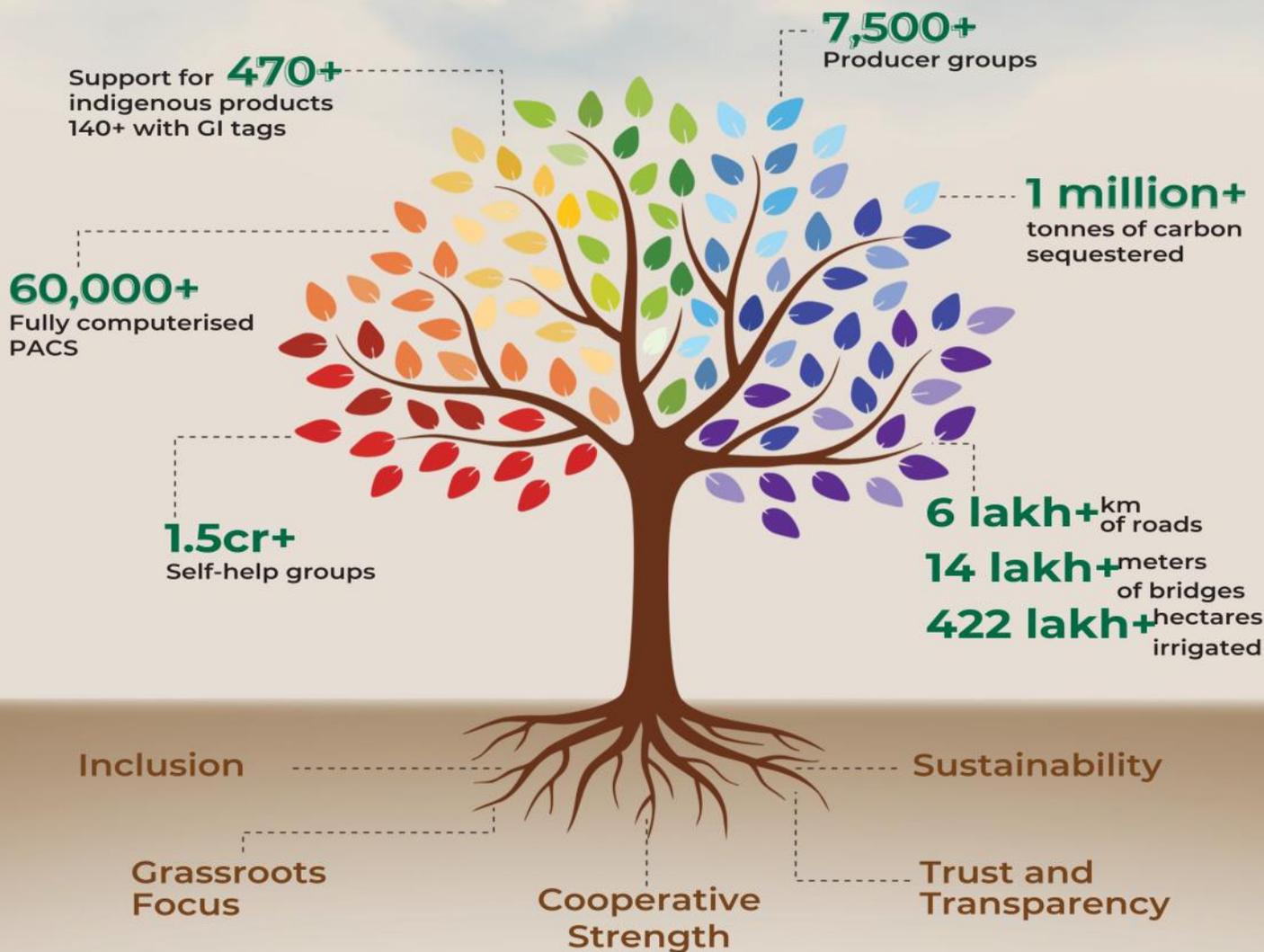
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