13th International Conference On

Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)

Venue: Assam University, Silchar, Assam, India

April 28-30, 2026

Abstract Book Cum Souvenir

Editors

Ajita Tiwari

Chhatarpal Singh

Sanjay Kumar Jha

Organized by

असम विश्वविद्यालय
ASSAM UNIVERSITY

Department of Agricultural Engineering,
TSSOT, Assam University (A Central University)
Silchar, Assam, India
(www.aus.ac.in)

AEDS

Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(Registered under the Society Registration Act XXI, 1860)
(Registered Under the Niti Aayog, Gov. of India)
(www.aedsi.org)

National Press and Publications (NPP)

Souvenir is also available on www.aedsi.org

Abstract Book Cum Souvenir

13th International Conference

On

Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)

Venue: Assam University, Silchar, Assam, India

April 28-30, 2026

Organized by

असम विश्वविद्यालय
ASSAM UNIVERSITY

Department of Agricultural Engineering,
TSSOT, Assam University (A Central University)
Silchar, Assam, India
(www.aus.ac.in)

AEDS

Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(Registered under the Society Registration Act XXI, 1860)
(Registered Under the Niti Aayog, Gov. of India)
(www.aedsi.org)

Editors

Dr. Ajita Tiwari
Head, Department of Agricultural Engineering, TSSOT, Assam University, Silchar, Assam, India

Dr. Chhatarpal Singh
President, Agro Environmental Development Society (AEDS), Rampur, U.P., India

Dr. Sanjay Kumar Jha
Professor, Central Department of Botany, Tribhuvan University, Kritipur, Kathmandu, Nepal

Abstract Book Cum Souvenir

13th International Conference

On

Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)

Disclaimer

The authors are solely responsible for the contents of the Abstracts compiled in this Abstract Book cum Souvenir. The publishers or editors do not take any responsibility for the same in any manner. Errors, if any, are purely unintentional and readers are requested to communicate such errors to the editors or publishers to avoid discrepancies in future.

ISBN: 978-81-971575-7-8

प्रोफेसर राजीव मोहन पंत
कुलपति

Prof. Rajive Mohan Pant
Vice-Chancellor

असम विश्वविद्यालय
(एक केंद्रीय विश्वविद्यालय)
सिलचर 788011, असम, भारत

Assam University
(A Central University)
Silchar 788011, Assam, India

Message

It gives me immense pleasure to extend my warm greetings and best wishes on the occasion of the 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)",** being organized at Assam University, Silchar.

In the present era, sustainable agricultural and environmental development has emerged as a global priority, demanding innovative scientific interventions and interdisciplinary approaches. This conference, as outlined in the brochure, provides an excellent platform for scientists, academicians, researchers, policy makers, and students from across the globe to deliberate on emerging challenges and technological advancements in agriculture, environmental management, and allied sciences.

Assam University, established by an Act of Parliament, has always been committed to academic excellence, research innovation, and societal development. Hosting this prestigious international conference reflects the University's dedication to fostering knowledge exchange and promoting sustainable solutions for pressing global issues such as climate change, food security, and resource conservation.

I am confident that the deliberations during this conference will lead to meaningful discussions, collaborative research opportunities, and actionable outcomes that will contribute significantly to sustainable development goals. Such academic gatherings not only enrich scientific understanding but also strengthen the bond between research and real-world applications.

I commend the organizers, particularly the Department of Agricultural Engineering and the Agro Environmental Development Society (AEDS), for their efforts in bringing together such a distinguished congregation of experts and participants.

I extend my best wishes for the grand success of the conference and hope that it will inspire innovative ideas and transformative research for the betterment of society and the environment.

Date : 13.04.2026

Vice-Chancellor

प्रोफेसर सी.आर. भट्टाचार्य
Prof. C.R. Bhattacharjee
Dean, Academics

असम विश्वविद्यालय
(एक केंद्रीय विश्वविद्यालय)
सिलचर 788011, असम, भारत

Assam University
(A Central University)
Silchar 788011, Assam, India

Message

It is my great pleasure to extend warm greetings on the occasion of the 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)"**, being hosted at Assam University, Silchar.

The contemporary challenges of environmental sustainability, climate change, and food security demand integrated efforts across diverse disciplines, combining scientific knowledge with technological innovation and sustainable practices. Advancements in agricultural sciences, engineering, environmental studies, biological sciences, and allied fields collectively play a crucial role in addressing these global concerns. This conference provides an excellent platform for fostering interdisciplinary dialogue and promoting cutting-edge research across a wide spectrum of scientific domains.

I am confident that this international gathering of eminent scientists, academicians, and young researchers will lead to meaningful exchanges of ideas, innovative approaches, and collaborative research initiatives. Such interactions are essential for developing sustainable solutions that are scientifically robust, socially relevant, and globally impactful.

I commend the organizers for their dedicated efforts in bringing together a forum of global importance and academic excellence. I am hopeful that the deliberations and outcomes of this conference will significantly advance science and sustainable development.

I extend my best wishes for the success of the conference and for all delegates to have a fruitful and enriching experience.

Prof. C. R. Bhattacharjee
Dean, Academics, Assam University, Silchar

प्रोफेसर सुदिप्ता राय

Prof. Sudipta Roy
Dean, Triguna Sen School of Technology (TSSOT)

असम विश्वविद्यालय
(एक केंद्रीय विश्वविद्यालय)
सिलचर 788011, असम, भारत

Assam University
(A Central University)
Silchar 788011, Assam, India

Message

It is a matter of great pride and privilege to extend my heartfelt greetings on the occasion of the 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)"**, being organized at Assam University, Silchar.

In today's rapidly evolving world, the integration of science and technology with sustainable agricultural and environmental practices has become essential to address global challenges such as climate change, resource depletion, and food security. This conference provides a significant platform for academicians, researchers, industry experts, and students to exchange innovative ideas, share research findings, and explore collaborative opportunities in these critical domains.

The Triguna Sen School of Technology (TSSOT), Assam University, has always been committed to promoting interdisciplinary research and technological advancements aimed at sustainable development. The Department of Agricultural Engineering, in collaboration with the Agro Environmental Development Society (AEDS), has taken a commendable initiative in organizing this international conference, which will undoubtedly contribute to knowledge dissemination and capacity building.

I am confident that the scientific deliberations and discussions during this conference will generate valuable insights and practical solutions for sustainable agricultural and environmental development. Such forums play a vital role in bridging the gap between research, innovation, and real-world application.

I congratulate the organizing committee for their dedicated efforts and extend my best wishes for the grand success of the conference.

Prof. Sudipta Roy
Dean, Triguna Sen School of Technology (TSSOT)
Assam University, Silchar

Central Department of Botany
TRIBHUVAN UNIVERSITY (TU)
Kritipur, Kathmandu, Nepal

Prof. Sanjay Kumar Jha, PhD
Professor, TU, Kathmandu
Email:sanjay.jha@cdbtu.edu.np
Website:*www.cdbtu.edu.np*
Mobile: +977-9843051710

Message

It is immense pleasure that "Agro Environmental Development Society (AEDS)" is going to organize 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)"** at Assam University (A Central University) Silchar, Assam, India during April 28-30, 2026 in collaboration with Department of Agricultural Engineering, TSSOT, Assam University, Silchar, Assam. I warmly welcome to all the participants and delegates at Silchar, a rich treasure of biodiversity with different natural resources. The city has historical land and surrounded by beautiful landscape and tea gardens.

This types of seminar and symposia are an important platform which helps in harnessing the research and communication skills of scientists, researchers, students and farmers. Such scientific gathering is the important part of knowledge shearing among the scientists. The topic of conference is very relevant because multi-disciplinary interactions are more useful to take a holistic view of a problem. After industrialization, Environment and climate changing has been the main causality, thus forcing all the countries to build a consensus to combat the same.

I am pleased to welcome all the delegates and participants in the 13th international conference and I wish all the members of organizing committee for their great efforts and suggestion to make this conference a grand success.

Sanjay

Prof. Sanjay Kumar Jha

डॉ. अजिता तिवारी
Dr. Ajita Tiwari
Head, Department of Agricultural Engineering
Triguna Sen School of Technology

असम विश्वविद्यालय
(एक केंद्रीय विश्वविद्यालय)
सिलचर 788011, असम, भारत
Assam University
(A Central University)
Silchar 788011, Assam, India

Message

It gives me immense pleasure to present the proceedings of the 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)"**, organized at the Department of Agricultural Engineering, Triguna Sen School of Technology, Assam University, Silchar.

This conference serves as a significant platform for academicians, researchers, scientists, and students from across the globe to deliberate on emerging challenges and innovative solutions in agriculture, environmental sustainability, and allied sciences. The diverse themes covered in this conference reflect the interdisciplinary nature of modern scientific research and its vital role in ensuring food security, environmental conservation, and sustainable development.

The proceedings encapsulate valuable research contributions and insightful discussions that will undoubtedly contribute to the advancement of knowledge and technology in the relevant fields. I am confident that this compilation will serve as a valuable resource for researchers, policymakers, and practitioners working towards sustainable agricultural and environmental systems.

I extend my sincere appreciation to the organizers, contributors, reviewers, and participants for their dedicated efforts in making this conference a grand success. I also acknowledge the support of the Agro Environmental Development Society (AEDS) and Assam University for providing this platform for academic excellence and collaboration.

I wish the readers a rewarding academic experience through these proceedings and hope that the ideas presented herein will inspire further research and innovation.

Dr. Ajita Tiwari
Head, Department of Agricultural Engineering
Triguna Sen School of Technology
Assam University, Silchar, India

एग्रो एनवायर्नमेंट्ल डेवलपमेंट सोसाइटी (ए.ई.डी.एस.)
Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur-244922, Uttar Pradesh, India
(Registered under the Society Registration Act XXI, 1860)
(Registered Under the Niti Aayog, Reg. No: UP/2020/0263654)

डॉ. छत्रपाल सिंह
Dr. Chhatarpal Singh
President, AEDS
Organizing Secretary, FSTSAED-2026

Phone: 91-6394082801
E-Mail: cpsingh.2012@gmail.com
Website : www.aedsi.org

Message

As organizing secretary, I warmly welcome to all the dignitaries, delegates and participants in the 13th International Conference on **"Frontiers in Science and Technology for Sustainable Agricultural and Environmental Development (FSTSAED-2026)"**. The conference is going to be organized by Agro Environmental Development Society (AEDS) Rampur, Uttar Pradesh & Department of Agricultural Engineering, TSSOT, Assam University (A Central University) Silchar, Assam at Assam University (A Central University) Silchar, Assam, India from April 28-30, 2026. The AEDS is continuously working in the agriculture and organizing various training, seminar and conference to keep the students, researchers and scientists encourage. The main focus of the society and conference is how to overcome the problems that are arising for the sustainable development and how to increases entrepreneurship with the low expenditure in agriculture and allied sectors.

I am very much thankful to our respected Chief Patron Prof. Rajive Mohan Pant Ji, Hon'ble Vice Chancellor, Assam University, Silchar, Assam for his consent to organize 14th International Conference. I am also thankful to Prof. C. R. Bhattacharjee Ji, Dean, Academics, Assam University, Silchar, Co-Patron Prof. Sudipta Roy, Dean, Triguna Sen School of Technology (TSSOT) Assam University, Silchar and I am deeply grateful to the Convener of the conference, Dr. Ajita Tiwari, Head, Department of Agricultural Engineering, Triguna Sen School of Technology, Assam University, Silchar, Assam for supporting and conducting this conference in joint collaboration.

I am also thankful to all the respective participants and committee members of this conference for their valuable support and guidance during the conference.

I once again express my heartfelt gratitude to all esteemed Delegates and Participants for taking part and enhancing the dignity of this conference and sharing their views on different aspects of Agriculture, Environment & Applied Sciences and making this conference grand success.

Dr. Chhatarpal Singh

CONTENTS

1. **Macro-fungi diversity in Thulo Ban Community Forest of Arjam, Myagdi District, Nepal** 01
Sanjay Kumar Jha and Shashi Shrestha

2. **Revolutionizing Cotton Cultivation: Impact of High-Density Planting System (HDPS) on Yield** 01
U.G. Thakare, A.M. Pachre, K.M. Deshmukh

3. **Determinants of Profitability in Cotton High Density Planting System** 02
U.G. Thakare, A.M. Pachre, K.M. Deshmukh

4. **Millet Based Composite Flour Blend for Development of Nutri-Dense Snack to School Children** 03
Akkavva Wadakappanavar S, Nirmala B. Yenagi and Kashibai Khydagi

5. **Explainable Lightweight Corn and Weed Recognition Framework Using Coordinate Attention-Integrated Mobile NetV3** 03
Akshay Dheeraj, Sapna Nigam, Md. Ashraful Haque, Madhu, Anshu Bharadwaj

6. **Influence of seeding rates and growth regulators on growth, yield, and economics of wheat (*Triticum aestivum* L.) under Mid-Himalayan Ecosystem** 04
Amit Kumar, Navin Chandra Gahtyari and Lakshmi Kant

7. **An overview of rice residue management in Haryana State** 05
Anil Kumar, Rakesh Kumar and Sandeep Kumar Antil

8. **Nutritional and Functional Analysis of *Capsicum annuum* and *Solanum lycopersicum* Greens: Exploring Their Potential for Sustainable Food Product Development** 06
Anindita Deb Pal and Falah Ismail

9. **Evaluation of Hematological, Genotoxic, and Biochemical Responses in *Cyprinus carpio* Following Sublethal Amoxicillin Exposure** 07
Anjali, Rajni, Madhu Sharma, Tarang Kumar Shah

10. **Diversity and Distribution of Epilithic and Endolithic Microalgae from Selected Hills in and Around Ajmer City, Rajasthan, India.** 07

Anju Banta*, Sushri Pooja Suthar, Monica Bhatnagar, Ashish Bhatnagar

11. An AI-Enabled Inventory Model for Sustainable Multi-Quality Recycled Paper under Carbon Taxation and Green Investment **08**

Karabi Dutta Choudhury, Ankita Gupta

12. Global Research on Nutraceutical Crops: Bibliometric Analysis and the Latent Potential of Agricultural Extension **09**

Anukrati Sekhri, Dr. Ragini Ranawat and Harsha Jain

13. Characterization of selected Yellow Sarson (*Brassica rapa*) mutants in M_3 generation **10**

Bornali Phukon

14. Bioinoculant Endophytic Bacteria Enhance Physiological and Biochemical Responses of Rice Under Salinity Stress **11**

Renuga S, C Srinivas

15. Assessing combining ability of the advanced breeding lines in FCV tobacco (*Nicotiana tabacum* L.) **11**

C. Nanda, K. Sarala, J.J. Rajappa, K. Gangadhara, S. Ramakrishnan and M. Sheshu Madhav

16. Secoisolariciresinol Diglucoside Enriched Flaxseed Lignan Extract Ameliorates PCOS in Rats Via Regulating Ovarian Function and Gut Microbiota **12**

Chaitanya Itagi and Asha Martin

17. Response of Phosphorus and Sulphur Fertilizers on Fenugreek (*Trigonella Foenum-Graecum* L.) **13**

Chavda J.D. Raval C.H., Patel H.K., Mor V.B

18. Herbicidal Weed Management in *Kharif* Sorghum **14**

Chavda K., Patel H. K., Suthar J. V. And Pal, A. D.

19. Harnessing Wild Relatives of Pearl Millet to Enhance Grain Protein Content: Importance, Gaps, and Genomic Strategies **15**

Deekshitha Bomireddy, Vetriventhan Mani, Kuldeep Singh, Jagadeesh Kommineni, Naresh D

20. **Climate variability shapes reproductive phenology and vulnerability of three *Mystus* species in the river Ganga** **16**
Deependra Singh, Abhilash Wodeyar K, Basanta Kumar Das, Thangjam Nirupada Chanu, Trupti Rani Mohanty, Pranay Kumar Parida

21. **Spatial Dynamics of Soil Organic Carbon and pH under Bund-Planted Poplar (*Populus deltoides*) in an Agroforestry System** **16**
Deepika and K K Bhardwaj

22. **Managanese Fractionation in Soil and Screening of Bread & Durum Wheat Varieties for Manganese Stress Tolerance** **17**
Dheeraj Panghaal, R.S. Malik and Chetan Kumar Jangir

23. **Recombinant major capsid protein of ISKNV as a potent subunit vaccine candidate: Immunoprotection and transcriptomic insights in Genetically Improved Tilapia (GIFT)** **18**
Dheeraj, S. B., Girisha, S. K., Suresh, T. and Rathod Kumara

24. **Effect of *Moringa oleifera* leaves extract on quality of preserved boar semen** **18**
Saharuz Zaman Laskar, Dibyajyoti Talukdar*, K. Lalrintluanga, Fazal Ali Ahmed, Girin Kalita, T. C. Tolenkhomba and Bedanga Konwar

25. **Physio-biochemical variation of *Andrographis paniculate* germplasms at different phenological stages** **19**
Divte P.R., K.A. Kalariya, Rohan Sarkar, Manish Das, J.K. Meena, R. Bhowmick, Sanjoy Saha and G. Kar

26. **Urban Green Spaces as Climate Assets: Plant Resilience and Carbon Storage** **20**
Dr Aasawari Shenwai

27. **Extremophiles as Plant Growth Promoters: A Sustainable Approach for Climate Resilient Agriculture** **21**
Dr. Abhinandita Sahoo

28. **Impact of frozen storage period (-18±1R"C) and formulation on keeping quality of vacuum packaged functional chicken sausages** **21**
Dr. Janagam Indumathi

29. **Assessment of suitable varieties for inland saline water (2-4 ppt) fish culture** **22**
Sivakumar K, Kannappan S

30. **Antidiabetic Potential of Dietary Fibre Extracted from Banana Pseudostem** **23**
Dr. Priyanka Bhattacharyya and Dr. Mamoni Das

31. **Reproductive Disorders in Buffaloes** **23**
Dr. Ravi Dutt

32. **Value addition of Cocoons: Entrepreneurial Avenue for Empowering ST Communities** **24**
Dr. Shefali Massey and Dr. Divya Singh

33. **Zederone from *Curcuma caesia* Mitigates Dementia via Amyloid Reduction and Gut Microbiota Modulation** **25**
Dr. Sudarshana Borah

34. **Detection and Molecular Diagnosis of Soybean Mosaic Virus (SMV) in soybean** **26**
Gaurav Verma, Sunaullah Bhat, Amit Paschapur, Anuradha Bhartiya, Krishna Kant Mishra & Lakshmi Kant

35. **Drone-based foliar application of nutrients in cotton** **26**
H R. Ramani, V. K. Vekariya, P. S. Patel and M. C. Patel

36. **Precision Horticulture with Drones: Improving Crop Monitoring and Sustainable Practices** **27**
Hanuman Ram

37. **Molecular Diversity and Phylogenetic Characterization of Chilli Germplasm for Improvement in Hot Arid Environments** **28**
Hanuman Ram, D.K. Samadia and Chet Ram

38. **In vitro screening of potential probiotic properties of *Lactiplantibacillus plantarum ZN06* isolated from traditional Rice Beer of southern Assam** **28**
Hanna Yumnam, Soumitra Nath, Indu Sharma

39. **Fecal metagenomic profiling identifies microbial biomarkers associated with breast and complementary feeding in tribal infants of** **29**

Arunachal Pradesh, India

S. Bikram Singh, Kalimuthusamy Natarajaseenivasan, Sumit Aggarwal, Hanna Yumnam, Yashmin Choudhury and Indu Sharma

40. Assessment of Nutritional Status among Patients with Chronic Kidney Disease in a tertiary hospital in Kamrup (M) 30

Jebin Sultana, Dr. Priyanka Bhattacharyya and Dr. Dhrubajyoti Choudhury

41. Physiological Responses and Heat-Tolerance Indices Of Nattukuttai Heifers Under Different Rearing Systems 31

Kiruthika, K Usha. S, Murugan, M and Ramesh, J

42. Elemental Profiling of *Zanthoxylum rhetsa* (Roxb) D.C Fuit Peicarp and its Significance in the Pharmaceutical Sector 31

K. Hanako Jamir, T. Ajungla and K. Tsurho

43. Effect of *Allium tuberosum* leaf powder addition on the bioactive profile of pasta 32

Kalyani Gorrepati, Shubhangi Gunjkar, Vaibhav Jadhav, Kunal Dube, Yogesh Khade, Hem Raj Bhandari, Bhushan Bibwe, Manjit Khatal, Vijay Mahajan

44. Critical Evaluation of Seed Validity Periods Using Planting Value as a Quality Indicator in paddy (*Oryza sativa* L.) seed lots 33

Kalyani Kumari, Kalyanrao, Banoth Vinesh, Sripathy K.V. and Uday Bhaskar K.

45. Breeding Climate-Resilient Shrimp: Development and Performance evaluation of Hypoxia-Tolerant Line of *Penaeus vannamei* for Sustainable Intensification 33

Karthik R, Tanushri Ghorai, Philominal Pathinathan

46. Valorization of Clitoria ternatea L. as a Sustainable Natural Antioxidant for Functional Food Development and Nutritional Health Security 34

Kritika Lodha, Dr. Ragini Ranawa

47. Effect of different organic sources on growth, yield and economics of kodo millet (*paspalum scrobiculatum* L.) 35

Kurkutiya S. R., Raval C. H., Patel H. K. And Chavda Krishna

48. **Deep Learning-Based Cattle Breed Identification Using Mobile Net V2 in Precision Agriculture** **36**

Madhu, Sapna Nigam, Akshay Dheeraj, Shashi Dahiya

49. **Nanobubble Irrigation: A Synergistic Approach to Crop Yield, Water Efficiency, and Soil Health** **36**

Meghna Sarkar

50. **Standardisation of spacing and time of planting for commercial production of *Centella asiatica* (L.)** **37**

Meinam Chanchan, Longkoi, Ak. Bijaya Devi and Ng. Piloo

51. **Comparative investigation on adult longevity and morphmetric traits of diversified voltine of the silkworm, *Bom*by*x mori*. L** **38**

Mohammad Jawad Ahamed, Rakshitha B D and T.S Jagadeesh Kumar.

52. **Chemical Characterization, Antimicrobial and Antiaflatoxigenic Efficacy of *Tithonia diversifolia (Hemsl.) A.Gray* Essential Oil (TDEO) Against Selected Bacteria and Fungi** **39**

Chaithra H.K and Mohana D.C

53. **Structure and Ligand Based Design, Synthesis and Biological Evaluation of Dual Inhibitors of Select Kinase Targets** **39**

Mrs. Suvarna N. Vakare and Dr. Rajesh B. Patil

54. **A Biotechnological Approach for the Detection of Mycotoxigenic Fungi in Food and Feed Grains** **40**

Ms. Snigdha Chetia

55. **Inheritance of Specific Leaf Area, Specific Leaf Weight, and Kernel Yield and the Potential of Specific Leaf Weight as a Selection Trait in Maize (*Zea mays* L.)** **41**

N Sabitha, D. Mohan Reddi and P. Sudhakar

56. **Artificial Intelligence and Computer-Aided Design in the Design and Development of Farm Machinery: A Comprehensive Review** **42**

N. Devarani, S. S. Das

57.	**IoT, AI and ML Driven Approaches for Precision Soil and Water Management: Advances, Challenges and Future Prospects** N. Subhasree B. Hasini, Vandhana S and B.Krishna Rao	**42**
58.	**Effect of iron and zinc on yield and quality of sorghum** Pal A.D., Patel H.K., Raval C.H. and Chavda Krishna	**43**
59.	**Micronutrient Strategies to Boost Fodder Maize Performance** Patel H.K. and Litoriya N.S.	**44**
60.	**Maintaince of Germplasm and Evaluation of Phenotypic Charaters Diversity Among the Thirty Selected Multivoltine Silkworm Breeds** Prakruthi CS, N Chandrakanth, TS Jagadeesh Kumar, P Deepa	**44**
61.	**Leveraging *Trichoderma* spp. for Sustainable Phytopathogen Management in the Unique Agroecology of Northeast India** Pranab Dutta	**45**
62.	**Physico- chemical Assessment of different Solids and Dissolved Oxygen in Nandan Pahar Pond, Deoghar, Jharkhand: Implications for Aquatic Pollution, Environmental Sustainability, and Public Health** Pritam Sharma Dr. Nilesh Kumar Dr NK Mandal	**46**
63.	**Clinical Translation of a Traditional Medicinal Plant for Neuroprotection: Evidence from a Randomized Controlled Study** Priya Dev, Rakesh Ranjan, Ashutosh Kumar Pathak, Vijaya Nath Mishra, Abhishek Pathak	**47**
64.	**Synthesis of taro starch nanoparticles from taro starch via ultrasound-assisted nanoprecipitation** Prodipti Dutta, Gopalakrishnan Kishore Kumar, and Sushil Kumar Singh	**48**
65.	**Studies on quality attributes of East Indian Arrowroot (*Curcuma angustifolia* Roxb.) for various applications** Prof. Rambir Singh	**48**
66.	**Insect Pest Complex of Tomato under Mixed Cropping and Monocropping System** Pukhram Bhumita, Padamini Rajkumari, Puyam Nikesh Singh, Meinam Chanchan and Indira Sarangthem	**49**

67. **Germination, Growth, and Reproductive Biology of the Giant Water Lily-Victoria amazonica Under Ex Situ Conditions** **50**
R Saravanan

68. **Optimizing Phenolic Extraction from Potato Peel Using Ultrasound-Assisted Technique: A Response Surface and Genetic Algorithm Approach** **51**
Raghavendra H.R., Shruti Sethi, Arpan Bhowmik, Eldho Varghese, Alka Joshi

69. **Soluble silicon in diverse Indian soils and its relationship with physicochemical properties** **51**
Rahul Panigrahi, Debmalya Sarkar, S. G. Sarowar, Aishita Sarkar, Sourin Das, Mandira Barman, M. C. Meena, Pravin K. Upadhyay, Debarup Das

70. **Thermal characteristics evaluation of hybrid solar tunnel dryer (HSTD) for drying Dillenia indica (Elephant apple)** **52**
Titikha Machahary, Prakash Kumar Nayak, Radha Krishnan Keshavan, Prasadarao Bobbili, Rajesh Kondareddy

71. **Assessment of Erythromycin-induced behavioural responses in *Cyprinus carpio*** **53**
Rajni Devi, Anjali, Madhu Sharma, Tarang Shah

72. **Harnessing the Jute Transcriptome: Functional SSR Markers in Stress-Regulatory Networks for Climate-Resilient Breeding** **53**
Rakesh Bhowmick, Kanti Meena, Thribhuvan R, K. N. Chourasia, Jitendra Kumar Meena, Jiban Mitra, Gouranga Kar

73. **Population dynamics of major insect pests on bottle gourd and their relation to weather parameters** **54**
Samroj Singh, Rinku Poonia, Sunita Yadav, Vijay Pal Singh Panghal, Manjeet Singh, Usha Kumari

74. **Morpho-phytochemical trait associations for quality-oriented breeding in *Gymnema sylvestre*** **55**
Rohini M.R

75. **Water Productivity and Economics of Soybean as Influenced by Precision Nutrient and Irrigation Management Under System of Crop Intensification** **56**
Sachin K.S, Anchal Dass

76. **Crop Productivity and Yield Dynamics of Direct-Seeded Rice under Integrated Nutrient Management** **57**
Sahil and R S Garhwal

77. **Personal care products (PCPs) in the Environment: Occurrence, Transport Pathways and Ecological Implications across Water, Soil, and Plant System** **57**
Seko-u Thele, Boopathi Gopalakrishnan, Ajay Kumar Singh, Paritosh Kumar, Sushil Sudhakar Changan

78. **Formulation and Functional Evaluation of Whey Protein and Plant Protein-Based Egg White Analogue** **58**
Shefali Sirame, Deep Narayan Yadav, Shaik Abdul Hussain, Heena Sharma, Sumit Arora

79. **Effect of Argon Cold Plasma Jet on the Morphological and Physicochemical Properties of Mature Dolichos lablab Bean Seed Starch** **59**
Snigdha Chetia, Pratyush Saikia, Prakash Kumar Nair, Nickhil C, Sankar Chandra Deka

80. **Synergistic potential of *Cordyceps javanica* (OM321438) with botanicals and insecticides against tea mosquito bug, *Helopeltis theivora* Waterhouse** **59**
Sudeshna Ray, Purnima Das & Banna Ushasri

81. **Biovalorization of Silkworm Pupae through Fermentation for Sustainable Aquafeed Development** **60**
Sumalini Bora, K.A. Murugesh, P. Priyadharshini

82. **Diversity of hypolithic microalgae of selected hills of Aravali range in Ajmer city in Rajasthan** **61**
Sushri Pooja Suthar, Anju Banta, Ashish Bhatnagar, Monica Bhatnagar

83. **Solanum torvum Mesoporous Silica Nanotherapy in Diabetic Rats** **62**
Swati Ravindra Borse

84. **Impact of sex and breeding season on the interdigital gland morphology and chemical constituents of South Indian breeds of Ramnad white sheep, *Ovis aries*** **62**
T. Rajagopal and T.R. Gayathri

85. **Influence Of FYM and Zinc on Agronomic Performance of Kharif Fodder Sorghum** **63**
Tomar A., Patel H.K., Rathod P.H., Raval C.H. And Chavda K.

86. **Soil-Vegetation Responses to Silica Sandstone Mining in a Tropical Dry Deciduous Forest: A Spatial Gradient Based Assessment from Prayagraj, India** **64**
Vandita and Kumud Dubey

87. **Molecular Approaches to Plant Genetic Transformation: Crispr–Cas Genome Editing, *Agrobacterium Tumefaciens* - Mediated Gene Transformation and Complementary Techniques.** **65**
Vijay Thakur, Himani Thakur, M.V. Parakhia, N.D. Dholariya, G.V Marviya, G.U. Kulkarni, V.R. Akabari, C.A. Babariya.

88. **Green AI Driven Energy-Efficient Deep Learning for Sustainable Farming Systems: A Vedic-Inspired Computational Framework** **66**
Vipin Kumar Choudhary, Vineet Vishnoi, Dev Raj Mishra and Anil Kumar

89. **Spatiotemporal Dynamics of Groundwater-Dependent Ecosystems (GDEs) in the Central Madhya Pradesh Integrated Corridor: A Multi-Sensor SAR Analysis (2010–2024)** **67**
Arpit Shrivastava, Surjeet Singh, Nidhi Shukla

90. **Adsorption, desorption, mobility and leaching studies of Broflanilide insecticide from agricultural soils collected from Goa, India** **68**
Shefali S. Ainkar, Dr. Rupesh E. Patre

91. **Nanotechnology-Based Seed Treatments for Sustainable Yield Improvement in Rice (*Oryza sativa* L.)** **69**
N. N. Makani, Sheetal R. Patel, Dharmishta M Patel

92. **Prediction of Seed Storability and Longevity using the Accelerated Aging (AA) Test** **69**
N. N. Makani; Dharmishtha M. Patel; and S. R. Patel

93. **Assessment of Nelumbo nucifera Genotypes for Vegetative Growth and Yield Performance under the Mid-Hill Ecosystem of Meghalaya** **70**
Nandha kumar N, P. Raviteja, H. Rymbai, V.K. Verma, H.D. Talang, M.B. Devi, Praveen G

94. **Berry: A Nutritional Magic in the Health Sector** **71**
Prathipati Aditya, Godisela Prashanthi

95. **Comparative characterization of yield and quality traits and root plasticity of rice under transplanted and aerobic ecosystems** **71**
Rakesh Kumar, Bhawana, Koppula Satya Sai Kumar, Prerna Pilania

96. **Development of Metal Organic Framework (mof) Based Nanosensors For Pesticide Detection** **72**
Rauvinsh Kumar, Dr. V. N. Mehta

97. **Landslide susceptibility mapping for agricultural land conservation and environmental management: a GIS-based MCDA approach in Uttarakhand himalaya, India** **74**
Shalini Polakampalli, Raju Sarkar

98. **Analysis of Fatigue Failure Mechanisms in Tillage Tools: Impact of Cyclic Loading and Soil Abrasivity on Component Longevity** **75**
Shankar Swarup Das, Ng. Devarani

99. **QTL mapping for drought tolerance at reproductive stage in Rice (*Oryza sativa* L.)** **75**
Sheetal R. Patel, R. K. Patel, Gita R. Chaudhari, N. N. Makani

100. **Studies On Genetic Variability, Diversity And Characterization Of Curcuma Caesia Roxb. Germplasm of North-East India** **76**
Tasnim Zumaina Mazumder, Manoj Kumar Sharma, Mohan Lal

101. **Optimization of Natural Dyeing Process Parameters for Banana Fabric Using *Rhododendron arboreum* Flower Extract** **77**
Adinath Murlidhar Bele and Sonu Rani

102. **Sustaining Barnyard Millet Productivity Using Liquid Consortia in Mid Hills of Himalaya** **78**
Ajay Kumar, Arunima Paliwal, V. Mageshwaran[3], Ankit

103. **Millet Based Formulations: Physical, Functional, Nutraceutical, Organoleptic and Storage Study for Development of Snacks** **79**
Akkavva Wadakappanavar S, Nirmala B. Yenagi and Kashibai Khydagi

104. **Comparative Study of Green Gram Cultivation under Natural Farming and Recommended Practices in Villages of Gwalior, Madhya Pradesh** **79**
Amita Sharma

105. **Recent trends in real time monitoring of quality in food Industry** **81**
Anamika Das

106. **Rearing of Srinidhi birds under semi-intensive system enhance rural farmers income in Chandel district of Manipur** **81**
Asem Ameeta Devi, Khumlo Levish, K Sonamani Singh, TS Leenda Monsang, Lavid Anal and Chanu Langlentombi

107. **Physicochemical characterization, motif and domain analysis of the *At GLR* proteins in *Arabidopsis thaliana*** **82**
Bidhan Chandra Roy

108. **Application of Molecular Markers in Mango (*Mangifera indica* L.) Breeding for Genetic Improvement** **83**
Devanshi Limbani, Dr. M. V. Parakhia

109. **Millet Based Composite Flour Blend for Development of Nutri-Dense Snack to School Children** **83**
Akkavva Wadakappanavar S, Nirmala B. Yenagi and Kashibai Khydagi

110. **Field Application of Infrared Thermography for Early Screening of Mastitis** **84**
Dr. Reshma Debbarma, Dr. Sohanvir Singh

111.	**Infrared Thermography as a Precision Tool for Early Detection of Subclinical Mastitis** Dr. Reshma Debbarma, Dr. Sohanvir Singh	**85**
112.	**Physicochemical Characterization and Comparative Evaluation of Four Non-Edible Seed Oils from Malvaceae Plants (Hibiscus cannabinus, Hibiscus sabdariffa, Sida cordifolia, and Abelmoschus esculentus) for Biodiesel Production** Dr. Seema Parveen	**85**
113.	**Analyzing the Economic Dynamics of Farming Systems in the sub-Mountainous Region of Punjab** Dr. Parminder Kaur	**86**
114.	**Genetic variability for leaf architectural traits in Burley germplasm accessions** Gangadhara, K, Anuradha, M, Rajappa, J, Sarala, K, and Sheshsu Madhav	**87**
115.	**Assessment of Genetic Variability of Physico-chemical Parameters and Spectral Vegetation Indices in Diverse Soalu (*Litsea Monopetala* Roxb.) Germplasm** Harisha R, Laishram Roshni Devi, Om Prakash Patidar, Sinto Antoo, Krishnamoorthy, Selva Prakash, Yendrembam Surjalata Devi, Md. Harron Rashid, Palash Datta, Kartik Neog	**87**
116.	**Ethnomedicinal plant extracts improve heat stress tolerance and productivity of chickpea under late sown conditions** Kavita	**88**
117.	**Ergonomic Assessment of Work-Related Stressors among Mango Harvesting Workers** Khumukcham Jenita and Harpinder Kaur	**89**
118.	**Smart Agriculture for Climate Resilience: Integrating Machine Learning and IoT for Detection of Crop Diseases of NEH of India** Leichombam Sophia, Ghanashyam Singh Yuremba, Sushma Gurumayum	**90**

119. Wide hybridization and QTL mapping for climate-resilience and higher yield in Soybean **91**
Manu Yadav, Manisha Saini, Afroz Alam and Akshay Talukdar

120. Zinc Biofortification and Nutrient Uptake in Broccoli through Chemical, Green and PEGylated ZnO nanofertilizer approaches **92**
Meghna Sarkar, K.N. Das, Pranjal Kumar Kaman

121. Proteomic approach for identification of estrus specific biomarkers in cervico-vaginal mucus of Lakhimi cows **92**
Nekibuddin Ahmed, Lakshya Jyoti Dutta, Dhrubajyoti Borpujari, Momi Sarma, Lukumoni Buragohain & Durlav Prasad Bora

122. Developing Herbicide-Tolerant Soybean through marker-assisted backcross breeding approach **93**
Nikita Chandila, Reshma O, Meniari Taku, Manisha Saini, Arun Kumar, and Akshay Talukdar

123. Development and Assessment of Climate Resilience Indicator Traits in Karan Fries Cattle under Tropical Conditions of India **94**
Phoebe C Lalremruati, Alex Rani, Vohra Vikas, Nidhishree NS, Dheeraj SG, Raja TV

124. Influence of row spacing on seed quality parameters of buffel grass (*Cenchrus ciliaris* L.): an important perennial grass in the Thar desert of Rajasthan **95**
Reena Rani and Archana Sanyal

125. Development of Superior Mulberry Genotypes through Polycross Hybridization **95**
Santosh kumar Magadum, Yallappa Harijan and N. Sakthivel

126. A Comparative and Multidimensional Analysis of Women's Empowerment under the ARYA Project in Uttar Dinajpur District, West Bengal **96**
Arpan Bag, Saumyadip Chakraborty, Prabhat Kumar Pal

127. **Case report on surgical management of mandibular fracture in a German Shepherd dog using Veterinary Cuttable Plates (VCPs)** **97**
Ram Niwas, Shweta

128. **Synergistic potential of *Cordyceps javanica* (OM321438) with botanicals and insecticides against tea mosquito bug, *Helopeltis theivora* Waterhouse** **98**
Sudeshna Ray, Purnima Das & Banna Ushasri

129. **A Review on Probiotic Biofilms for Preventing Pathogen Colonization in Fruits and Vegetables.** **98**
Sushma Gurumayum, S.K.Meher, Ng. Devarani, Panchal Purnima M, A. Raleng, Indu

130. **A Multicriteria Decision Support Framework for Sustainable Potato Cultivation and Storage Practices in West Bengal** **99**
Jamuna Prasad Kundu, Manik Chandra Das, Bivash Mallick, Bijan Sarkar

131. **Nanoparticle-based Management of Multidrug-Resistant *Escherichia coli* from Bovine Mastitis Milk in Southern Assam, India** **100**
Anuradha Chakroborty, Soumitra Nath and Indu Sharma

132. **Leveraging *Trichoderma* spp. for Sustainable Phytopathogen Management in the Unique Agroecology of Northeast India** **101**
Pranab Dutta

133. **Eco-friendly Conservation of Fruit and Vegetable Wastes for Microalgae Cultivation Media** **101**
Saroj Bala and Urmila Gupta

134. **Emerging Trends and Innovations in Agricultural Nanotechnology** **102**
Amita Dhariwal

135. **Emerging Trends and Innovations in Agricultural Nanotechnology** **103**
Amita Dhariwal

136. **Indigenous AI-IoT Frameworks for Precision Agriculture: Scaling Sustainable Productivity in India** **104**
Babankumar S. Bansod

137. Unveiling the traditional health benefits and food security of fermented soybean products among ethnic tribes of Meghalaya, Northeast India 104
Florence Lalsiemvar Lungtau, Hanna Yumnam, Indranil Chattopadhyay, Yashmin Choudhury, Pompi S Marak, Ibanylla Daimon Slong, and Indu Sharma

138. From Ocean to Innovation: Marine Bioactives for Next-Generation Functional Foods and Nutraceuticals 105
Kandi Sridhar

139. Chemometric Fingerprint-Based Detection of $Pb^{2}z$ in Water Using AuNPs-Modified Electrodes via Square Wave Voltammetry 105
Monika Antil

140. A Study on Shrikhand Consumption Patterns among Youth in Anand 106
Dileepkumar V. Kaner

145. Pesticide-Induced Changes in Soil Microbial Diversity in Northern India 107
Umesh Kumar, Sulochana Kaushik, Vinod Kumar

Lead/Invited Lectures & Oral/Poster Presentation

Macro-fungi diversity in Thulo Ban Community Forest of Arjam, Myagdi District, Nepal

Sanjay Kumar Jha and Shashi Shrestha
Central Department of Botany, Tribhuvan University, Kathmandu
Email: sk.jha@cdb.tu.edu.np

Abstract

Macro-fungi produce large fructifications that are visible without the help of a microscope. They play an important role in the conservation of forest ecosystems and biodiversity**.** The current study deals with the diversity of macro-fungi in the subtropical mixed forest of Arjam, Myagdi District. The study was conducted from June to September 2020, at a height of 1250 to 1450 meters above sea level. In three transects, 10 m×10 m quadrat was used and a total of 18 plots were made. A total of 70 macrofungal taxa were collected. Among them, 56 were identified at the species level, and 14 were generic levels belonging to 26 different families and 12 orders. The highest species-containing family was Russulaceae, with 16 species, whereas the densest species was *Mycena* sp., comprising 11.8 percent and *Cantharellus cibarius* was the most frequent species, consisting of 44.44 percent.

Keywords: *Cantharellus cibarius, forest ecosystem, Russulaceae, subtropical mixed forest*

Revolutionizing Cotton Cultivation: Impact of High-Density Planting System (HDPS) on Yield

U.G. Thakare[1], A.M. Pachre[2*], K.M. Deshmukh[3]
[1]Senior Scientist and Head, RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India
[2]Young Professional-II, RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India
[3]Subject Matter Specialist (Agronomy), RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India
****Corresponding author: pc@kvkakola.org***

Abstract

This study assesses the agronomic and statistical impact of High-Density Planting System (HDPS) on cotton (*Gossypium* spp.) yield as compared to that of conventional method of planting. Field trials were conducted across 120 farms in Akola district, Maharashtra, India during the 2024 cotton growing season under Special Project on Cotton. The experiment utilized a Randomized Complete Block Design (RCBD) to minimize climatic and topographical variations. Two planting geometries viz., HDPS (90 X 15 cm) and Conventional spacing (120 X 30 cm) were compared for yield performance using Z-test analysis, confidence intervals, Cohen's d effect size and correlation analysis was done between plant population density and corresponding yield. Results revealed a significant yield increase of 32.7% under HDPS with mean yield of 12.25 qtl/acre as compared to conventional method (9.23 qtl/acre). Highly significant z-score (18.06**), confidence intervals (95% CI: 2.69 – 3.35) depicting true yield difference between both the methods of planting and Cohen's d (2.33) showing large effect size confirmed superiority of HDPS over conventional planting. Correlation coefficient (r = 0.71) affirmed the strong positive relation between plant population density and yield/acre. Furthermore, HDPS exhibited early maturity, better canopy coverage, reduced pest exposure, particularly to pink bollworm and ultimately improved resource

use efficiency. The results substantiate HDPS as a scalable, sustainable solution for enhancing cotton productivity in rainfed regions with light to medium soil.

Keywords: *HDPS Cotton, Confidence interval, Cohen's d, Rainfed Regions, Planting geometry, Correlation*

Determinants of Profitability in Cotton High Density Planting System

U.G. Thakare[1], A.M. Pachre[2*], K.M. Deshmukh[3]

[1]Senior Scientist and Head, RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India
[2]Young Professional-II, RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India
[3]Subject Matter Specialist (Agronomy), RDRF's Krishi Vigyan Kendra, Akola, Maharashtra, India

****Corresponding author: pc@kvkakola.org***

Abstract

High-Density Planting System (HDPS) has gained attention as a productivity-enhancing intervention in cotton, particularly under rainfed and resource-constrained conditions. While experimental studies have reported yield advantages under optimized plant population, evidence from farmers' field conditions remains essential for assessing economic viability, profitability and its determinants. The present study evaluated the agronomic and economic performance of HDPS (90 X 15 cm) relative to conventional spacing (120 X 30 cm) through paired on-farm demonstrations conducted on 60 cotton growers' fields in Akola district, Maharashtra, India during the 2024-25 cotton growing season. Study revealed that the net income and benefit–cost ratio were significantly superior under HDPS and the mean incremental cost–benefit ratio (2.34) indicated that the additional investment was economically justified. However, the magnitude of income gain varied across farmers. Correlation analysis showed that education, knowledge and other behavioural traits viz., innovativeness, scientific perspective, economic motivation and risk preference were positively associated with percentage increase in net income. Multiple regression analysis incorporating personal, socio-economic and behavioural variables revealed that education, knowledge of HDPS technology and above behavioural traits exerted a significant positive influence on income gain ($p < 0.05$), whereas age, landholding, family size, annual income and experience in cotton cultivation did not demonstrate significant independent effects. The coefficient of determination ($R^2 = 0.78$) explained that personal and behavioural attributes of the farmer play a critical role in achieving the gains from technological intervention. The study confirms HDPS as economically advantageous, while highlighting the importance of personal attributes, behavioural traits, technical competence and extension support in maximizing benefits to the farmer.

Keywords: *HDPS Cotton, Multiple regression, Behavioural characters, ICBR, Socio-economic traits, Determinants of productivity*

Millet Based Composite Flour Blend for Development of Nutri-Dense Snack to School Children

Akkavva Wadakappanavar S[a], Nirmala B. Yenagi[b] and Kashibai Khydagi[c]

[a] Assistant Professor, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

[b]Professor (Retd), Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

[c]Professor and Head, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

Corresponding author email: akkurani20@gmail.com

Abstract

Millets are recognized as potential future crops because of relatively high dietary fiber, antioxidants, micronutrients, sulphur containing amino acids and essential fatty acids. In this present study germinated finger millet, fermented little millet, germinated Horsegram and Refined wheat flour in the ration of 50:30:10:10 respectively were used for the preparation of composite flour. This flour blend were studied for its functional properties and the results revealed that, the colour parameters (L*, a*, b*) showed significant differences (pd"0.01) among the flour samples, highest lightness (L*) was observed in refined wheat flour (93.78) and little millet flour (93.53). Water solubility and Water binding capacity was highest in horse gram flour (19.02, 6.52%respectively). The composite flour (155.03%) demonstrated improved water binding capacity. Oil absorption capacity was significantly higher in composite flour (1.13 g/g). The pasting properties (RVA) also differed significantly. The composite flour exhibited balanced physicochemical, functional, and pasting properties compared to individual flours. The composite flour exhibited enhanced protein and mineral content with adequate energy value. The nutraceutical evaluation revealed significant differences (pd"0.01) among the flour samples with respect to total polyphenol content and antioxidant activity. Further this composite flour blend was used in the preparation of Sev Ladoo, is a sweet snack and analysed for its optimization and **75:25 and 50:50** proportions showed good acceptability scores. The nutrient and mineral content, physical attributes, storage study and acceptability by school children were also done. Overall, Sev Ladoo is an energy-dense (438 Kcal/100g) snack with good protein (15.72%) content and also it provides appreciable amounts of essential minerals. The storage stability of Sev ladoo is one and half month. The Rural and Urban children (90 and 94%Resp.) accepted the snack. Food based approach is the best way to combat hidden hunger and malnutrition among school children.

Keywords*: Composite flour, Sev Ladoo, Antioxidants,*

Explainable Lightweight Corn and Weed Recognition Framework Using Coordinate Attention-Integrated Mobile NetV3

Akshay Dheeraj[1*], Sapna Nigam[1], Md. Ashraful Haque[1], Madhu[1], Anshu Bharadwaj[1]

[1] ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India

***Corresponding author email:** akshay.dheeraj@icar.org.in*

Abstract

Agricultural productivity is significantly affected by weeds that compete with crops for essential resources such as sunlight, nutrients, and water, resulting in considerable yield losses. Early-stage weed identification is therefore crucial for enabling precision weeding and improving crop health. In this study, we propose a lightweight and computationally efficient deep learning framework for automatic classification of corn and associated weed species using RGB imagery. The proposed model is built upon the MobileNetV3 architecture, selected for its depthwise separable convolutions and inverted residual blocks that ensure reduced computational complexity. To enhance discriminative capability, a Coordinate Attention (CA) module is integrated into the backbone network, enabling the model to capture both channel relationships and precise positional information. This mechanism allows the network to focus on biologically relevant features such as leaf margins, venation patterns, and shape characteristics while suppressing background noise commonly present in field environments. The model was trained and evaluated on a publicly available corn-weed dataset collected under varying illumination and background conditions to simulate real-world agricultural scenarios. Experimental results demonstrate high classification performance while maintaining a significantly reduced parameter count and computational footprint compared to conventional deep learning architectures. Furthermore, explainable artificial intelligence techniques, including Grad-CAM and LIME, were employed to validate the model's decision-making process, confirming that attention is consistently directed toward meaningful plant regions. Owing to its lightweight design, fast inference speed, and strong classification accuracy, the proposed framework is well suited for deployment on resource-constrained edge devices and integration into autonomous precision agriculture systems.

Keywords: *Attention mechanism; Coordinate Attention; Explainable AI; MobileNetV3; Precision agriculture.*

Influence of seeding rates and growth regulators on growth, yield, and economics of wheat (*Triticum aestivum* L.) under Mid-Himalayan Ecosystem

Amit Kumar[1]*, Navin Chandra Gahtyari[1] and Lakshmi Kant[1]
[1]ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand, India
Corresponding Author's E-mail: amuvpkas@gmail.com

Abstract

Wheat (*Triticum aestivum* L.) is one of the four major cereal crops worldwide and plays a crucial role in global food security. It occupies about 220 million hectares globally, with nearly 14% of area in India. In Uttarakhand, wheat is grown in rabi season across diverse agro-climatic regions. Wheat crop in hills of Uttarakhand faces several constraints, including erratic rainfall, wild animal damage, limited arable land, and climate change. In crops application of growth regulators can alter physiological and morphological aspects of crop development which can modify overall crop response. In this context,

field experiments were conducted during the rabi seasons of 2023–24 and 2024–25 at ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, India, to evaluate the effects of varying seeding rates and foliar application of growth regulators and drum rolling on the performance of wheat. Three seeding rates (60, 80 and 100 kg/ha) as main plot and foliar application of growth regulators (100 ppm 2,3,5-triiodobenzoic Acid (TIBA) at tiller initiation, 100 ppm 6-benzyl amino purine at tiller initiation, two sprays as tank mix of chlormequat chloride (Lihocin) @ 0.2% + tebuconazole (Folicur 430 SC) @ 0.1% of commercial product at first node and flag leaf stages, mechanical drum rolling along (30 & 45 DAS) and control (as sub plot factor) were tested in three time replicated split plot design in wheat (VL cookies). Increasing seeding rate from 60 to 100 kg/ha has significantly increased wheat grain yield by 10.4%. Foliar sprays of growth regulators and mechanical drum rolling had no significant effect on wheat grain yield. Two tank-mix sprays of Lihocin @ 0.2% + Folicur 430 SC) @ 0.1% of commercial product at first node and flag leaf stages has significantly reduced plant height by 4.6% compared to control. The highest net return (126.1×10^3 Rs/ha) was recorded with the use of 100 kg seed rate per ha followed by 80 kg and 60 kg seed rate/ha. As compared to control, drum rolling and applications of growth regulators recorded lower net returns.

Keywords*: seeding rates, foliar application, growth regulators, mechanical drum rolling*

An overview of rice residue management in Haryana State

Anil Kumar[1], Rakesh Kumar[2] and Sandeep Kumar Antil[3]
[1]Associate Professor, Deptt. of FMPE, CCS HAU, Hisar
[2]Assistant Rice Breeder, Deptt. of FMPE, CCS HAU, Hisar
[3]DES, Agricultural Engineering, KVK, Sonipat, CCS HAU, Hisar
E-mail: anilsaroha@hau.ac.in

Abstract

The rice-wheat is the major cropping system of Haryana covering 18 lakh hectare area in the state. The harvesting of rice is mainly done by combine harvesters which leaves large amount of loose and anchored crop residue in the field. The rice residue of coarse varieties is considered as inferior quality feed due to higher content of silica and lignin and is hardly used as fodder and ultimately results in burning of residue. Burning causes severe air pollution which has very bad effect on human and animal health. Paddy straw burning also results in huge loss of plant nutrients, organic matters and degrades soil properties due to wastage of residue. Paddy straw should be managed by different farm machinery options, either by In-situ management or by removal (Ex-situ). In-situ management of paddy straw includes incorporation of paddy straw into the soil using conventional tillage machineries like harrow, cultivator, rotavator, reversible plough and super seeder etc. or retaining the paddy straw as mulch in the field and sowing with happy seeder and smart seeder directly or after chopping the residue with cutter or using super SMS. The use of different machine depends on the condition of the field (type of soil, moisture content of soil and straw). The ex-situ management includes removal of straw from the field by using straw chopper, hay rake and balers and that can be used as animal fodder and silage,

biogas and CHG production, briquetting and pallets, card board and packaging material, mushroom cultivation and bio ethanol production.

Keywords: *Burning, Environment, Ex-situ, In-situ, Residue*

Nutritional and Functional Analysis of *Capsicum annuum* and *Solanum lycopersicum* Greens: Exploring Their Potential for Sustainable Food Product Development

Anindita Deb Pal[1*] and Falah Ismail[1]

[1] Department of Food Science & Nutrition Management, J.D. Birla Institute, 11 Lower Rawdon Street, Kolkata-700020.

****Corresponding author email: deb_anindita@yahoo.com***

Abstract

Green edible leaves are economical and sustainable resources for improving nutritional security and health. However, their utilization remains limited due to low consumer awareness and lack of attractive food applications. This study investigates the nutritional and functional potential of lesser-known edible greens of green chili (*Capsicum annuum*) and tomato (*Solanum lycopersicum*), commonly cultivated in tropical and subtropical regions of India, to explore their suitability for sustainable food product development. Fresh leaves were analyzed for nutrient composition, phytochemicals, radical-scavenging, antimicrobial, and prebiotic properties using AOAC-recommended methods. *C. annuum* leaves exhibited higher micronutrient content, particularly iron (25.6 mg/100 g), calcium (431 mg/100 g), phosphorus (40.81 mg/100 g), vitamin C (50.1 mg/100 g), and â-carotene (420 µg/100 g), compared to *S. lycopersicum*. In contrast, tomato leaves showed greater phytochemical richness, including flavonoids, alkaloids, and total phenols, and demonstrated superior free radical mitigation, and prebiotic potential. To enhance acceptability and utilization, leaf-based spreads formulated with *C. annuum* (CS), *S. lycopersicum* (SS), and a combination of both (CSS) were developed in three variations each and organoleptically evaluated using a 9-point hedonic scale. Variation 3 of each spread (CS3, SS3, and CSS3) achieved the highest sensory scores and demonstrated improved nutritional and functional attributes over the control. CS3 contained elevated levels of iron, calcium, magnesium, phosphorus, vitamin C, â-carotene, and bioactive compounds, while SS3 showed moderate improvements. Notably, CSS3 exhibited the most enhanced nutritional and functional profile, indicating a synergistic effect of combining both leaves. Overall, the findings suggest that value-added products developed from *Capsicum* and *Solanum* greens, particularly their combined formulation, hold strong potential as affordable, sustainable functional foods for mitigating hidden hunger and promoting health.

Keywords*: Edible Leaves; Functional; Food; Nutritional; Sustainable*

Evaluation of Hematological, Genotoxic, and Biochemical Responses in *Cyprinus carpio* Following Sublethal Amoxicillin Exposure

Anjali, Rajni, Madhu Sharma, Tarang Kumar Shah
Department of Zoology, SCVB Degree College, Palampur
Department of Fisheries, DGCN COVAS, CSKHPKV, Palampur, H.P.

Abstract

Pharmaceutical products represent a diverse group of chemical substances extensively used in human and veterinary medicine. Among them, antibiotics are frequently detected in aquatic ecosystems due to their widespread application and improper disposal. The present study aimed to evaluate the toxic effects of amoxicillin on the freshwater fish Cyprinus carpio (common carp), with special emphasis on hematological, genotoxic, and biochemical alterations as non-lethal biomarkers. Fish were exposed to a sublethal concentration of 100 mg/L amoxicillin for 96 hours. Hematological, genotoxic, and biochemical parameters were assessed at 24, 48, 72, and 96 hours of exposure. Significant alterations were observed in the treated group compared to the control. A progressive decrease in erythrocyte (RBC) and leukocyte (WBC) counts was recorded during the exposure period, while hemoglobin (Hb) levels showed fluctuating changes. Genotoxic evaluation revealed various cytological abnormalities, including cytoplasmic changes (CC), abnormal nuclei (AN), peripheral nuclei (PN), and an increased frequency of polychromatic erythrocytes (PCE). Nuclear and cytoplasmic alterations were most pronounced at 72 hours of exposure. Biochemical analysis indicated a declining trend in total protein, high-density lipoprotein (HDL) cholesterol, and triglyceride levels, whereas serum glutamic-pyruvic transaminase (SGPT) levels showed a significant increase, suggesting hepatic impairment in the treated fish. The findings of the present study demonstrate that amoxicillin exposure induces marked hematological, genotoxic, and biochemical disturbances in *C. carpio*. These parameters may serve as reliable non-lethal biomarkers for monitoring pharmaceutical contamination and assessing fish health in aquatic ecosystems.

Keywords: *Pharmaceuticals, Amoxicillin, Hematology, Genotoxicity, Biochemical biomarkers, Cyprinus carpio*

Diversity and Distribution of Epilithic and Endolithic Microalgae from Selected Hills in and Around Ajmer City, Rajasthan, India.

Anju Banta*, Sushri Pooja Suthar, Monica Bhatnagar, Ashish Bhatnagar
Department of Microbiology, Maharshi Dayanand Saraswati University, Ajmer 305009, Rajasthan, India
Email- anju@mdsuajmer.ac.in

Abstract

Arid–semiarid regions experience low, erratic rainfall, intense solar radiation, nutrient-poor substrates, and wide temperature fluctuations, fostering specialized microbial communities. This study examines

the diversity and community structure of epilithic and endolithic microalgae from Aravalli hills of Ajmer, north-western India, highlighting their ecological roles as pioneer colonizers and primary producers. Rock samples representing both epilithic and endolithic niches were collected from the bottom, middle, and top elevations of a selected hill in Makadwali village to examine vertical variation in microbial assemblages. Epilithic communities were sampled by sterile scraping of rock surfaces, while endolithic communities were obtained by carefully fracturing rocks to access internally colonized zones. The mineralogical composition of the rocks was analyzed using XRD and FTIR and physical properties using standard petrographic techniques. For the cultural diversity of oxygenic microphototrophs, samples were enriched in BG-11 medium, with and without combined nitrogen, to promote the growth of both diazotrophic and non–diazotrophic taxa. Cultures were incubated under controlled laboratory conditions and identified based on morphological characteristics using light microscopy and standard taxonomic keys. Total prokaryotic diversity present in the original rock scrapings was further evaluated using culture-independent molecular methods involving 16S rRNA gene sequencing using illumine platform. Cultural diversity revealed the dominance of cyanobacteria such as *Nostoc, Scytonema*, and *Phormidium*, along with green algae dominated by *Chlorella* and *Chlorococcum*. Variations in species richness and community assemblage structure were strongly influenced by rock type, elevation-related microclimatic conditions, and moisture availability. Genetic diversity of epilithic and endolithic microalgae reveals distinct adaptive lineages with stress-resistance genes for desiccation and radiation tolerance, ensuring ecological resilience and functional stability in extreme rocky habitats. The study highlights the ecological significance of lithic microhabitats in shaping microbial diversity in arid and semi-arid hill ecosystems and provides baseline data for future ecological and biotechnological investigations.

Keywords: *Diversity, Epilithic, Endolithic, Cyanobacteria, 16S rRNA sequencing, arid desert ecosystem.*

An AI-Enabled Inventory Model for Sustainable Multi-Quality Recycled Paper under Carbon Taxation and Green Investment

Karabi Dutta Choudhury[1], Ankita Gupta[1*]
[1]Department of Mathematics, Assam University, Silchar-788011, Assam, India
Corresponding author e-mail: ankitagupta98@outlook.com

Abstract

This paper develops an AI-enabled inventory model for a multi-quality recycled paper supply system operating under carbon taxation and green investment decisions. The system consists of a two-warehouse structure in which collected waste paper is processed into multiple grades of recycled paper and sold to price-sensitive markets. To ensure economically consistent demand behaviour, price sensitivity is modelled parametrically, while the effects of green investment, carbon taxation, and product quality on demand are learned using supervised machine learning. The learned demand functions are embedded into a nonlinear profit maximisation framework to jointly determine optimal selling prices, replenishment cycle length, and green investment level. To capture adaptive decision-making under regulatory

uncertainty, the model is extended using a reinforcement learning approach. Numerical results show that green investment and recycling yield significantly enhance both profitability and environmental performance, and that learning-based policies outperform static solutions under volatile carbon tax regimes. The proposed framework provides valuable managerial insights for sustainable inventory and pricing decisions in recycling systems.

Keywords: *Sustainable inventory management, Multi-quality recycled paper, Carbon taxation, Green investment, Machine learning, AI-enabled inventory optimisation.*

Global Research on Nutraceutical Crops: Bibliometric Analysis and the Latent Potential of Agricultural Extension

Anukrati Sekhri[1], Dr. Ragini Ranawat[2*] and Harsha Jain[3]

[1,3]Research scholar, Department of Home Science, University of Rajasthan, Jaipur,
Email: anukratisekhri23@gmail.com, harshajain147@gmail.com

[2]Assistant Professor, Department of Home Science, University of Rajasthan, Jaipur, Email:
raginiranawat20@gmail.com

Abstract

Nutraceutical crops are gaining importance for their role in improving nutrition, supporting health, and promoting sustainable agriculture. Yet, their impact depends on how effectively this knowledge is transferred to farmers through agricultural extension. This study analysed global research on nutraceuticals and agricultural extension using 3,485 Scopus-indexed publications between 2015 and 2024, with the primary objective of assessing the role of agricultural extension in bringing nutraceuticals to the grassroots level. Bibliometric tools (Biblioshiny and VOSviewer) were used to examine publication growth, authors, contributing countries, keyword patterns, thematic clusters, and collaboration networks. The analysis reveals steady progress over time, accelerating after 2020. India emerged as the clear global leader, followed by the USA and China, with institutional participation from universities such as Charles Sturt University and King Saud University. Research activity covered two main areas: themes related to agriculture and sustainability, such as food security, climate change, and farming practices; and studies on plant-derived compounds, including phytochemicals, antioxidants, and bioactive substances. The most important finding of this study is the near absence of extension-related themes. Although the search strategy included extension terms, they did not emerge as clusters or trends, highlighting a significant research gap.

Keywords: *Nutraceuticals, Agricultural Extension, Bibliometric Analysis, Research Trends, Sustainability*

Characterization of selected Yellow Sarson (*Brassica rapa*) mutants in M_3 generation

Bornali Phukon
School of Agricultural Sciences, Nagaland University, Medziphema, Nagaland. Department: Genetics and Plant Breeding, Pin Code: 797106
Corresponding author e-mail: bornali0907@gmail.com

Abstract

Yellow sarson (*Brassica rapa* L) var. yellow sarson is an early maturing self-pollinated ecotype of rapeseed belonging to the genus Brassica of the family Brassicaceae, cultivated during the Rabi season in Assam. Domestication and cultivation under limited area in India, probably led to genetic erosion in existing genetic variability. Mutation breeding is a potent and effective tool to generate a novel induced genetic variability for qualitative and quantitative traits. In the year 2021-22, two yellow sarson varieties (B-9 and JYS14-2) were treated with 400 Gy, 600 Gy and 800 Gy of gamma-ray doses (Co^{60} source) at BARC, Trombay, Mumbai. Single plants were harvested individually in M_1 generation. In the year 2022-23, seeds of M• generation were sown in individual plant progeny rows along with parent row (control) for evaluation of induced genetic variability for morpho-agronomic traits and character inter-relationship in M_2 generation. In the M_2 generation, putative mutant genotypes of both the varieties were selected for the characters low foot length, high siliqua density, high seed per siliqua, longer siliqua length, early maturity and early flowering with 600 and 800 Gray along with the parent varieties in M_3 generation during the year 2023-24. The present study comprised of evaluation and characterization of 48 putative mutant lines. Significant variation was observed among the lines. This revealed effectiveness of gamma-rays for induction of quantitative variation. The shift in mean values of the genotypes selected for low foot length compared to the check varieties for most of the traits in both varieties revealed better performance of these genotypes. Also, these genotypes show moderate resistance for Alternaria blight. High GCV, PCV and high heritability coupled with high genetic advance was estimated in harvest index, and seed yield per plant. Pearson's correlation revealed that number of siliquae on the main shoot and harvest index showed a strong positive correlation with seed yield per plant. Path analysis revealed that harvest index had the highest positive direct effect on seed yield per plant followed by biological yield and number of siliquae on the main shoot. The agronomically suitable putative mutants should be evaluated in the next generations and can be characterized by morphological and molecular markers. The promising mutants should be included in breeding programmes for development of high yielding yellow sarson varieties.

Keywords: *Yellow sarson mutant, Shift in mean values, Heritability, Genetic advance, Positive direct effect, Alternaria blight*

Bioinoculant Endophytic Bacteria Enhance Physiological and Biochemical Responses of Rice Under Salinity Stress

Renuga S, C Srinivas*

Department of Microbiology, Biotechnology and Food Technology, Bangalore University, Bangalore 560056

Corresponding Author: Srinivasbub@gmail.com

Abstract

Salinity is a major abiotic stress limiting rice productivity worldwide, which restricts growth and lowers yields and impacts global food security. Through reducing water intake, osmotic stress, ion toxicity, and oxidative stress, these stressors limit photosynthesis, interfere with physiological processes, and impede optimal growth and yield. The present study investigates the role of endophytic plant growth–promoting bacteria (PGPB) in enhancing growth and salt stress tolerance in Oryza sativa L. Endophytic bacterial strains were isolated from healthy rice tissues and systematically screened for key plant growth–promoting (PGP) traits, including indole-3-acetic acid (IAA) production, phosphate solubilization, siderophore production, and ACC deaminase activity. Promising isolates were selected and inoculated into rice seedlings grown under controlled saline conditions. Inoculated plants exhibited a significant increase in germination percentage, vigor index, biomass accumulation, chlorophyll content, and relative water content compared to uninoculated controls. Furthermore, treated plants demonstrated enhanced antioxidant enzyme activities, suggesting improved oxidative stress management and greater tolerance to salinity stress. The findings suggest that endophytic PGPB enhance salt tolerance by modulating phytohormone balance, improving nutrient uptake, and activating antioxidant defense mechanisms. This study highlights the potential application of endophytic bacteria as an eco-friendly and sustainable strategy to improve rice productivity in salt-affected soils.

Keywords: *Endophytic bacteria, PGPB, Salt stress, Oryza sativa.*

Assessing combining ability of the advanced breeding lines in FCV tobacco (*Nicotiana tabacum* L.)

C. Nanda*, K. Sarala[1], J.J. Rajappa[1], K. Gangadhara[2], S. Ramakrishnan* and M. Sheshu Madhav[1]

*ICAR-National Institute for Research on Comercial Agriculture, Research Station, Hunsur, Karnataka.

[1]ICAR-National Institute for Research on Comercial Agriculture, Rajahmundry, AP.

[2]ICAR-National Institute for Research on Comercial Agriculture, Research Station, Kandukur, AP.

Abstract

In the Karnataka Light Soils (KLS) region, Flue-Cured Virginia (FCV) tobacco is grown in the red sandy loam soils of Mysuru and Hassan districts as a Kharif crop. Often marketed as “Mysore Style” tobacco, it is prized by global manufacturers as high-quality filler because of its excellent “burn”

properties and low levels of impurities. Average yields in KLS range between 800 to 1,200 kg per hectare. Recent data from 2024–2025 indicates a slight decline in general state averages (around 730–900 kg/ha) due to erratic weather during crop season. To mitigate the effects of climate change, continuous breeding efforts to develop stable high yielding varieties/hybrids are required which in turn depend on the selection of suitable parental materials. In this direction, six advanced breeding lines obtained from NIRCA Rajahmundry were crossed with three broad based testers to synthesize 18 F_1 crosses. These crosses were evaluated along with lines and testers in a RBD trial with two replications during 2024-25 crop season to study their combing abilities. Observations were recorded on seven yield and yield related traits and data was statistically analyzed using L×T analysis using TNAUSTAT. Analysis of variance indicated that crosses and parents differed significantly for leaf width, green and cured leaf yield. ANOVA for combining ability revealed that GCA of lines was significant for only leaf width while GCA of testers was significant for plant height, number of leaves, internode length and leaf width. SCA of crosses was significant for internode length and green and cured leaf yield. GCA effects of lines and testers were non-significant suggesting limited exploitable additive variance for the traits studied. Non significant SCA for a cross suggests that performance of cross is adequately predicted by the parents' average effects; and that there is no strong, specific hybrid vigour or specific incompatibility for that trait beyond what GCA already explains. From the study it can be concluded that thought the variance is present there is no exploitable additive and specific hybrid vigour among the material used.

Secoisolariciresinol Diglucoside Enriched Flaxseed Lignan Extract Ameliorates PCOS in Rats Via Regulating Ovarian Function and Gut Microbiota

Chaitanya Itagi[1,2] and Asha Martin[1*]

[1] Department of Biochemistry, CSIR-Central Food Technological Research Institute, Mysuru-570020, India.

[2] University of Agricultural Sciences, Dharwad-580005

Corresponding author Email: ashamartin@cftri.res.in

Abstract

Polycystic ovary syndrome (PCOS) is a multifaceted endocrine disorder and its exact cause remains elusive. This comprehensive study investigated the dose-dependent therapeutic effect of secoisolariciresinol diglucoside (SDG)-enriched flaxseed lignan extract on PCOS in a rat model. PCOS was induced in female Wistar albino rats (9-10 weeks old) through high fat diet (HFD) combined with letrozole for 21 days. The estrous cycles in animals were regularly monitored throughout the study period. After successful induction of the disease, treatment was given with SDG-enriched flaxseed lignan extract at low and high doses and compared with standard drug Metformin. At the end of 13 weeks treatment, animals were sacrificed; biochemical parameters such as lipid profile, glucose levels, serum hormone levels like LH, FSH, estrogen, testosterone and insulin, ovarian morphology, gut microbiota and short chain fatty acids (SCFA) were examined. Results demonstrated that different doses of SDG-enriched flaxseed lignan extract effectively improved metabolic parameters, restored

ovarian morphology, ameliorated irregular estrous cycle and corrected endocrine abnormalities. Additionally, increased SCFA levels, á-diversity of gut microbiome and modulated gut dysbiosis through increased abundance of microbial phyla (*Bacteroidetes* and *Bacillota*) and key genera such as *Allobaculum*, *Romboutsia* and *Lachnospiraceae* members appeared to play pivotal roles in maintaining metabolic and ecological balance within the gut environment. Overall, SDG-enriched flaxseed lignan extract exhibits promising potential as a nutraceutical component for alleviating PCOS symptoms by correcting endocrine, metabolic functions and gut homeostasis in a preclinical model.

Keywords: *Polycystic ovary syndrome, secoisolariciresinol diglucoside, flaxseed, ovarian morphology, gut homeostasis, SCFA.*

Response of Phosphorus and Sulphur Fertilizers on Fenugreek (*Trigonella Foenum-Graecum* L.)

Chavda J.D. Raval C.H., Patel H.K., Mor V.B
Department of Agronomy, B. A. College of Agriculture, Anand Agricultural University, Anand
Corresponding Author e-mail. jdchavda@aau.in

Abstract

A field experiment was conducted at the Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat to study the Response of phosphorus and sulphur fertilizers on fenugreek (*Trigonella foenum-graecum* L.) during *rabi* season of the year 2022-23. The field experiment was laid out in a Randomized Block Design (Factorial) with replicated three times. The experiment comprised of sixteen treatment combinations involving four levels of phosphorus and four levels of sulphur application *viz.* P_0: 0 kg P_2O_5/ha, P_1: 20 kg P_2O_5/ha, P_2: 30 kg P_2O_5/ha, P_3: 40 kg P_2O_5/ha and four levels of sulphur application *viz.* S_0: 0 kg S/ha, S_1: 20 kg S/ha, S_2: 30 kg S/ha, S_3: 40 kg S/ha. The results of the experiment indicated that an application of phosphorus @ 40 kg/ha recorded significantly the highest values of growth parameters *viz.*, plant height at harvest (64.58 cm) and no. of branches per plant at harvest (6.08), dry weight of nodules per plant (9.79 mg). An application of phosphorus @ 40 kg/ha produced significantly higher number of pods per plant (20.25), length of pod (12.83 cm), test weight (13.35 g), seed yield (1515 kg/ha) & straw yield (3261 kg/ha) and biological yield (4776 kg/ha). Treatment P_3 noted 25.31% higher seed yield compared to no application of phosphorus. The lowest values of yield attributes and yield were observed under control (0 kg P_2O_5/ha). It was observed that an application of 40 kg S/ha was recorded significantly the highest plant height (14.50 and 64.16 cm at 30 DAS and at harvest, respectively), branches per plant at harvest (6.33) and dry weight per nodule per plant (9.38) and found statistically at par with application of 20 kg S/ha and 30 kg S/ha in case of plant height at 30 DAS and at harvest and dry weight per nodule per plant. Application of 40 kg S/ha recorded significantly higher values of yield and yield attributing parameter *viz.*, number of pods per plant (20.66), length of pod (12.66 cm) and test weight (13.30 g), as well as seed yield (1476 kg/ha), straw yield (3259 kg/ha) and biological yield (4734 kg/ha). Seed yield of fenugreek was 20.39% higher in S_3 (40 kg S/ha) than no application of sulphur (S_0: 0 kg S/ha).

Keywords*: Fenugreek, phosphorus, seed yield and sulphur*

Herbicidal Weed Management in *Kharif* Sorghum

Chavda K., Patel H. K., Suthar J. V. And Pal, A. D.
Department of Agronomy, B. A. College of Agriculture, Anand Agricultural University, Anand
Corresponding Author e-mail. krishnachavda2022@gmail.com

Abstract

To study the efficacy of different herbicides on mixed weed flora in sorghum, an experiment was conducted during the *kharif* season of 2023 at the Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand. The experiment was laid out in a Randomized Block Design with three replications and twelve treatments, comprising atrazine, pendimethalin, 2,4-D sodium salt, tembotrione, and mesotrione applied either alone or in combination. During the course of investigation, the experimental field was infested with eleven weed species. Among these, *Eleusine indica* L. Gaertn., *Dactyloctenium aegyptium* (L.) Willd., *Digitaria sanguinalis* (L.) Scop., *Setaria tomentosa* (Roxb.) Kunth, *Commelina benghalensis* L., and *Eragrostis major* were monocotyledonous weeds. The dominant dicot weeds included *Oldenlandia umbellata* L., *Mollugo nudicaulis* Lam., *Phyllanthus niruri* L., *Trianthema monogyna* L., and *Digera arvensis* Forsk. The results revealed that at 30 days after sowing (DAS), the tank-mix application of atrazine 50% WP at 500 g a.i. ha{ ¹ + pendimethalin 30% EC at 500 g a.i./ha as pre-emergence (PE) recorded the highest WCE (93.09%) and HEI (18.23%). This superior performance was attributed to lower weed growth rate (WGR) (0.15 g m{ ² day{ ¹) and WPI (0.79%).With respect to dicot weed control, cent per cent WCE and HEI were recorded under early post-emergence (EPoE) tank-mix application of tembotrione 34.4% SC at 84 g a.i./ha + atrazine 50% WP at 500 g a.i./ha, as well as under premix application of mesotrione 2.27% + atrazine 22.7% SC at 625 g a.i./ha and 825 g a.i./ha. Additionally, pre-emergence application of atrazine 50% WP at 1000 g a.i./ha resulted in higher total WCE (86.61%) and HEI (8.88%), which was directly correlated with lower WGR (0.43 g m{ ² day{ ¹) and WPI (0.85%). A similar trend in weed control was observed for both monocot and dicot weeds at 60 DAS. However, the tank-mix application of atrazine 50% WP at 500 g a.i./ha + pendimethalin 30% EC at 500 g a.i./ha as PE recorded the highest mixed weed control efficiency at 60 DAS. The sole application of atrazine at 1000 g a.i./ha and its tank-mix application with pendimethalin at 500 g a.i./ha produced significantly higher grain and straw yields, indicating superior weed suppression efficacy of these herbicidal treatments. Residue analysis revealed that residues of all tested herbicides in sorghum grain and soil after crop harvest were below the limit of quantification (LOQ), indicating their safe use under the experimental conditions.

Keywords: *HEI (Herbicide efficiency index), LOQ (limit of quantification), WCE (Weed control efficiency), WGR (Weed growth rate) and WPI (Weed persistence index).*

Harnessing Wild Relatives of Pearl Millet to Enhance Grain Protein Content: Importance, Gaps, and Genomic Strategies

Deekshitha Bomireddy[1*], Vetriventhan Mani[1], Kuldeep Singh[1], Jagadeesh Kommineni[1], Naresh D[1]

[1]Genebank, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad, 502324

***Corresponding Author Email:** deekshitha2170@gmail.com*

Abstract

Protein is an indispensable macronutrient essential for growth, immune function, enzyme synthesis, and overall metabolic homeostasis in humans. Global protein deficiency remains a pressing public health challenge, affecting over 800 million people, particularly in low- and middle-income countries of Sub-Saharan Africa and South Asia. The WHO recommends a daily protein intake of 0.8 g per kg body weight for adults, with higher requirements for children, pregnant women, and the elderly. In regions where animal-derived protein is economically inaccessible, cereal crops serve as the primary dietary protein source, making the nutritional quality of staple grains critically important. Pearl millet (*Pennisetum glaucum*), a climate-resilient cereal cultivated across the semi-arid tropics, is a dietary staple for over 90 million people. Despite its agronomic superiority — including tolerance to drought, heat, and poor soils — grain protein content in cultivated pearl millet varieties typically ranges from 8 to 12%, which is insufficient to meet daily nutritional requirements of dependent populations. Bridging this protein gap necessitates leveraging the genetic diversity harbored in wild relatives of pearl millet, particularly *Pennisetum violaceum*, where grain protein content exceeding 18–24% has been documented at ICRISAT, presenting a compelling opportunity for biofortification. Several approaches and technologies are available to introgress high-protein traits from wild relatives into elite cultivars. These include conventional backcross breeding, development of recombinant inbred lines (RILs) for QTL mapping, and QTL-seq for rapid identification of genomic regions governing protein accumulation. Whole-genome resequencing enables fine-mapping of candidate genes involved in nitrogen metabolism, protein biosynthesis, and storage protein pathways. Marker-assisted backcrossing (MABC) further accelerates introgression while minimizing linkage drag. Emerging tools such as genomic selection and CRISPR-based functional validation offer additional precision in translating wild-derived alleles into breeding outcomes. Integrating these genomic and breeding strategies presents a transformative opportunity to develop protein-enriched pearl millet cultivars, thereby addressing hidden hunger and contributing to global nutritional security.

Keywords: *Protein nutrition, pearl millet, wild relatives, biofortification, QTL mapping, marker-assisted breeding*

Climate variability shapes reproductive phenology and vulnerability of three *Mystus* species in the river Ganga

Deependra Singh*, Abhilash Wodeyar K, Basanta Kumar Das*, Thangjam Nirupada Chanu, Trupti Rani Mohanty, Pranay Kumar Parida
ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120, India
Presenting Author: deep165.singh@gmail.com

Abstract

Climate-driven alterations in hydro-climatic regimes increasingly threaten reproductive processes of riverine fishes in the River Ganga. The present study evaluated reproductive phenology and climate sensitivity of three small indigenous catfishes, *Mystus cavasius*, *M. tengara* and *M. bleekeri*, using 1,828 specimens collected from the Farakka stretch of the River Ganga during January 2022-December 2024. Seasonal reproductive patterns were assessed through gonado-somatic index (GSI), fecundity and length at first maturity (Lm… •), and their relationships with environmental variables were analysed. All species exhibited clear monsoon-synchronised spawning with peak female GSI during June–July. Maximum GSI values were 19.42 in *M. cavasius*, 19.83 in *M. bleekeri* and 15.70 in *M. tengara*. Length at first maturity ranged from 89 to 99 mm, indicating early maturation, while fecundity showed a strong positive relationship with fish size. Long-term climatic analysis revealed an approximate warming of 0.62°C since 1985 in the study region. Generalized Additive Models explained 81-84% of the variation in monthly GSI, identifying temperature as the principal driver of reproductive dynamics, followed by turbidity and selected water quality variables. Rainfall showed comparatively weaker direct influence on reproductive indices. Species-specific responses indicated narrower thermal tolerance and greater reproductive vulnerability in *M. bleekeri* compared to the other two species. The results demonstrate that climatic warming and increasing hydro-climatic variability may alter reproductive timing and recruitment success of small indigenous catfishes in the Ganga River. Climate-adaptive fisheries management strategies, including protection of spawning habitats and maintenance of environmental flows, are essential for sustaining *Mystus* populations and associated fisheries in the changing riverine environment.

Keywords: *Mystus spp., Reproductive biology, Climate variability, Gonado-somatic index, Ganga River*

Spatial Dynamics of Soil Organic Carbon and pH under Bund-Planted Poplar (*Populus deltoides*) in an Agroforestry System

Deepika* and K K Bhardwaj
Department of Soil Science, CCS HAU, Hisar, Haryana-125004
Corresponding author E-mail: deepikachhoturam@gmail.com

Abstract

The present investigation was carried out at Forestry Research Farm, CCS HAU, Hisar to study the effect of bund-planted poplar on soil organic carbon (OC) and soil pH at different distances and directions.

Soil samples were collected from six distances (3, 6, 9, 12, 15 and 18 m) from the tree line in four directions (East, West, North and South). The results revealed that soil organic carbon was significantly influenced by both distance and direction. Organic carbon decreased progressively with increasing distance from the poplar bund, ranging from 0.601% at 3 m to 0.449% at 18 m. Among the directions, the highest mean organic carbon was recorded in the western direction (0.559%), followed by east (0.542%), north (0.522%) and south (0.487%). Higher organic carbon near the tree line may be attributed to greater litter fall and root biomass addition under poplar. In contrast, soil pH showed a slight increasing trend with increasing distance from the tree base, ranging from 7.832 at 3 m to 7.967 at 18 m. However, the effect of distance and direction on soil pH was found to be non-significant, indicating that bund planted poplar had minimal influence on soil reaction. The findings suggest that poplar-based agroforestry systems enhance soil organic carbon in the vicinity of trees without causing significant changes in soil pH, thereby improving overall soil health.

Keywords*: Poplar, Agroforestry, Soil organic carbon, Soil pH, Directional variation.*

Managanese Fractionation in Soil and Screening of Bread & Durum Wheat Varieties for Manganese Stress Tolerance

Dheeraj Panghaal[1*], R.S. Malik[2] and Chetan Kumar Jangir [3]

[1]*District Extension Specialist Soil Science, CCS HAU- KVK, Jind, Haryana (126102)*

[2] *Retd. Professor and Head, Department of Soil Science, CCS HAU, Hisar, Haryana (125004)*

[3]*Soil Scientist ICAR NRCSS Tabiji Ajmer (305206)*

Corresponding author Email: dheerajpanghal27@gmail.com

Abstract

The study was carried out in screen house of Department of Soil Science, CCS HAU, Hisar. The soil selected for study was sand textured. In this experiment 12 prominent varieties of bread wheat and 6 durum wheat varieties were chosen for study. The order of preponderance of different fractions of Mn found was as Residual > Fe MnOx bound > Carbonate bound > Exchangeable > Organic matter bound. The wheat yield, concentration and uptake of Mn by wheat grain increased with the application of manganese fertilizer. The maximum increase in yield was found in RAJ-3765 and PDW-314 respectively for bread and durum wheat. The maximum increase in the manganese concentration in grains was found in WH-283 for bread and PDW-314 for durum wheat. The maximum uptake in bread wheat was found in HD-2967 and WHD-948 for durum wheat. Protein content in wheat increased with application of Mn fertilizer. There was no significant variation in harvest index in both the bread and durum wheat cultivars with application of Mn fertilizers. Mn transfer coefficient increased over control in bread and durum wheat varieties. The highest increase in straw yield was found in RAJ-3765 for bread and in WHD-948 for durum wheat, whereas the maximum concentration of Mn in straw was found in WH-283 for bread and in PDW-314 for durum wheat. The maximum uptake was found in WH-1080 in bread wheat and in WHD-948 for durum wheat.

Keywords: *Manganese fractionation, bread wheat, durum wheat*

Recombinant major capsid protein of ISKNV as a potent subunit vaccine candidate: Immunoprotection and transcriptomic insights in Genetically Improved Tilapia (GIFT)

Dheeraj, S. B.[1*], Girisha, S. K.[1], Suresh, T.[1] and Rathod Kumara[1]
[1]Department of Aquatic Animal Health Management, College of Fisheries, Mangalore, Karnataka, 575002
****Corresponding author e-mail: dheerajsb07@gmail.com***

Abstract

Infectious spleen and kidney necrosis virus (ISKNV), a member of the genus *Megalocytivirus* (family *Iridoviridae*), has recently emerged as a significant pathogen in India, affecting multiple fish species. Propagation of ISKNV in fish cell lines revealed typical cytopathic effects, while transmission electron microscopy confirmed icosahedral virions (12–146 nm) with a double-layered proteinaceous capsid. The major capsid protein (MCP), a key structural component mediating viral entry, was identified as a promising antigen for subunit vaccine development. In this study, the MCP gene was cloned, expressed, and purified to obtain recombinant MCP (rMCP). Genetically improved mono-sex tilapia were immunized with rMCP, and survival outcomes were compared with adjuvant and control groups. The relative percentage survival (RPS) was significantly higher in the MCP group (86.67%) compared to adjuvant (70%) and control (53.33%). Transcriptomic analysis of spleen and kidney tissues revealed strong immune activation: MHC I and MHC II were highly upregulated toward the end of the trial, while cytokines such as IL-1â and IL-4 showed sustained upregulation from the onset. These findings demonstrate that rMCP elicits robust humoral and cellular immune responses, conferring enhanced protection against ISKNV. The study highlights MCP as a potent candidate for subunit vaccine development, offering a promising strategy for mitigating ISKNV-associated losses in aquaculture.

Keywords*: ISKNV, Major Capsid Protein (MCP), Subunit Vaccine, Tilapia Immunization*

Effect of *Moringa oleifera* leaves extract on quality of preserved boar semen

Saharuz Zaman Laskar, Dibyajyoti Talukdar*, K. Lalrintluanga, Fazal Ali Ahmed, Girin Kalita, T. C. Tolenkhomba and Bedanga Konwar
Department of Animal Reproduction, Gynaecology & Obstetrics
College of Veterinary Sciences & A.H., Central Agricultural University, Aizawl, Mizoram, India
****Corresponding author Email Id: dibya26@gmail.com***

Abstract

Moringa leaf extract (MLE) is one of the natural ingredients that can improve the quality of preserved semen by preventing sperm lipid oxidation and increase the sperm storage time. The aim of the present study is to evaluate the effect of *Moringa oleifera* leaves extract on boar semen quality during short-term preservation at liquid state. Four mature healthy Large White Yorkshire boars of about 1.5-2 years

age group having good reproductive health was selected for the study. Ten ejaculates were collected from each boar by gloved hand technique using dummy as mount for 2 times in a week. Each ejaculate was divided into 4 aliquots (equal volume and sperm concentration) and *Moringa oleifera* leaves extract (MLE) @ 0 µg/ml (control), 100 µg/ml, 200 µg/ml, and 300 µg/ml w/v was mixed in each aliquot after extension of semen samples with Beltsville Thaw Solution (BTS) extender. In each group 10 gilts/sows were artificially inseminated with the liquid preserved semen to record the conception rates and litter size. The mean percent of motile sperm, live sperm, intact plasma membrane, intact acrosome among the groups were increased significantly (P<0.01) as compared to control at 24 and 48 hours of preservation. The supplementation of *Moringa oleifera* leaves extract in BTS extender at concentration of 100 µg/ml, 200 µg/ml and 300 µg/ml significantly improved the Large White Yorkshire boar's semen quality during short term preservation at 18°C as compared to control. The conception rate and average litter size at birth among the groups were increased significantly (P<0.01) as compared to control (C). The significantly (P<0.01) higher conception rate and litter size at birth was recorded in T3 group i.e. 300 µg/ml. In conclusion, the concentration of 300 µg/ml *Moringa oleifera* leaves extract was found to be better among other concentrations.

Keywords*: Moringa oleifera leaves extract, BTS extender, boar semen, preservation, quality*

Physio-biochemical variation of *Andrographis paniculate* germplasms at different phenological stages

Divte P.R.[1]*, K.A. Kalariya[2], Rohan Sarkar[2], Manish Das[2], J.K. Meena[1], R. Bhowmick[1], Sanjoy Saha[1] and G. Kar[1]

[1]ICAR- Central Research Institute for Jute and Allied Fibres, Barrackpore, West Bengal, India
[2]ICAR- ICAR-Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat, India
Corresponding author email: prdivte11@gmail.com

Abstract

Kalmegh (*Andrographis paniculata*), commonly known as the "king of bitters," is an important medicinal plant widely used in Ayurvedic and Unani systems of medicine for the treatment of digestive disorders, hepatoprotection, hypoglycemic conditions, and as an antibacterial, anti-inflammatory, analgesic, vermicidal, and antipyretic agent. The present study was conducted to evaluate physio-biochemical variability among fourteen (14) *A. paniculata* germplasms at two phenological stages, namely 45 and 80 days after sowing (DAS), with the objective of identifying superior germplasms. Significant variation was observed among germplasms for morpho-physiological traits such as total chlorophyll content (1.2-2.4 mg g{ ¹), plant height (30.1-60.93 cm), dry biomass (10.6-28.6 g), relative growth rate (0.06-0.43 g g{ ¹ day{ ¹), and leaf area (500-1806 cm²) at both stages. Biochemical analyses revealed wide variation in total phenol content (41-98 mg GAE g{ ¹ dry extract), total flavonoids (133-402 mg QE g{ ¹ dry extract), and antioxidant activity measured through DPPH radical scavenging assay. Higher radical scavenging activity was observed at 80 DAS (239-834 µg ml{ ¹) compared to 45 DAS (1209-3194 µg ml{ ¹) across all germplasms. High-performance liquid chromatography (HPLC) analysis indicated

considerable variation in andrographolide content, ranging from 0.20-0.40% at 45 DAS and 0.28-0.54% at 80 DAS in whole plant samples. The highest andrographolide content was recorded in germplasm AP-121 (0.54%), followed by AP-40 (0.47%) at 80 DAS. A positive association was observed between andrographolide content and total phenols, flavonoids, and antioxidant activity, particularly in AP-121 and AP-40 germplasms. The study identified AP-121 and AP-40 as promising germplasm with superior physio-biochemical traits and high andrographolide content, suggesting their potential use in crop improvement programs and varietal development of *A. paniculata.*

Keywords: *Kalmegh, Morpho-physiological variation, Phenols, Flavonoids, DPPH assay, Andrographolide.*

Urban Green Spaces as Climate Assets: Plant Resilience and Carbon Storage

***Dr Aasawari Shenwai**
Assistant Professor, Satish Pradhan Dnyanasahana College Thane Maharashtra India
****aasawarishenwai22@gmail.com***

Abstract

Urban green spaces play a crucial role in climate change mitigation by supporting carbon storage and improving environmental quality in rapidly growing cities. In urban environments, vegetation is continuously exposed to air pollution, which influences plant performance and determines its effectiveness as a long-term climate asset. This study focuses on identifying pollution-tolerant plant species and evaluating their contribution to carbon storage in urban landscapes. The findings reveal that selected plant species demonstrate a high level of tolerance to vehicular air pollution, enabling them to sustain growth and maintain stable biomass under stressed urban conditions. These pollution-tolerant species contribute significantly to carbon storage and enhance the functional value of urban green spaces. In contrast, pollution-sensitive species exhibit visible stress responses under polluted environments, indicating their usefulness as indicators of air quality rather than reliable carbon sinks.The integration of pollution tolerance and carbon storage highlights the importance of plant resilience in strengthening urban ecosystems. Resilient species offer dual benefits by withstanding environmental stress while supporting climate mitigation through carbon accumulation. These insights are particularly relevant for rapidly urbanizing regions of India, including cities in North-East India, where expanding infrastructure and increasing vehicular emissions pose growing environmental challenges.

The study underscores the need for informed plant selection in urban planning to maximize ecosystem services such as carbon storage, air quality improvement, and climate resilience. By recognizing urban green spaces as dynamic climate assets, the findings support the adoption of nature-based solutions for sustainable urban development and long-term climate change mitigation.

Keywords: *Urban green spaces; Plant resilience; Air pollution tolerance; Carbon storage; Climate mitigation*

Extremophiles as Plant Growth Promoters: A Sustainable Approach for Climate Resilient Agriculture

Dr. Abhinandita Sahoo
Department of Plant Pathology, M.S.Swaminathan School of Agriculture, Centurion University of Technology and Management, Paralakhemundi, Gajapati, Odisha-761211

Abstract

Agricultural systems are increasingly exposed to abiotic stresses such as salinity, drought, extreme temperatures, heavy metal contamination, and pH variations, which significantly reduce crop productivity. Extremophiles are microorganisms that thrive under extreme environmental conditions and have gained attention as potential plant growth promoters for sustainable agriculture. These include halophiles, thermophiles, psychrophiles, acidophiles, alkaliphiles, and metallophiles, each possessing unique physiological and metabolic adaptations that enable survival and functionality in harsh environments. Besides their adaptability to extreme conditions, they promote plant growth through direct and indirect mechanisms. Direct mechanisms include phytohormone production (such as indole-3-acetic acid and gibberellins), nitrogen fixation, phosphate solubilization, siderophore production and ACC deaminase activity, which collectively enhance nutrient uptake and root development. Indirectly, extremophiles improve plant tolerance to stress by producing osmoprotectants, exopolysaccharides, stress-responsive enzymes, and antioxidant compounds that mitigate oxidative damage under adverse conditions. The use of extremophiles as biofertilizers and biostimulants offers an eco-friendly alternative to chemical inputs, contributing to improved soil health and climate-resilient crop production. Their resilience and functional stability under extreme conditions make them particularly valuable for cultivation in marginal and degraded lands. Overall, extremophiles represent a novel and sustainable microbial resource for enhancing plant productivity and ensuring agricultural sustainability under changing environmental conditions.

Impact of frozen storage period (-18±1R”C) and formulation on keeping quality of vacuum packaged functional chicken sausages

Dr. Janagam Indumathi*
Princpal, Animal Husbandry Polytechnic, Sodum-517123, Chittoor district, Andhra Pradesh.

Abstract

Vacuum packaged functional chicken sausages were developed with 10% percent level of replacement of chicken fat with grounded poppy, sesame, groundnut seeds and were analysed for their keeping quality along with high fat control kept at frozen (-18±1°C) temperatures for 180 days. Results revealed that, FFA, TBARS, tyrosine and all microbiological parameters of chicken sausages were significantly ($P<0.05$) influenced by formulation and vacuum packaging in frozen storage and functional chicken sausages were found to have significantly lower values than control. Regardless of formulation, the mean values of pH, FFA, TBARS, tyrosine, standard plate counts, psychrophilic count, yeast and moulds

count, lactobacillus count and anaerobic counts were significantly ($p < 0.05$) increased throughout the storage period in all chicken sausages under frozen conditions. Scores for all sensory attributes decreased significantly ($P<0.05$) during storage in frozen temperatures in all chicken sausages irrespective of formulation. Coli forms could not be detected in any of chicken sausages throughout the frozen storage period irrespective of formulation. Study concludes that vacuum packaging extended the shelf life of the sausages up to 180 days irrespective of formulation with minor changes in physico-chemical, microbiological and sensory quality. All the three ground vegetable oil seeds are effective in delaying the lipid oxidation, microbial growth and preserving sensory quality during frozen storage and among them ground sesame seed was more potent to be a better preservative than rest of the two. Combination of vacuum packing and fat replacement with ground vegetable oilseeds as natural antioxidants reduced lipid oxidation and microbial growth in chicken sausages and maintained the sensory quality characteristics during frozen storage for 180 days.

Keywords*: Functional, vegetable oil seeds, chicken sausages, vacuum packaging, Freezing, shelf life.*

Assessment of suitable varieties for inland saline water (2-4 ppt) fish culture

Sivakumar K[1,*], Kannappan S[2,3]

[1]Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University,
Orathanadu - 614 625, Thanjavur District, Tamil Nadu, India

[2]National Fisheries Development Board, Hyderabad – 500 052, Telangana, India

[3]Crustacean Culture Division, ICAR-Central Institute of Brackishwater Aquaculture,
Chennai - 600 028, Tamil Nadu, India

****Corresponding author e-mail: ksivafbt@gmail.com***

Abstract

Inland fish farming the resources for water is mainly depends on rain fed as well as irrigation. During fish farming seed and feed are found to be significant contribution to promote cultivation. The groundwater of seashore surroundings and other inland area of Chengalpattu district, Tamil Nadu, India is resourced as low saline (6 ppt and above) water. During rainy season, salinity may turn up below 6 ppt (2-4 ppt), which is more suitable for salinity tolerant freshwater or brackishwater fishes. Also, the availability of brackishwater fish seeds is mostly relay on natural resources and season bounded. Consequently, unable to do fish culture in the need based situations by the farmers. Under this condition, it is necessary to enhance fish production mainly depends on low saline water based fish ponds. Based on this, the present study was aimed. In the current assessment Indian Major Carps (IMC) and Pangasius Catfish (PC) was stocked separately at 1000 Nos (1 No/sq.mt.) in 0.1 Ha earthen ponds for 6 months culture period at ten villages (Totally 30 fish ponds) in this district. Among them, each 10 Nos were stocked with IMC and PC, the remaining ponds with Carp polyculture and Tilapia, which was considered as farmers' practice (Control). The higher fish growth (0.51 kg/fish), survival (85.00 %) and production

(4335 kg/Ha) was significantly ($p<0.05$) observed in PC farming as compare with IMC farming (fish growth – 0.48 kg/fish, survival – 85.12 % and production – 4086 kg/Ha) and farmers' practice (fish growth - 0.35 kg, survival - 79.31 % and production - 2776 kg/Ha). As per this trial, Pangasius Catfish farming may be more appropriate technique for inland saline water (2-4 ppt) based fish farming concerning higher fish production.

Keywords: *Fish farming, Growth, IMC, Inland saline water, Pangasius catfish, Pond*

Antidiabetic Potential of Dietary Fibre Extracted from Banana Pseudostem

Dr. Priyanka Bhattacharyya[1*] and Dr. Mamoni Das[2]
[1]Dept of Food Science and Nutrition, The Assam Royal Global University, Guwahati, Assam
[2]Dept. of Food Science and Nutrition, Assam Agricultural University, Jorhat, Assam
[*]***Corresponding author email: pbhattacharyya@rgu.ac***

Abstract

Dietary fibre plays a crucial role in the regulation of glucose homeostasis and the management of diabetes mellitus. The present study aimed to evaluate the glucose-binding potential and antidiabetic efficacy of dietary fibre extracted from the pseudostem of *Musa balbisiana* Colla, an underutilized agro-industrial by-product. The extracted fibre was first assessed for its *in vitro* glucose adsorption capacity (GAC), followed by *in vivo* evaluation using streptozotocin (STZ)-induced diabetic Wistar rats. The fibre exhibited a significantly higher GAC (120.11 ± 3.45 mg/g) compared to cellulose, indicating strong glucose-binding ability. Acute oral toxicity studies confirmed its safety up to 2000 mg/kg body weight. *In vivo* studies demonstrated a dose-dependent improvement in glucose tolerance, significant reduction in fasting blood glucose levels, and stabilization of plasma insulin levels in diabetic rats supplemented with the extracted fibre (500, 1000, and 1500 mg/kg body weight). Notably, the highest dose produced glycaemic control comparable to the standard antidiabetic drug metformin. The observed hypoglycaemic effect may be attributed to delayed glucose absorption, enhanced glucose entrapment, increased digesta viscosity, and improved insulin secretion. These findings highlight the potential of *Musa balbisiana* pseudostem-derived dietary fibre as a safe, effective, and sustainable functional ingredient for the dietary management of diabetes mellitus.

Keywords*: Anti-diabetic, Banana pseudostem, Dietary fibre, Glucose, Insulin*

Reproductive Disorders in Buffaloes

Dr. Ravi Dutt
Department of Veterinary Gynaecology & Obstetrics, College of Veterinary Sciences, LUVAS, Hisar, Haryana-125004, India
Email id: raviduttvets@yahoo.co.in

Abstract

Buffaloes play a pivotal role in India's dairy sector, and their reproductive efficiency directly influences overall productivity and farmers' income. Major reproductive disorders commonly reported in buffaloes include anestrus, repeat breeding, delayed puberty, uterine infections, dystocia, uterine torsion, cervico-vaginal/uterine prolapse, retained fetal membranes and abortions. Among these, anestrus and repeat breeding show the highest incidence, resulting in prolonged calving intervals and significant reduction in milk yield. Nutritional deficiencies, poor heat detection, hormonal imbalance, and subclinical uterine infections are important etiological factors. Seasonal breeding tendencies and heat stress further aggravate reproductive inefficiency in buffaloes. Uterine torsion is a life-threatening obstetrical emergency in advanced pregnancy, frequently observed in pluriparous buffaloes, and requires prompt diagnosis and skilled obstetrical intervention. Brucellosis remains a major infectious reproductive disease, causing late-term abortions, infertility, and substantial economic losses. The disease also poses a serious public health concern due to its zoonotic nature. Haryana, as a leading state in livestock development, has made notable contributions in mitigating reproductive disorders through improved breeding management and efficient veterinary services. The state has strengthened artificial insemination, pregnancy diagnosis, and estrus synchronization programs at the field level. Extension activities and farmer awareness programs have enhanced early detection and timely clinical intervention.

Keywords*: Reproductive disorders, Buffaloes, Uterine torsion, Repeat Breeding, Anestrus.*

Value addition of Cocoons: Entrepreneurial Avenue for Empowering ST Communities

[1*]Dr. Shefali Massey and [2]Dr. Divya Singh
[1]Assistant Professor, Department of Apparel & Textile Science
[2]Assistant Professor, Department of Resouce Management & Consumer Science
College of Community Science, Govind Ballabh Pant University of Agriculture & Technology
Pantnagar-263145, Uttarakhand
Corresponding author email- shefali.massey@gmail.com

Abstract

Uttarakhand is known as "Bowl of Bivoltine silk" due to its high quality bivoltine cocoons of International grade. In the vicinity of the spectacular Kumauni region of Uttarakhand lays the district of Udham Singh having 91,015 Scheduled Caste and 65,186 Scheduled Tribe population involved in sericulture activities (Census 2011). Sericulture is season-based activity hence the livelihood security and regular flow of income is a major concern. In sericulture, quality of cocoons plays a major role on raw silk yield and productivity and thus, has direct bearing on the income yield. In the process of silkworm rearing, few cocoons get damaged/cut/pierced/stained and categorized as inferior quality cocoons. These substandard cocoons are sold at much lower price than the high-quality grade silk. The sericulture farmers don't have awareness about the diversified products/handicrafts/home textiles that can be prepared from value addition of inferior quality/substandard cocoons/ or short silk fibers. Value addition and waste minimization are some ways which can increase the profitability in sericulture. The present study surveyed 280 ST communities residing in four blocks of Udham Singh Nagar involved in sericulture

activities. The general information was collected including age, education, marital status etc. Most of the population involved in sericulture was in the age group of 40-50 years, a large majority i.e. 68.7% was married. The respondents surveyed had primary school education (30%) and high school (27%) and had income ranging from Rs. 5000/- to Rs. 15000/-. A total number of 280 beneficiaries from four blocks were benefitted through vocational skill training programmes. The three trainings included vocational skill training on value added innovative products/handicrafts from sericulture waste; training on visual merchandising, sales promotion techniques and marketing for value added products and training on exhibiting value added products and marketing. The diversified products like batches, mementos, invitation card, *rakhi*, garlands etc. were developed.

Key Words: *Sericulture, inferior quality, cocoons, agriculture, diversified products, vocational skill*

Zederone from *Curcuma caesia* Mitigates Dementia via Amyloid Reduction and Gut Microbiota Modulation

Dr. Sudarshana Borah
Associate Professor, Royal School of Pharmacy, The Assam Royal Global University-781035
Email: shonapharma@gmail.com

Abstract

Dementia is commonly associated with neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease, frontotemporal dementia, and cerebrovascular conditions. Emerging evidence indicates that *Curcuma caesia* (family Zingiberaceae) possesses diverse pharmacological properties, including antioxidant, antidepressant, analgesic, anticonvulsant, and anti-acetylcholinesterase activities. The present study was designed to investigate the effects of zederone on the fecal microbial composition in an aluminum-induced dementia rat model. Zederone was isolated and characterized from the rhizomes of *Curcuma caesia*. Its cognition-enhancing potential was evaluated in aluminum-induced demented rats using behavioral assessment with the radial eight-arm maze. Amyloid plaque deposition in the cerebral neocortex was examined by fluorescence microscopy following Congo red staining of brain tissues. Eighteen female Wistar albino rats were randomly allocated into three groups, with six animals in each group. Fecal microbiome profiling was performed through metagenomic DNA extraction followed by next-generation sequencing to determine the association between gut microbial alterations and amyloid plaque formation in dementia. Zederone was identified as pale yellow, needle-shaped crystals with a purity of 96.57%. Administration of zederone at a dose of 10 mg/kg body weight significantly improved cognitive performance (p d" 0.0001) and markedly reduced amyloid plaque accumulation, as observed under fluorescence microscopy. Fecal microbiome analysis revealed a notable shift in the treated group toward an increased abundance of *Lactobacillus* species, in contrast to the dominance of *Bacteroides* observed in the demented group. The findings suggest that zederone, a sesquiterpenoid compound, may play a beneficial role in modulating gut microbial dysbiosis and holds promise as a potential therapeutic agent for dementia and other neurodegenerative disorders.

Keywords: *Fecal microbiome; Lactobacillus; Bacteroides; Neuroprotection; Phytopharmacology; Metagenomic sequencing*

Detection and Molecular Diagnosis of Soybean Mosaic Virus (SMV) in soybean

Gaurav Verma*, Sunaullah Bhat, Amit Paschapur, Anuradha Bhartiya, Krishna Kant Mishra & Lakshmi Kant

ICAR- Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora-263601, Uttarakhand, India

Abstract

Soybean [*Glycine max* (L.) Merr.] is an economically important oilseed crop cultivated extensively in India, including the hill Kumaun region of Uttarakhand. Based on a two-year study, 28 entries of Soybean disease screening nursery (SDSN) were sown and SMV detection through molecular tools was carried out. Out of the twenty-eight entries of SDSN evaluated, fifteen were found positive for SMV infection. Symptomatic and asymptomatic leaf samples, seeds exhibiting hilum bleeding, and associated aphid vectors (*Aphis glycines*) were collected and subjected to molecular analysis. Total RNA was extracted from the samples and converted into complementary DNA, followed by RT-PCR amplification targeting the coat protein (CP) gene of Soybean mosaic virus (SMV). A clear 469 bp amplicon of 469 bp was obtained from samples. Sequencing and BLASTn analysis confirmed high nucleotide identity with previously reported SMV isolates. Phylogenetic analysis using the Maximum Likelihood method clustered the Almora isolate with globally distributed SMV strains, particularly those reported from Asia and North America, with strong bootstrap support. The isolate showed low genetic divergence within the CP gene region, indicating genetic conservation. The study underscores the need for integrated disease management strategies to protect the crop from virus in the hill agro-ecosystems of Uttarakhand. SMV also infects several other cultivated and wild hosts including *Glycine soja* (wild soybean), *Vigna unguiculata* (cowpea), *Phaseolus vulgaris* (common bean), *Phaseolus lunatus* (lima bean), *Vigna radiata* (mungbean), *Lablab purpureus* (hyacinth bean), *Chenopodium quinoa*, *Chenopodium album*, *Pisum sativum* (pea), *Lupinus* spp. (lupin), *Lespedeza* spp., and *Nicotiana* spp. (tobacco), which may serve as alternative or experimental hosts and potential reservoirs for virus survival and spread.

Keywords: *Soybean mosaic virus; Glycine max; Hilum bleeding; North Western Himalayas; Uttarakhand; Seed-borne virus; Aphid transmission*

Drone-based foliar application of nutrients in cotton

H R. Ramani, V. K. Vekariya, P. S. Patel and M. C. Patel

Main Cotton Research Station, Navsari Agricultural University, Surat-395007, Gujarat, India.

Corresponding author Email: hrramani@nau.in

Abstract

The experiment was conducted during *kharif* 2024 for effect of nutrients spray using drone in Bt cotton at Main cotton Research station, Surat. Eight treatments of Potassium nitrate were imposed

at flowering stage using drone. Non-replicated trial with 50 m long 4 m wide strip for each treatments and 2 meter buffer were sown for better management practices of drone for spray. Plant height, No. of monopodia, No. of sympodia, Boll per sq. metre, Boll weight, yield and protein content were non- significantly deviated due to chemical spray through drone and manual spray while highest seed cotton yield was observed in T8 (2958.7 kg/ha) followed by T5 (2909.8 kg/ha). Boll weight and no. of boll per sq. metre were none significant due to treatments. Plant height, No. of monopodia and No. of sympodia, protein content in leaf were non-significantly differed among the treatments. Highest Net return and Marginal cost ratio were observed in Manual spray of KNO3 followed by Drone spray of KNO3 @8%.

Keywords: *Drone, Potassium nitrate and Protein*

Precision Horticulture with Drones: Improving Crop Monitoring and Sustainable Practices

Hanuman Ram*

ICAR-Central Institute for Arid Horticulture, Bikaner-334 006, Rajasthan, India

****Corresponding author email: hramdhanari@gmail.com***

Abstract

The integration of unmanned aerial vehicles (UAVs), commonly referred to as drones, has become a transformative advancement in precision horticulture, enabling site-specific crop monitoring and data-driven management strategies. Equipped with high-resolution RGB, multispectral, thermal, and hyperspectral sensors, drones facilitate rapid and accurate assessment of crop health, canopy vigor, nutrient status, water stress, pest and disease incidence, and yield potential with enhanced spatial and temporal resolution. In horticultural systems, drone-derived data support precision interventions such as variable-rate irrigation, targeted agrochemical application, optimized nutrient management, and canopy regulation, thereby improving resource-use efficiency while minimizing input costs and environmental impact. Furthermore, drones contribute significantly to orchard mapping, plant population analysis, phenotyping, and continuous monitoring of crop growth across developmental stages. The integration of drone imagery with geospatial analytics, machine learning algorithms, and decision-support systems further strengthens real-time decision-making and promotes sustainable production practices. Although challenges remain—including data processing complexity, regulatory limitations, and operational expenses—drone technology demonstrates substantial potential to enhance productivity, profitability, and environmental sustainability in precision horticulture.

Keywords: *Precision horticulture; Unmanned aerial vehicles (UAVs); Multispectral imaging; Variable-rate application; Crop monitoring; Remote sensing; Sustainable agriculture.*

Molecular Diversity and Phylogenetic Characterization of Chilli Germplasm for Improvement in Hot Arid Environments

Hanuman Ram*, D.K. Samadia and Chet Ram
ICAR-Central Institute for Arid Horticulture, Bikaner-334 006, Rajasthan, India
****Corresponding author email: hramdhanari@gmail.com***

Abstract

Assessment of genetic diversity in chilli (*Capsicum* spp.) is essential for identifying superior genotypes to strengthen crop improvement programs. The present study aimed to evaluate and characterize molecular variation among 45 chilli genotypes using Start Codon Targeted (SCoT) polymorphism markers. Among 18 primers screened, 10 exhibited clear polymorphism across the accessions, producing amplification products ranging from 280 bp to 2.0 kb. A total of 81 alleles were detected, with 5–10 alleles per primer and an average of 8.1 alleles per locus. Of these, 62 alleles (76.54%) were polymorphic. Genetic similarity coefficients ranged from 24.2% to 100%, with a mean similarity of 62.1%, indicating substantial genetic variability among the genotypes. Cluster analysis based on the UPGMA method using the Nei–Li similarity coefficient grouped the 45 genotypes into two major clusters, which was further supported by principal coordinate analysis (PCoA), where genotypes were distributed across four distinct quadrants. Analysis of molecular variance (AMOVA) revealed significant genetic differentiation ($p < 0.001$, 999 permutations), with greater variability observed among populations (55%) than within populations (45%). The mean Nei's gene diversity (h) was 0.2233, and the mean Shannon's Information Index (I) was 0.3470, with the highest values recorded for the SCoT7 marker. The pronounced genetic variation detected by SCoT markers demonstrates their effectiveness for molecular diversity assessment, genotype identification, and potential application in association studies. These findings provide valuable insights for the strategic utilization of diverse germplasm in chilli breeding programs.

Keywords: *Chilli (Capsicum spp.); Genetic diversity; SCoT markers; Molecular characterization; Phylogenetic analysis; AMOVA; Germplasm evaluation.*

In vitro screening of potential probiotic properties of *Lactiplantibacillus plantarum ZN06* isolated from traditional Rice Beer of southern Assam

Hanna Yumnam[1], Soumitra Nath[2], Indu Sharma[1*]
[1] Department of Microbiology, Assam University, Silchar, Assam, India, 788011
[2] Department of Biotechnology, Gurucharan University, Silchar, Assam, India, 788007
Corresponding author e-mail: drsharma7652@gmail.com

Abstract

This study reports the characterization, safety evaluation, and technological properties of strain ZN06, isolated from traditionally fermented rice beer of the Zeme Naga tribe in Southern Assam, Northeast India. Morphological and biochemical analysis identified the isolate as a Gram-positive, rod-shaped

lactic acid bacterium, and 16S rRNA gene sequencing confirmed it as *Lactiplantibacillus plantarum* (GenBank accession no. OR607374). ZN06 exhibited strong acid tolerance, with optical density (OD_{600}) values of 0.544 ± 0.047 at pH 7.2, 0.460 ± 0.038 at pH 3.0, and 0.434 ± 0.048 at pH 2.0, indicating minimal reduction under acidic stress. In simulated gastric juice (pH 3.0), the strain-maintained OD values of 1.321 ± 0.191 (control) and 1.201 ± 0.220 (treated). Bile tolerance assessment showed OD values of 0.772 ± 0.132 at 0.3% bile and sustained growth at 0.5% bile concentration. At a concentration of 0.5% pancreatin, ZN06 retained viability with an OD of 1.334 ± 0.319, compared to 2.188 ± 0.171 in control conditions. The strain demonstrated 51.3% and 41.1% cell surface hydrophobicity toward n-hexadecane and xylene, respectively, and 41.2 % auto-aggregation ability. ZN06 exhibited notable antagonistic activity against *Escherichia coli* (19.00 ± 1.73 mm), *Enterobacter bugandensis* (17.67 ± 1.53 mm), and *Bacillus cereus* (11.00 ± 1.00 mm). Safety evaluation confirmed the absence of hemolytic and DNase activities, and antibiotic profiling showed susceptibility to most clinically relevant antibiotics without alarming resistance traits. Technological assessment revealed the absence of proteolytic, lipolytic, and amylolytic activities. The findings highlight ZN06 as a safe and promising probiotic candidate. Future studies may focus on whole-genome sequencing, in vivo validation, functional metabolite analysis, and its incorporation into functional food formulations.

Keywords: *Zeme Naga tribe; Lactiplantibacillus plantarum ZN06; Rice beer; Probiotic properties; Safety evaluation*

Fecal metagenomic profiling identifies microbial biomarkers associated with breast and complementary feeding in tribal infants of Arunachal Pradesh, India

S. Bikram Singh[1], Kalimuthusamy Natarajaseenivasan[2], Sumit Aggarwal[3], Hanna Yumnam[1], Yashmin Choudhury[4] and Indu Sharma[1]

[1, 1*,] Department of Microbiology, Assam University, Silchar-788011, Assam, India
[2]Rowan-Virtua School of Osteopathic Medicine, United States.
[3]Scientist and Program Officer, Div. Of Epidemiology and Communicable Diseases, Indian Council of Medical Research, DHR, Ministry of Health and Family Welfare, Ansari Nagar, New Delhi
[4]Department of Biotechnology, Assam University, Silchar-788011, Assam, India
[5]PDF, IASST, Guwahati
Corresponding author e-mail: drsharma7652@gmail.com

Abstract

Early-life gut microbiota is strongly influenced by breastfeeding and complementary feeding, shaping immune and metabolic development. This prospective study investigated fecal microbiome signatures of infants (15 days–6 months) from three distinct tribal populations of Arunachal Pradesh, India-Adi, Nyshi, and Apatani to identify microbial biomarkers associated with early feeding practices. Thirty fecal samples (n=10 per tribe) were analyzed using culture-based methods, antibiotic susceptibility testing, biofilm assays, and 16S rRNA (V3–V4) metagenomic sequencing, followed by bioinformatic analysis. Culture-dependent analysis revealed a high prevalence of beneficial genera, including

Bifidobacterium and lactic acid bacteria, alongside opportunistic taxa such as *Escherichia*, *Staphylococcus,* and *Salmonella*. Antibiotic profiling demonstrated tribe-specific resistance patterns, highlighting the infant gut as a potential reservoir of antimicrobial resistance genes. Alpha diversity indices differed significantly among tribes ($p<0.05$), with the Apatani group exhibiting the highest diversity. Dominant phyla included *Firmicutes* and *Actinobacteria*, with differential enrichment of *Bifidobacterium longum*, *Bifidobacterium adolescentis*, *Veillonella dispar*, and *Lactobacillus mucosae* across groups. These findings reveal distinct early-life microbial signatures shaped by feeding practices and environmental exposure, identifying candidate biomarkers of healthy gut colonization in indigenous populations.

Keywords: *breastfeeding, complementary feeding, delivery mode, infant microbiome.*

Assessment of Nutritional Status among Patients with Chronic Kidney Disease in a tertiary hospital in Kamrup (M)

Jebin Sultana*, Dr. Priyanka Bhattacharyya and Dr. Dhrubajyoti Choudhury
*Department of Food Science and Nutrition, The Assam Royal Global University, Guwahati-781035,
Email: xebin22gmail.com

Abstract

Chronic kidney disease (CKD) is increasingly recognised as a major global public health challenge, representing a progressive loss of renal function and structural kidney damage lasting more than three months. The present study aims to evaluate the nutritional status of CKD patients using standardized assessment tools and investigate the correlation between nutritional status and clinical outcomes in CKD patients. This study was conducted among **80 chronic kidney disease (CKD) patients** attending Apollo Hospitals, Guwahati. Patients were assessed for disease profile, dietary intake, risk factors, functional status and quality of life using standardized tools, including the **Subjective Global Assessment (SGA).** Correlation analysis was performed to examine the association of clinical outcomes and malnutrition indices**.** The study revealed that the majority (56%) of the CKD patients were middle-aged, with a higher proportion (69%) of males, and 64% presented at moderate disease stages. Despite predominantly normal BMI, a considerable proportion (34%) showed moderate malnutrition by SGA, along with inadequate intake of energy, protein, and fats, indicating a significant risk of protein-energy wasting among the patients. Correlation analysis confirmed that SGA scores and BMI of the patients significantly ($p < 0.05$) associate with serum albumin and serum creatine levels. This study indicated that malnutrition during CKD is a serious concern, often leading to CKD progression as well as delays the treatment outcomes. Adaption of a personalised nutritional intervention at an early stage of the diseases is the need of the hour.

Keywords: *Chronic kidney disease, SGA, BMI, Malnutrition, Energy, Protein.*

Physiological Responses and Heat-Tolerance Indices Of Nattukuttai Heifers Under Different Rearing Systems

Kiruthika, K Usha. S*, Murugan, M and Ramesh, J
Department of Livestock Production Management
Madras Veterinary College, (TANUVAS), Chennai-600 007, India
Corresponding Author: Email: drushavet@gmail.com

Abstract

The present study evaluated the physiological responses and heat tolerance of Nattukuttai cattle heifers reared under three different management systems: T• (open yard grazing), T, (grazing with concentrate supplementation) and T*f* (grazing with mixed fodders). Physiological parameters including rectal temperature, respiratory rate, pulse rate and heart rate were recorded during morning and afternoon sessions, along with microclimatic variables to determine the heat load experienced by each system. Morning rectal temperature differed significantly (P<0.01), with T exhibiting higher values (38.20 ± 0.03°C) than T, (37.73 ± 0.08°C) and T*f* (37.78 ± 0.09°C); a similar highly significant trend persisted during afternoon hours. Respiratory rate, pulse rate and heart rate showed no significant variations between systems in both time periods, indicating stable cardiopulmonary responses across treatments. Microclimatic assessment revealed significantly higher morning and afternoon THI values in the open yard system (T• Group), reflecting a comparatively greater heat load. Correspondingly, heat tolerance indices demonstrated favourable adaptability across systems, with Iberia Heat Tolerance Test values of 97.10, 98.55 and 98.85; Gaala's Heat Tolerance Test values of 95.94, 97.97 and 98.39; and Benezra Coefficient of Adaptability values of 1.98, 2.01 and 2.00 for T• , T, and T*f* respectively. Dairy Search Index values also indicated good thermotolerance across treatments (1.06–1.14). Overall, despite microclimatic differences, Nattukuttai heifers maintained physiological stability and exhibited strong heat tolerance, with animals in T, and T*f* showing comparatively better adaptability under moderate heat stress conditions.

Keywords*: Nattukuttai heifers, physiological responses, heat tolerance indices, temperature–humidity index, rearing systems*

Elemental Profiling of *Zanthoxylum rhetsa* (Roxb) D.C Fuit Peicarp and its Significance in the Pharmaceutical Sector

K. Hanako Jamir*, T. Ajungla and K. Tsurho
Department of Botany, Nagaland University, Lumami-797004.India
Corresponding author e-mail: hanakojamir15@gmail.com

Abstract

Medicinal and aromatic plants (MAPs) play a crucial role in the pharmaceutical sector as sources of bioactive compounds, nutraceutical ingredients, and essential mineral elements. Scientific validation of traditionally used medicinal plants is important to strengthen their relevance in modern drug

development. *Zanthoxylum rhetsa* (Rutaceae), a medicinal and aromatic plant widely used in the traditional healthcare practices of North-East India, is known for its therapeutic and aromatic properties, particularly its fruit pericarp. The present study evaluates the pharmaceutical relevance of *Zanthoxylum rhetsa* through elemental profiling of its fruit pericarp. Elemental analysis of the powdered fruit pericarp sample revealed the presence of essential macro- and micro-elements. Potassium (50.913 ppm) was recorded as the dominant element, followed by magnesium (21.022 ppm) and calcium (20.856 ppm). Trace elements such as manganese (6.608 ppm), iron (1.002 ppm), zinc (0.116 ppm), and copper (0.044 ppm) were also detected. The presence of these essential elements supports the traditional medicinal use of *Zanthoxylum rhetsa* and highlights the potential role of its fruit pericarp in metabolic regulation, antioxidant defence, and enzymatic activities. The findings suggest that *Zanthoxylum rhetsa* fruit pericarp may serve as a valuable natural resource for pharmaceutical and nutraceutical applications. This study emphasizes the importance of sustainable utilization and scientific validation of medicinal and aromatic plants from biodiversity-rich regions such as North-East India.

Keywords: *Medicinal and aromatic plants; Zanthoxylum rhetsa; fruit pericarp; elemental analysis; pharmaceutical sector; nutraceutical potential*

Effect of *Allium tuberosum* leaf powder addition on the bioactive profile of pasta

Kalyani Gorrepati[1]*, Shubhangi Gunjkar[1], Vaibhav Jadhav[1], Kunal Dube[1], Yogesh Khade[1], Hem Raj Bhandari[1], Bhushan Bibwe[1], Manjit Khatal[1], Vijay Mahajan[1]

[1]ICAR-Directorate of Onion and Garlic Research, Pune, Maharashtra, India

[*]***Corresponding author: kalyanigorrepati@gmail.com***

Abstract

Traditional pasta is mainly carbohydrate rich and low in bioactive compounds like phenols, flavonoids and antioxidants. With rising awareness of diet related health issues and growing demand for functional foods, improving the nutritional quality of pasta without affecting its acceptability has become increasingly important. In this study, pasta samples were prepared by incorporating *Allium tuberosum* leaf powder in to semolina at different levels ((0%, 2%, 4%, 6%, 8%, and 10%), with the 0% formulation serving as the control sample. A significant increase in the phenol content, flavonoid content and antioxidant activity was observed with the incorporation of *Allium tuberosum* leaf powder. The total phenol content of the control sample was 134.50 mg GAE/100g and increased progressively from 137.17 to 292.33 mg GAE/100g as the level of *Allium tuberosum* leaf powder increased from 2% to 10%. Similarly, the flavonoid content and antioxidant activity were lowest in the control sample (40.62 µg QE/100g and 140.00 mmol/100g respectively) and reached their highest values in the pasta fortified with 10% *Allium tuberosum* leaf powder (48.55 µg QE/100g and 3048.89 mmol/100g respectively). Overall, the results demonstrated that fortification with *Allium tuberosum* leaf powder significantly enhances the bioactive profile of pasta in a concentration dependent manner.

Keywords: *Pasta, Allium tuberosum, Functional, Leaf, Powder*

Critical Evaluation of Seed Validity Periods Using Planting Value as a Quality Indicator in paddy (*Oryza sativa* L.) seed lots

Kalyani Kumari, Kalyanrao, Banoth Vinesh, Sripathy K.V. and Uday Bhaskar K.
ICAR-National Institute of Seed Science & Technology, Mau (U.P.)
Corresponding author E mail Id: kalyani.kumari7@gmail.com

Abstract

A storage study was conducted to evaluate the planting value and storability of seed lots of four paddy varieties, viz., Ponni , ADT (R) 46 , Pusa-44, and PB-1121 stored under ambient conditions in two packaging materials-gunny bags and high-density polyethylene (HDPE) bags. Seed quality parameters were assessed at bimonthly intervals until germination percentage declined to 5% below the Indian Minimum Seed Certification Standards (IMSCS). Moisture content and germination tests were carried out following ISTA standard procedures. Seed vigour was quantified using Vigour Index I (germination percentage × seedling length) and Vigour Index II (germination percentage × seedling dry weight). Results indicated a progressive decline in germination, vigour indices, and overall seed quality with advancement of the storage period across all varieties. Seed moisture content exhibited significant variation between the two storage containers, with greater fluctuations observed in gunny bags. Seeds stored in HDPE bags consistently maintained lower and more stable moisture content, resulting in superior germination and vigour irrespective of the variety. The germination percentage fell 5% below IMSCS after 11 months of storage in Ponni under HDPE conditions, while ADT (R) 46 and PB-1121 maintained acceptable germination for up to 13 months in HDPE bags. In contrast, Pusa-44 retained viability up to 15 months under both storage conditions. Based on these findings, extension of the prescribed viability period for certain paddy varieties, particularly when stored in HDPE bags under ambient conditions, may be suggested.

Breeding Climate-Resilient Shrimp: Development and Performance evaluation of Hypoxia-Tolerant Line of *Penaeus vannamei* for Sustainable Intensification

Karthik R[1*], Tanushri Ghorai[1], Philominal Pathinathan[2]
[1]College of Fisheries, Dr. Rajendra Prasad Central Agricultural University, Dholi, Muzaffarpur, Bihar
[2]Directorate of Incubation and Vocational Training in Aquaculture, Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Tamil Nadu
Corresponding author Email: karthikmfsc@gmail.com

Abstract

Intensive shrimp culture systems are designed to sustain and maximize productivity at high stocking densities in circular tanks (kg m{ ³) and/or outdoor earthen ponds (kg m{ ²). Considering hypoxia resilience as a primary selection criterion in the genetic improvement program through selective breeding, and its incorporation in the Pacific white shrimp, *Penaeus vannamei* culture system could potentially reduce mechanical aeration dependency, improve survival under environmental stress, and represents a

strategic advancement towards climate-resilient aquaculture. Elucidating the HIF-1á (Hypoxia-Inducible Factor) signalling pathway is critical for enhancing adaptive resilience, as it functions as a master regulator of cellular oxygen homeostasis, modulating genes involved in anaerobic metabolism, energy reallocation, and oxidative stress mitigation. For this study, subject the broodstock representing multiple families to standardized acute (96 h) or chronic (30–60 d) hypoxia challenge tests under controlled low dissolved oxygen (DO) concentrations (2 to 3 mg L{ ¹). Select families demonstrating superior survival, feed conversion efficiency and post-hypoxic recovery, estimate based on breeding values, and advance across 8–10 successive generations to achieve sustained cumulative genetic gain and develop a genetically stable, commercially viable elite hypoxia-tolerant line of *Penaeus vannamei*. Analyse for expression of HIF-1á and target genes associated with glycolysis, lactate dehydrogenase (LDH) activity, antioxidant enzymes (superoxide dismutase and catalase) for hypoxia-tolerant line. Integrating hypoxia tolerance as a core trait in genetic improvement programme of *Penaeus vannamei* supports sustainable intensification by lowering aeration energy requirements, enhancing climate adaptability, and improving production stability in high-density aquaculture systems.

Keywords: *Hypoxia, Selective breeding, Penaeus vannamei, HIF-1á pathway, Stress physiology and Hypoxia tolerant Genetic line*

Valorization of Clitoria ternatea L. as a Sustainable Natural Antioxidant for Functional Food Development and Nutritional Health Security

Kritika Lodha[1], Dr. Ragini Ranawat[2]
[1,2] Department of Home Science, University of Rajasthan, Jaipur- 302007, Rajasthan, India
Corresponding author e-mail: kritikalodha39@gmail.com

Abstract

The rising prevalence of metabolic disorders such as diabetes, obesity, and cardiovascular diseases has been strongly associated with increased oxidative stress and inadequate antioxidant intake. While exotic antioxidant-rich foods such as blueberries and acai berries are widely promoted, their limited accessibility and high cost restrict their widespread use in developing countries. This study explores the potential of *Clitoria ternatea* L. (blue pea flower), an indigenous and sustainable plant source, as an affordable natural antioxidant and its application in functional food development. Blue pea flowers were procured, cleaned, oven-dried, and processed to obtain an aqueous concentrate using a standardized extraction protocol. The antioxidant activity of the concentrate was evaluated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. The results demonstrated significant free radical scavenging activity, confirming the strong antioxidant potential of the flower due to its rich anthocyanin and flavonoid content. To translate laboratory findings into practical applications, fifteen value-added food products including bakery items, beverages, and dairy-based formulations were developed using blue pea flower concentrate. The products were standardized and evaluated for sensory attributes using a nine-point hedonic scale with a semi-trained panel. Most formulations demonstrated high overall

acceptability, indicating strong consumer feasibility. Preliminary shelf-life and quality assessments showed satisfactory stability under controlled storage conditions.

The findings highlight the potential of blue pea flower as a sustainable, cost-effective, and functional food ingredient that can contribute to improved nutritional health security. The integration of indigenous antioxidant-rich resources into commonly consumed foods may offer a promising strategy to combat oxidative stress-related metabolic disorders while promoting sustainable food innovation.

Keywords: *Clitoria ternatea L., antioxidants, DPPH assay, anthocyanins, functional foods, health security*

Effect of different organic sources on growth, yield and economics of kodo millet (*paspalum scrobiculatum* L.)

***Kurkutiya S. R., Raval C. H., Patel H. K. And Chavda Krishna**
Department Of Agronomy, B. A. College Of Agriculture,
Anand Agricultural University, Anand 388110
****Corresponding Author e-mail. shivanikurkutiya@gmail.com***

Abstract

A field experiment was carried out during *kharif* season of 2023 at College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand to study the effect of different organic sources on growth and yield of kodo millet under organic condition. The soil at the trial location was loamy sand in texture, low in organic carbon and available nitrogen, medium in available phosphorus and potassium. The experiment was conducted in Randomized Block Design with 3 replication and 10 treatments. According to conducted experiment results, Seed treatment of Bio NPK consortium (5 ml/kg) + application of 75 % nitrogen through castor cake *fb* Bio NPK consortium as soil application (1 L/ha) at 30 and 45 DAS, recorded significantly higher plant height at 60 DAS (92.26 cm) and at harvest (94.45 cm), no of effective tillers per meter row length (58.40) and panicle length (10.66 cm). Among the different organic sources treatments, Seed treatment of Bio NPK consortium @ 5 ml/kg + 75% N through castor cake *fb* soil drenching of Bio NPK consortium 1.0 L/ha at 30 and 45 DAS] recorded significantly higher grain yield (2799 kg/ha) and straw yield (7457 kg/ha) over rest of the treatments. Non-significant response of different treatments on plant population, test weight and harvest index. The protein content of kodo millet grain (8.34%), iron content in grain (92.85 mg kg{ ¹), and zinc content in straw (26.59 mg kg{ ¹) were recorded significantly higher with the treatment involving seed treatment with Bio NPK consortium (5 ml kg{ ¹ seed) combined with the application of 75% nitrogen through castor cake followed by soil application of Bio NPK consortium (1.0 L ha{ ¹) at 30 and 45 DAS. In contrast, the highest zinc content in grain (22.75 mg kg{ ¹) was observed under the treatment receiving 75% nitrogen through castor cake followed by soil drenching of Bio NPK consortium (1.0 L ha{ ¹) at 30 and 45 DAS.

Keywords: *Kodo millet, Bio NPK consortium, FYM, Vermicompost, Castor cake, Neem cake*

Deep Learning-Based Cattle Breed Identification Using Mobile Net V2 in Precision Agriculture

Madhu[*1], Sapna Nigam[1], Akshay Dheeraj[1], Shashi Dahiya[1]
[1]ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi
Corresponding author: madhu.iasri@icar.org.in

Abstract

Accurate identification of cattle breeds is fundamental to efficient livestock management and precision agriculture. Manual breed identification methods are often time-consuming and subjective, which underscores the necessity for automated and reliable alternatives. Commonly used identification techniques, including ear tags and wearable sensors, may compromise animal welfare and often produce inconsistent results in real-world farm settings. In this study, a deep learning–based cattle breed identification system utilizing the MobileNetV2 architecture is proposed and evaluated. The system was tested on five cattle breeds: Ayrshire, Brown Swiss, Holstein Friesian, Jersey, and Red Dane. The dataset consisted of approximately 1,200 images, with around 200 images per breed, and was divided into training, validation, and testing subsets. The proposed model achieved a maximum validation accuracy of 99.50%, a training accuracy of 98.58%, and a testing accuracy of 80.96%. Model performance was further assessed using precision, recall, and F1-score, yielding values of 81.34%, 80.74%, and 80.90%, respectively. These results demonstrate that the MobileNetV2-based model can effectively learn discriminative features for cattle breed identification while maintaining a lightweight and computationally efficient architecture. Although the testing accuracy is lower than the training and validation performance, the model exhibits satisfactory generalization under real-world conditions, making it suitable for deployment in resource-constrained and mobile farming environments. The proposed approach offers a practical, non-invasive, and animal-friendly solution for automated cattle breed identification and supports precision livestock management and decision-making in modern dairy farming. Future research will focus on dataset expansion, enhancement of test-set generalization, and real-time deployment in farm environments.

Keywords*: Cattle breed, Deep Learning, Livestock, Precision agriculture, Smart agriculture.*

Nanobubble Irrigation: A Synergistic Approach to Crop Yield, Water Efficiency, and Soil Health

Meghna Sarkar[1*]
[1]Department of Soil Science, Assam Agricultural University, Jorhat-785013, Assam, India
****Corresponding author e-mail: meghna.sarkar.adj22@aau.ac.in***

Abstract

The escalating global population, compounded by the persistent challenges posed by climate change and the depletion of natural resources, has intensified the need to revolutionize agricultural practices toward greater sustainability. In response to mounting concerns over food security and sustainability, as well as the imperative to enhance crop productivity, nanobubbles (NBs) have emerged as a promising

innovation in agricultural research, offering potential benefits for sustainable crop production. Nanobubbles are defined as ultrafine bubbles with diameters typically between 50 and 200 nm, and less than 1000 nm overall. They exhibit longer lifespans in aqueous environments, promoting gas dissolution and oxidation through the formation of hydroxyl radicals upon collapse. In fruiting vegetables like tomato and cucumber, NB-based irrigation significantly enhanced yield, irrigation water use efficiency, and fruit quality parameters such as vitamin C and soluble sugar content. In optimal treatment scenarios, tomato yields increased by 16.9%, with notable improvements in water use. Cucumber crops showed even greater yield improvements (22.1%), along with gains in water efficiency (22.1%) and fruit quality. The rice field experiment showed significant increase in rice yield with NB treatment, potentially saving 25% of the fertilizer. The application has increased the total C, organic matter, available nitrogen, and available potassium in soil. Cross-sectional and longitudinal soil profiles reveal that nanobubble-treated soils exhibit finer pore structures compared to control treatments. X-ray microtomography results confirmed a 355.1% increase in pore connectivity and a 43.1% increase in total porosity. Crucially, nanobubble technology shows potential for enhanced nutrient utilization, higher microbial diversity, combined with soil remediation strategies that allow plants to achieve comparable yields with significantly less fertilizer dependency, offering environmental and economic benefits for sustainable agriculture.

Keywords: *Nanobubble, Water use efficiency, Crop yield, Soil health, Climate change*

Standardisation of spacing and time of planting for commercial production of *Centella asiatica* (L.)

Meinam Chanchan, Longkoi, Ak. Bijaya Devi and Ng. Piloo

[1]Department of Horticulture, College of Agriculture, Iroisemba, Central Agricultural University, Imphal

****Corresponding Author Email: chancham.meinam17@gmail.com***

Abstract

Centella asiatica (L.) (Indian Pennywort), a high-value medicinal herb with increasing global demand in the pharmaceutical and nutraceutical industries, faces commercialization challenges due to over-reliance on wild collection and the absence of standardized cultivation protocols. This study addresses key technological gaps by developing science-based cultivation guidelines specifically tailored to the agro-climatic conditions of Northeast India, offering significant opportunities for startups and agripreneurs. A factorial randomized block design experiment was conducted at College of Agriculture, Central Agricultural University (CAU), Imphal, in 2024, evaluating three plant spacing (30×30 cm, 30×45 cm, 45×45 cm) and four planting times (28 February, 15 March, 31 March, 15 April). Results showed that optimal spacing and planting time significantly affected both yield and economic returns. The treatment combination of 30×30 cm spacing with 15 March planting (S1P2) produced the highest yield of 9,642.99 kg/ha, with superior economic performance, a net return of Rs.1,215,808/ha and a benefit-cost ratio of 3.72 respectively. This innovation ready technology enables smallholder farmers

and agristartups to shift from subsistence to commercial medicinal herb production. The economic viability demonstrated through cost-benefit analysis provides a strong foundation for entrepreneurial ventures, contract farming models, and FPO led cultivation initiatives. Quality parameters, including antioxidant activity (88.77%), total phenols (1686.94 mg GAE/100g), and flavonoids (552.73 mg QE/ 100g) meet pharmaceutical industry standards, establishing market linkage potential. The research delivers actionable intelligence for agripreneurs, replicable cultivation protocols, economic feasibility data, and quality benchmarks. This positions *Centella asiatica* cultivation as a viable agribusiness model for the Northeast region, supporting biodiversity conservation while creating income opportunities.

Keywords: *Centella asiatica, commercial cultivation, agripreneurs, medicinal herbs, commercialization, Northeast India*

Comparative investigation on adult longevity and morphmetric traits of diversified voltine of the silkworm, *Bom*b*yx mori*. L

Mohammad Jawad Ahamed, Rakshitha B D and T.S Jagadeesh Kumar.*
Department of Studies in Sericulture Science, Manasagangothri
University of Mysore, Mysuru, Karnataka 570005
Corresponding author: mohammedjawadahamed@gmail.com

Abstract

The investigation was undertaken to assess the expression of adult lifespan and morphometric traits among selected voltine different groups of the silkworm (*Bombyx mori* L.), on the influence of type of sex and mating duration. Five silkworm breeds namely, Pure Mysore, FC1, FC2, PM×CSR2, and FC1×FC2 were domesticated under standard environmental and managerial conditions. The objectives of study to measure the longevity of adult virgin male and female silk moths,to assess the longevity of adult mated male and female silk moths and to record important morphometric traits of adult silk moths. Adult longevity was recorded after moth emergence until natural death under both virgin and mated conditions. Morphometric traits such as body length and width were measured using standard morphometric procedures. The data were generated were subjected to appropriate statistical analyses.The results indicated significant differences in adult lifespan between virgin and mated moths with virgin moths generally exhibiting longer longevity, suggesting the physiological cost associated with mating and reproduction. Female moths showed comparatively longer lifespan than male moths among the breeds. Considerable variation was also observed among the silkworm strains with respect to adult longevity, highlighting the influence of genetic background on lifespan traits. Significant inter-strain differences were recorded for morphometric characters, reflecting variability in adult body size and structural features. Certain breeds exhibited superior morphometric performance may be associated with better reproductive efficiency.The findings emphasized the importance of simultaneous evaluation of adult lifespan and morphometric attributes for effective silkworm breeds characterization and selection procedure . This information supports breeding aimed at improving productivity, adaptability and long term sustainability under diversified rearing conditions.

Keywords: *Silkworm breeds, Adult longevity, Morphometric traits, Silkworm breeds*

Chemical Characterization, Antimicrobial and Antiaflatoxigenic Efficacy of *Tithonia diversifolia (Hemsl.) A.Gray* Essential Oil (TDEO) Against Selected Bacteria and Fungi

Chaithra H.K and Mohana D.C*
Department of Microbiology, Biotechnology and Food Technology, Bangalore University,
Jnana Bharathi, Bengaluru - 560 056, India.
Corresponding author e-mail: mohanadc@gmail.com

Abstract

The present investigation aimed to characterize the phytochemical constituents of TDEO and evaluate its antibacterial, antifungal, antiaflatoxigenic and ergosterol inhibition activities against selected bacteria and storage fungi. The GC–MS analysis confirms the presence of 27 compounds, among which trans-ocimene (24.58%), D-limonene (22.89%) and á-pinene (20.65%) where identified as the major components, primarily belonging to monoterpene and sesquiterpene classes. The antibacterial activity of TDEO was assessed by disc diffusion method against *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Streptococcus faecalis*, *Salmonella typhimurium* and *Staphylococcus aureus*, the obtained results revealed that TDEO shows significant antibacterial activity with zone of inhibition ranging from 10.5 to 15 mm at 20 µL/disc and MIC values ranged between 2.5 and 10 µL mL{ [1]. The highest activity was observed against *S. faecalis*, whereas *P. aeruginosa* showed the least activity. Antifungal efficacy of TDEO was determined using the poisoned food technique, and the results demonstrated significant mycelial growth inhibition against *Aspergillus flavus, Aspergillus niger, Fusarium oxysporum, Fusarium verticillioides, Penicillium chrysogenum, and Nigrospora* sp. at 4 µL mL{ ¹ with MIC values ranging from 2.5 to 20 µL mL{ ¹. The antiaflatoxigenic potential of TDEO against toxigenic strain of *A. flavus* and the result revealed a significant reduction in aflatoxin B (AFB) production at 2 µL mL{ ¹. In addition, ergosterol biosynthesis also drastically decreased from 43.67 mg g{ ¹(control) to 0.787 mg g{ ¹ at 2 µL mL{ ¹ treatment of TDEO. Overall, TDEO exhibited broad-spectrum antimicrobial and potent antiaflatoxigenic activities, highlighting its potential application as a natural preservative for storage of agricultural commodities.

Keywords: *Tithonia diversifolia, Essential oil, GCMS analysis, Antimicrobial activity, Antiaflatoxigenic efficacy, Food storage*

Structure and Ligand Based Design, Synthesis and Biological Evaluation of Dual Inhibitors of Select Kinase Targets

Mrs. Suvarna N. Vakare* and Dr. Rajesh B. Patil
Department of Pharmaceutical Chemistry, STES's Sinhgad College of Pharmacy, Vadgaon
BK. Pune- 411041, India
vakare.suvarna@gmail.com

Abstract

Cyclin-dependent kinase 4/6 (CDK4/6) inhibitors and FMS-like tyrosine kinase-3 (FLT3) have been proven to play a significant role in tumour therapy. The present study aimed to generate 2D QSAR model to predict the CDK4/6 and FLT3 activity. A dataset of molecules with affinity for both the CDK4/6 and FLT3 was taken from the literature. The genetic algorithm based multiple linear regression (GA- MLR) approach was used to generate highly predictive models using Padel descriptors available in QSARINs program. The 2D-QSAR models were developed and validated using internal and external validation criteria R2: 0.8152 and Q2loo: 0.7136 for CDK4 inhibitory activity and R2: 0.8388 and Q2loo: 0.7175 for FLT3 inhibitory activity, with good external predictivity. The most active compound 23K (Potent dual acting FLT3 and CDK4 inhibitors) was taken further for the shape and multi-feature based (Lipinski's rule, TPSA, and LogP) virtual screening of Zinc database.The CDK4 and FLT3 inhibitory activity was predicted for filtered zinc compounds by using developed 2D QSAR models. Hit selection against FLT3 and CDK4 was finally achieved. Further, the comparative binding affinity assessment, against CDK4 and FLT3 targets, for the dataset compounds and selected hits from the ZINC database, was obtained from the molecular docking studies. Binding energies and protein–ligand interactions were analysed. Top six hit compounds each for CDK4 and FLT3, identified through molecular docking, were selected for molecular dynamics (MD) simulations, where 100 ns MD simulations employing Gromacs 2020.4 was performed. The results of the QSAR studies, molecular docking insights and binding affinity evaluations and stability of respective CDK4, FLT3 complexes will be presented. The synthesis of identified hit molecules belonging to 1,2,5 trisubstituted 1,3,4-triazoles is currently in progress and will be appropriately showcased.

Keywords*: CDK4/6-FLT3 dual inhibitors, 2D QSAR, virtually screening, molecular docking*

A Biotechnological Approach for the Detection of Mycotoxigenic Fungi in Food and Feed Grains

Ms. Snigdha Chetia
Research Scholar, Dept. of Food Engineering and Technology, Tezpur University, Napaam, Tezpur, Assam, India

Abstract

Mycotoxigenic fungi, which encompass species from genera like *Aspergillus*, *Fusarium*, and *Penicillium* produce secondary metabolites such as mycotoxins that can contaminate various crops, leading to severe economic losses and posing health risks to both humans and animals. Detecting the presence of mycotoxigenic fungi and monitoring the levels of mycotoxins in food products helps ensure food safety and prevent health risks. Early and rapid coupled with ability to simultaneously detect several contaminants at a single point of time can be an effective management strategy. Towards this end, the present work was undertaken to develop a rapid molecular technique for simultaneous detection. A variety of corn and paddy samples were collected from different households and store houses located in

and around Jorhat. Different protocols were tested for the extraction of genomic DNA from the samples viz., The CTAB method, SDS method and Qiagen Kit method. Although, both the SDS and kit extraction methods yielded good quality genomic DNA with an A_{260}/A_{280} ration of 1.80 and 1.76 respectively. The SDS method was used for subsequent work being cheaper. Five species-specific primers viz., *Aspergillus flavus* (PepO), *Aspergillus parasiticus* (PAR), *Aspergillus carbonaerum* (CARBO), *Fusarium proliferatum* (PRO) and *Fusarium verticilliodes* (VER) were designed from distinct genomic regions from the three mycotoxigenic fungi along with the gene-specific primers viz., aflR, omtA, nor-1, otaB, fum13, and pks13 coding for toxins like AflatoxinB1, Fumonisin, Ochratoxin, and Zealerenone respectively and validated for their accuracy through a simplex PCR. Following their validations, the primer sets were taken in combination of 2 and 3 sets for multiplex PCR amplification. The primers *A. flavus* (PepO) and *A. parasiticus* (PAR); *F. proliferatum* (PRO) and *F. verticilliodes* (VER); AflatoxinB1(aflR) and AflatoxinB2(nor1); AflatoxinB1(omtA) and Ochratoxin (otaB); Fumonisin (fum13) and Zearelenone (ZEA13) were optimized and tested to identify the presence of fungus as well as the toxin-producing gene in them. Multiplex PCR is a valuable, quick approach for identifying several species and their toxin producing genes in corn, assisting in the creation of pathogen-free corn and paddy for rapid diagnostic and certification programs.

Inheritance of Specific Leaf Area, Specific Leaf Weight, and Kernel Yield and the Potential of Specific Leaf Weight as a Selection Trait in Maize (*Zea mays* L.)

N Sabitha *, D. Mohan Reddi and P. Sudhakar
Department of Genetics and Plant Breeding,
Acharya N.G. Ranga Agricultural University,
S.V. Agricultural College, Tirupati 517502, Andhra Pradesh, India
Email id: nsabitha84@gmail.com

Abstract

This study evaluated 45 single cross hybrids from ten inbred lines over three seasons from 2016-17 for SLA, SLW and kernel yield with a hypothesis whether SLW can be used as parameter in the selection of high yielding inbred lines and hybrids and to characterise the nature of gene action governing these traits. An inverse relationship between SLA and SLW was noted between SLA and SLW among inbred lines and hybrids.in general inbred lines/ hybrids with moderate values of SLW were found to be the high kernel yielders. Combining ability indicated that both additive and non-additive gene actions were associated with SLA, SLW and kernel yield but non-additive effects playing an important role. Top-performing hybrids hybrids such as Heypool x PDM 1474, DFT Y x Heypool, BML7 x DFTY, BML 15 x PDM 1474 and BML 6 x PDM 1474 showed significant sca effects for kernel yield but moderate sca effects for SLA and SLW. The inbred lines DFTY, Heypool and PDM 1452 and PDM 1474 with medium SLA and SLW have recorded higher kernel yield suggesting medium SLW is associated with higher kernel yield in maize. Inbred lines with medium SLA and SLW registered higher kernel yielded. Therefore, medium leaf is, and weight would be useful for higher kernel yields in maize. Hybrids such as BML 15 x PDM 1474 and BML 7 x DFTY with high per se performance and significant sca effects may be

exploited for hybrid vigour. High-performing hybrids and non-significant sca effects may be utilized for pedigree breeding or population improvement to develop superior parental lines and hybrids.

Keywords*: Maize; Specific leaf area, Specific leaf weight, combining ability analysis.*

Artificial Intelligence and Computer-Aided Design in the Design and Development of Farm Machinery: A Comprehensive Review

N. Devarani[1]*, S. S. Das[1]

[1]Department of Farm Machinery and Power Engineering, College of Agricultural Engineering and Post Harvest Technology (Central Agricultural University Imphal) Ranipool, Sikkim 737135, India

Corresponding author e-mail: dev.ngangkham@gmail.com

Abstract

The rapid transformation of agriculture toward precision, automation, and sustainability has intensified the demand for advanced design methodologies in farm machinery. Artificial Intelligence (AI) and Computer-Aided Design (CAD) have emerged as powerful tools that significantly enhance the design, development, optimization, and performance evaluation of agricultural machines. AI enables intelligent decision-making, predictive analysis, and automation, while CAD provides precise geometric modeling, simulation, and visualization. The integration of AI with CAD tools allows designers to develop efficient, reliable, and customized farm machinery with reduced development time and cost. This review paper presents a comprehensive overview of AI and CAD applications in the design and development of farm machines, discussing methodologies, benefits, challenges, and future research directions.

Keywords: *Artificial Intelligence, CAD, Farm Machinery, Agricultural Engineering, Machine Design, Precision Agriculture*

IoT, AI and ML Driven Approaches for Precision Soil and Water Management: Advances, Challenges and Future Prospects

N. Subhasree[1*] B. Hasini[2*], Vandhana S[2] and B.Krishna Rao[1]

[1]ICAR-Indian Institute of Soil and Water Conservation, Research Centre, Ballari, 583101, Karnataka

[2]Department of Computer Science and Engineering, Amrita School of Computing, 64112, Coimbatore, Amrita Vishwa Vidyapeetham, Tamil Nadu

Corresponding author: subhaiiswc@gmail.com; hasinibattu1@gmail.com

Abstract

Efficient management of soil and water resources is essential for enhancing resource-use efficiency, maintaining soil health and ensuring sustainable agricultural productivity under increasing environmental and resource constraints. Conventional management practices often ignore field variability and result in inefficient water use, nutrient losses and environmental degradation, highlighting the urgent need for data-driven and site-specific solutions. In this context, the integration of the Internet of Things (IoT),

Artificial Intelligence (AI) and Machine Learning (ML) is transforming precision agriculture by enabling real-time monitoring, predictive analytics and automated decision-making. This review presents a comprehensive overview of recent advances, applications, challenges and future prospects for IoT, AI and machine learning-driven approaches for precision soil and water management. IoT-based systems use integrated sensors to monitor soil moisture, nutrient status and environmental conditions in real time, while machine learning algorithms analyze the data to optimize irrigation and fertilizer application. Despite these technological advances, economic constraints, data reliability issues, infrastructure gaps and limited farmer awareness continue to obstruct the large-scale adoption. The review also highlights the pathways to overcome these barriers through affordable technologies, improved connectivity, capacity building, policy support, data interoperability, user-friendly tools, collaboration and sustainable practices. Overall, IoT, AI and ML-driven approaches hold significant promise for improving soil and water management, enhancing climate resilience and promoting sustainable agricultural systems.

Keywords: *Artificial Intelligence, Internet of Things, Machine Learning, Precision Agriculture*

Effect of iron and zinc on yield and quality of sorghum

***Pal A.D., Patel H.K., Raval C.H. and Chavda Krishna**

Department of Agronomy, B. A. College of Agriculture, Anand Agricultural University, Anand 388110

****Corresponding author e-mail: anjalipal1803@gmail.com***

Abstract

A field experiment was conducted during the summer season of 2024 at Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat to study the effect of iron and zinc on yield and quality of sorghum. The experimental soil was loamy sand in texture, slightly alkaline in reaction, low in organic carbon, available nitrogen and zinc content, while available phosphorus and potassium were in the medium range. The experiment comprised ten treatments laid out in a RBD with three replications. Results of the experiment revealed that the combined application of 25 kg $ZnSO_4$/ha and 50 kg $FeSO_4$/ha as soil application along with foliar application of 0.5% $ZnSO_4$ at 30 and 45 days after sowing significantly enhanced grain yield (3722 kg/ha), protein content (11.87 %), zinc content (31.79 and 23.17 mg/kg) and uptake (118.16 and 295.38 g/ha) in grain and straw, respectively. The same treatment increased the yield by 22.35% over the control (only RDF). However, treatment 20 kg $ZnSO_4$/ha+ 40 kg $FeSO_4$/ha + 0.5% $ZnSO_4$/ha foliar application at 30 and 45 DAS produced the maximum straw yield (12931 kg/ha) and zinc use efficiency (144.29 kg grain/kg Zn).

Keywords: *Zinc, Micronutrient, Soil application, Foliar application, Sorghum*

Micronutrient Strategies to Boost Fodder Maize Performance

Patel H.K.* and Litoriya N.S.
Main Forage Research Station, Anand Agricultural University, Anand 388110 (Gujarat)
Correspondence: hiren@aau.in

Abstract

The field experiment was conducted for two consecutive years during the *kharif* seasons of 2021 and 2022 at Main Forage Research Station, Anand Agricultural University, Anand (Gujarat) to study the effect of zinc and iron on green yield and quality of fodder maize in Gujarat. **T_1**: 0 kg $ZnSo_4$/ha (control), **T_2:** 10 kg $ZnSo_4$/ha as basal + 1% $ZnSo_4$ foliar spray at 45 DAS, **T_3:** 10 kg $FeSo_4$/ha as basal + 0.5% $FeSo_4$ foliar spray at 45 DAS, **T_4:** 10 kg $ZnSo_4$ +10 kg $FeSo_4$/ha as basal + 1% $ZnSo_4$ + 0.5% $FeSo_4$ foliar spray at 45 DAS, T_5: 20 kg $ZnSo_4$/ha as basal +1% $ZnSo_4$ foliar spray at 45 DAS, **T_6:** 20 kg $FeSo_4$/ha as basal + 0.5% $FeSo_4$ foliar spray at 45 DAS and **T_7:** 20 kg $ZnSo_4$ +20 kg $FeSo_4$/ha as basal + 1% $ZnSo_4$ + 0.5% $FeSo_4$ foliar spray at 45 DAS. Recommended dose of fertilizer (80-40-0 NPK) to fodder maize crop was applied commonly. The experiment was laid out in Randomized Block Desing with three replications. Pooled data result revealed that application of 20 kg $ZnSo_4$ and $FeSo_4$/ha as basal + 1% $ZnSo_4$ + 0.5% $FeSo_4$ foliar spray at 45 DAS treatment reported significantly the highest green fodder yield (407 q/ha), it was 8.24 and 33.0 % higher over treatment T_4 and T_1, respectively. Increase in yield was due to improved availability of micronutrients (Zn and Fe) which could be attributed to the formation of stable organometallic complexed of micronutrients with organic matter, especially during the enrichment process to last for a longer time and release the nutrients slowly in the soil system in such a way that the nutrients are protected from fixation and made available to the plant root system throughout the crop growth. Date expressed in Table 1 indicated that higher dry matter yield (82.95 q/ha) was reported in treatment T_7 (20 kg $ZnSo_4$ +20 kg $FeSo_4$/ha as basal + 1% $ZnSo_4$ + 0.5% $FeSo_4$ foliar spray at 45 DAS). Biofortification of Fe and Zn improved the yield and increased in yield might be due to their crucial role in photosynthesis, respiration, biological and physiological activities. Response of different treatment on dry matter content, crude protein content, crude protein yield and neutral detergent fibre were found non-significant.

Keywords: *Biofortification, Fodder maize, green fodder yield, crude protein yield, dry matter yield and acid detergent fibre*

Maintaince of Germplasm and Evaluation of Phenotypic Charaters Diversity Among the Thirty Selected Multivoltine Silkworm Breeds

Prakruthi CS [1], N Chandrakanth[1], TS Jagadeesh Kumar[2], P Deepa[1]
[1]Central Sericultural Research and Training Institute, Mysuru-570008, Karnataka, India
[2]Department of Studies in Sericulture Science, Manasagangothri University of Mysore, Mysuru-570005, Karnataka
****Corresponding author: prakruthics103@gmail.com***

Abstract

The selection of silkworm parents with higher diversity is a crucial step in silkworm breeding. In India, more than 70% of raw silk produced is of multivoltine origin, primarily as crossbreeds. Therefore, genetic variability of quantitative characters can identify a promising multivoltine silkworm breeds used in further breeding programs targeting specific traits. In this study, the quantitative data of the generated by silkworm rearing of thirty multivoltine silkworm breeds over five different seasons span within one year. Data on silkworm rearing traits such as effective rate of rearing (ERR) by number and weight, single cocoon weight, single shell weight, and shell percentage were collected and maintained with triplicate. The data were subjected to one-way ANOVA separately with silkworm breeds and seasons as factors. The results were revealed significant variation ($P < 0.05$) between seasons but not between silkworm breeds, indicating the dominant role of environment on expression of quantitative traits. A dendrogram was constructed using Ward method with Euclidean distance, resulting in four clusters. The average distance within the silkworm breeds of clusters I, II, III and IV are with 186.2, 381.8, 136.8 and 330.6, respectively. HB6 and MO6 (816) were found to be the most unrelated, whereas L1 and MAS3 (4.1) were the most closely related. The phenotypic data depicted substantiate amount of diversity among the silkworm breeds and Hence, the silkworms breeds from different clusters can be utilized as parents for obtaining higher hybrid vigor. The prime driving force for formation of clusters was the ERR by number representing the survivality of mulberry silkworm breeds. Therefore, these results can be utilized in a breeding programe that targets the development of silkworm breeds with higher survival or robustness are discussed and represented in a systematic manner to understand the genetic and phenotypic diversity among the selected multivoltine breeds.

Keywords: *Multivoltine, Crossbreed, Dendrogram, Diversity, Robustness*

Leveraging *Trichoderma* spp. for Sustainable Phytopathogen Management in the Unique Agroecology of Northeast India

Pranab Dutta

Chairman, School of Crop Protection, College of Post Graduate Studies in Agricultural Sciences, Central Agricultural university (Imphal), Umiam, Ri Bhoi, Meghalaya-793103

Email: pranabdutta74@gmail.com

Abstract

Trichoderma spp., versatile ascomycetous fungi, represent a powerful bio-control arsenal for sustainable agriculture, particularly in the unique agroecological conditions of Northeast India. These opportunistic plant symbionts thrive in diverse niches and function as multifunctional agents, acting as biopesticides, biostimulants, and biofertilizers. Their efficacy stems from a combination of direct mechanisms—such as mycoparasitism, antibiosis, and competition for space and nutrients—and indirect strategies, including the induction of systemic plant resistance (ISR, SAR) and significant plant growth promotion. Over two decades of study, native *Trichoderma* strains were isolated from Northeast India and West Bengal. *In vitro* and *in vivo* evaluations demonstrated their high efficacy against key soil-borne pathogens (*Rhizoctonia solani*, *Sclerotinia sclerotiorum*, *Fusarium oxysporum*, *Colletotrichum capsici*, *Sclerotium*

rolfsii) and the root-knot nematode (*Meloidogyne incognita*). The fungi also showed excellent compatibility with other biocontrol agents (e.g., *Bacillus subtilis*, *Pseudomonas fluorescens*, entomopathogenic fungi), enabling the development of potent consortial bioformulations. Innovative approaches, like intergeneric protoplast fusion with *Metarhizium anisopliae*, yielded hybrid cells with enhanced pest and pathogen suppression capabilities. This research has successfully translated into practical, low-cost technology. Stabilized liquid bioformulations (Org-Trichojal, Um-Tricho, etc.) with extended shelf-life have proven effective in managing diseases while promoting plant growth across various field and horticultural crops. These formulations induce host defense responses, leading to increased chlorophyll, phenolic compounds, lignin deposition, and other biochemical changes that enhance physical and basal resistance. The technology has been commercialized through state government initiatives in Nagaland and Meghalaya, providing farmers with an eco-friendly management tool and creating avenues for local entrepreneurship and cottage industry development in the region

Keywords: *Trichoderma spp., Biocontrol agent, Plant disease management, Agroecology of Northeast India, Bioformulation, Induced systemic resistance (ISR)*

Physico- chemical Assessment of different Solids and Dissolved Oxygen in Nandan Pahar Pond, Deoghar, Jharkhand: Implications for Aquatic Pollution, Environmental Sustainability, and Public Health

[1]Pritam Sharma [2]Dr. Nilesh Kumar [3]Dr NK Mandal

[1]Research Scholar Department of Zoology Sido Kanhu Murmu University Dumka Jharkhand India
[2]Associate Professor and Head Zoology Department SKMU Dumka Jharkhand [3]Assistant Professor of Chemistry.

Email id – pritamdistricticondeoghar@gmail.com

Abstract

Physico chemical monitoring of Nandan Pahar Pond in Deoghar, Jharkhand was conducted quarterly from July 2024 through April 2025. Measured parameters were total dissolved solids (TDS), total suspended solids (TSS), and dissolved oxygen (DO). TDS values ranged from 152 mg/L (post-monsoon) to 260 mg/L (pre-monsoon summer), reflecting seasonal concentration changes. TSS remained negligibly low (<1 mg/L) in all seasons, indicating very clear water. DO varied from a low of 5.15 mg/L in summer to 6.8 mg/L in winter. The data show typical seasonal patterns: summer's high temperature and evaporation drove up TDS and lowered DO, while winter's cooler waters held more oxygen. These values were compared to water quality standards. All TDS values were well below WHO and BIS guidelines for potable water, and DO mostly met the Indian CPCB thresholds for fisheries (4–5 mg/L) and was close to the 6 mg/L criterion for drinking-water sources. Low TSS implies excellent water clarity (below 20 mg/L is generally clear), minimizing issues like gill clogging or reduced light. Overall, the pond's water quality appears moderate and supports aquatic life, but seasonal stress during hot months (higher TDS, lower DO) could challenge sensitive organisms. Implications for ecosystem health and human use are discussed.

Keywords: *Total dissolved solids (TDS); total suspended solids (TSS); dissolved oxygen (DO); seasonal variation; water quality; Nandan Pahar Pond; Jharkhand; aquatic ecosystem; eutrophication; public health.*

Clinical Translation of a Traditional Medicinal Plant for Neuroprotection: Evidence from a Randomized Controlled Study

Priya Dev[1]*, Rakesh Ranjan[2], Ashutosh Kumar Pathak[3], Vijaya Nath Mishra[1], Abhishek Pathak[1]

[1]Department of Neurology, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India

[2]DST-CIMS, Institute of Science, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India

[3]Department of Rachana Sharir, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India

Corresponding author e-mail: priyadev8090@gmail.com

Abstract

Stroke remains a leading cause of mortality and long-term disability worldwide. Despite advances in acute neurological care, effective neuroprotective strategies remain limited, and a substantial proportion of patients are ineligible for reperfusion therapies, underscoring the need for safe, accessible, and adjunct therapeutic approaches. Traditional medicinal plants with documented anti-inflammatory, antioxidant and immunomodulatory properties represent promising candidates for translational neuroprotection; however, high-quality clinical evidence supporting their efficacy remains scarce. In the present randomized, placebo-controlled study, eligible patients with acute ischemic stroke presenting within 7 days of symptom onset were assigned to receive adjunct therapy with a standardized plant extract or placebo in addition to standard care. Functional and neurological outcomes at 90 days were assessed using the modified Rankin Scale (mRS) and National Institutes of Health Stroke Scale (NIHSS). Of 420 enrolled patients, 406 completed the study. The mean mRS score at 90 days was lower in the intervention group compared to placebo, with a significantly higher proportion achieving favorable functional outcome (mRS d”3). The treatment effect favored the intervention arm, with an adjusted odds ratio of 3.1 (95% CI: 2.063–4.682). Neurological recovery as measured by NIHSS was also significantly improved in the treatment group. The therapy was well tolerated with no major safety concerns observed. These findings provide robust clinical evidence supporting the translational potential of plant-derived neuroprotective strategies and reinforce the scientific validation of ethnomedicinal knowledge within evidence-based clinical practice. The trial was registered in the Clinical Trials Registry of India (CTRI).

Keywords*: Tinospora cordifolia, randomized controlled trial, ischemic stroke, neuroprotection, medicinal plants*

Synthesis of taro starch nanoparticles from taro starch via ultrasound-assisted nanoprecipitation

Prodipti Dutta, Gopalakrishnan Kishore Kumar, and Sushil Kumar Singh *
Department of Food Process Engineering, National Institute of Technology, Rourkela
Odisha – 769008, India.
Corresponding author: Dr. Sushil Kumar Singh, National Institute of Technology- Rourkela, Odisha, India
Email: singhsk@nitrkl.ac.in

Abstract

Starch, a natural plant polymer, is abundant and biodegradable making it a sustainable biomass. This biopolymer is widely used in various sectors like food industry, textiles, pharmaceuticals *etc.* around the world. In this study, taro starch nanoparticles were synthesized from native starch using ultrasound-assisted nanoprecipitation, an eco-friendly method. The experiments were conducted with independent variables including different starch-to-solvent ratio (1:1 & 1:2), ultrasound amplitude (70 & 80%), and treatment time (55-75 min). The synthesized nanoparticles were characterised by various techniques such as particle size, Field Emission Scanning Electron Microscopy (FESEM), Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD) and Raman spectroscopy to analyze the properties of the particles. Ultrasound-assisted nanoprecipitation reduced starch particle size from micro-scale (native starch) to an average of 190 nm for SNPs, although mild agglomeration was observed. FTIR spectroscopy indicated subtle shifts in peak positions but retention of characteristic functional groups, confirming no chemical alterations. XRD analysis further showed preserved crystalline structure with minor peak broadening to nanoscale effects. Overall, the results highlight ultrasound-assisted nanoprecipitation as a purely physical process yielding nano-sized SNPs with intact chemical integrity, holding promise for applications in biodegradable packaging films.

Keywords: *Nanoprecipitation; starch nanoparticles; taro starch; ultrasonication.*

Studies on quality attributes of East Indian Arrowroot (*Curcuma angustifolia* Roxb.) for various applications

Prof. Rambir Singh
Department of Horticulture, Aromatic and Medicinal Plant,
Mizoram University (A Central University), Aizawl-796004, Mizoram, India.
Email: rambirsingh@mzu.edu.in

Abstract

Plant starch is widely used in diverse industries due to its biodegradability, renewability, and functional properties. In the food industry, it acts as a thickening, stabilizing, and gelling agent in sauces, soups, confectionery, and bakery products. In pharmaceuticals, starch serves as a binder and disintegrant in tablet formulations. The textile industry uses starch for sizing and finishing fabrics to improve strength

and texture. In paper manufacturing, it enhances surface strength and printability. Modified starch is also utilized in biodegradable plastics, adhesives, and packaging materials. Additionally, starch-based bioethanol production supports renewable energy initiatives and sustainable industrial development. Considering the food security issues, interest is growing in non-traditional starches sources for food as well as other applications. *Curcuma angustifolia* Roxb., East Indian Arrowroot (*Tikhur*) is a rhizomatous perennial flowering plant widely available in NER. The powdered rhizome together with milk and sugar is used as a general tonic for children and the flower is consumed as vegetable. The plant rhizome is valuable source of starch. The starchy flour is also used as a weaning food. Considering the importance of this plant in food security in NER and also other commercial uses, we evaluated North East collections *C. angustifolia* for various biological and chemical indices for identification of elite germplasm. The germplasms were evaluated for morphological parameters and yield and rhizome characteristics. The starch isolated from the selected germplasms was evaluated for various physico-chemical characteristics like bulk density, particle size, particle shape and surface properties.

Keywords*: Curcuma angustifolia, germplasm, starch, particle size, surface properties.*

Insect Pest Complex of Tomato under Mixed Cropping and Monocropping System

Pukhram Bhumita*, Padamini Rajkumari, Puyam Nikesh Singh, Meinam Chanchan and Indira Sarangthem

College of Agriculture, Iroisemba, Central Agricultural University, Imphal

Corresponding Email: pbhumita@gmail.com

Abstract

A field experiment was conducted at the Central Farm of College of Agriculture, CAU, Imphal, located at Lamphelpat to evaluate the insect pest complex of tomato under monocropping and mixed cropping systems. The study aimed to assess pest incidence and the comparative influence of cropping systems on pest buildup in sole tomato cropping (monocropping) and tomato intercropped with companion crops (mixed cropping). Observations were recorded at regular intervals from vegetative stage to harvest without prophylactic insecticide application in order to assess natural pest buildup. The major insect pests observed in tomato monocropping included fruit borer (*Helicoverpa armigera*), whitefly (*Bemisia tabaci*), aphid (*Aphis gossypii*), thrips (*Scirthothrips dorsalis*), and tobacco caterpillar (*Spodoptera litura*). Higher pest population density and greater fruit damage were recorded in monocropped plots, particularly during flowering and fruiting stages.

In contrast, mixed cropping plots exhibited significantly lower pest incidence, with negligible fruit damage and reduced sap-sucking pest populations. The findings clearly demonstrate that crop diversification effectively suppresses insect pest buildup in tomato. The results emphasizes the potential of mixed cropping as an eco-friendly and sustainable pest management strategy, reducing dependency on chemical pesticides while ensuring stable crop production. The adoption of such agroecological practices can enhance environmental safety and reinforce integrated pest management approaches for sustainable tomato cultivation.

Keywords*: Tomato, Mixed cropping, Monocropping, eco-friendly management, sustainable production*

Germination, Growth, and Reproductive Biology of the Giant Water Lily-Victoria amazonica Under Ex Situ Conditions

R Saravanan*
A.J.C. Bose Indian Botanic Garden, Botanical Survey of India, Howrah-711103
Corresponding author e-mail: saravanan0311@gmail.com

Abstract

The genus Victoria Lindl. (Nymphaeaceae), named in honour of Queen Victoria, is renowned for possessing the largest leaves among aquatic angiosperms and represents one of the most remarkable lineages of tropical water lilies. The genus is native to tropical South America and currently comprises three recognized species: Victoria amazonica (Poepp.) Klotzsch., V. cruziana A.D. Orb., and V. boliviana Magdalena & L.T. Sm. Among these, V. amazonica is the most widely known and horticulturally valued species, indigenous to the Amazon River basin. It is distinguished by its massive orbicular floating leaves, measuring approximately 1.75–2 m in diameter, supported by submerged petioles and capable of bearing weights up to 40 kg. The species also produces spectacular nocturnal flowers nearly 30 cm across that undergo dramatic morphological and chromatic changes during anthesis, opening white and strongly fragrant on the first evening and turning pink by the second evening. These flowers are primarily pollinated by beetles, though self-pollination may also occur. The seeds have also proven to be of immense nutritive value. Historically, V. amazonica was introduced into the garden collections in 1873 by George King, where they successfully completed their life cycles in various lakes. While perennial in their native habitats, they behaved as annuals under cultivated conditions. However, the populations were lost following the severe impact of Cyclone Amphan in May 2020. Subsequent restoration efforts were complicated by insufficient scientific documentation of morphological diagnostic characters for cultivated specimens. To re-establish populations, seeds were procured from Yogi Vemana University (YVU), Kadapa, Andhra Pradesh, and subjected to experimental germination treatments aimed at optimizing rooting success. Seeds submerged in alluvial soil exhibited rooting within approximately 55 days, whereas seeds maintained in dark aquatic conditions without soil required about 70 days, indicating substrate composition as a critical factor influencing germination. Following emergence of primary leaves, seedlings were transplanted into nursery containers of varying shapes prior to final introduction into lakes. Observations revealed that vegetative growth peaked during the monsoon season (July–September), while flowering commenced in September. Initial flowers did not produce viable seeds due to environmental limitations; successful seed formation occurred only after November, requiring roughly 50–60 days for maturation. Environmental parameters, particularly soil type and temperature, were identified as decisive determinants of survival, growth, and reproductive success. Under present managed conditions, the plants demonstrate perennial behaviour, and selected individuals maintained in large nursery units serve as a reliable source of seeds for propagation, conservation, and further study.

Overall, these findings highlight the importance of controlled cultivation protocols, substrate selection, and seasonal timing for successful reintroduction and maintenance of Victoria species in botanical collections, contributing to both ex situ conservation and horticultural research on giant water lilies.

Keywords: *Victoria amazonica, Alluvial soil, Germination, Seed formation*

Optimizing Phenolic Extraction from Potato Peel Using Ultrasound-Assisted Technique: A Response Surface and Genetic Algorithm Approach

Raghavendra H.R., Shruti Sethi, Arpan Bhowmik, Eldho Varghese, Alka Joshi
ICAR-Indian Agricultural Research Institute, Assam

Abstract

Potato peels, often considered a waste product during potato processing, are rich in phytochemicals, particularly phenolics. These compounds, known for their antioxidant and antimicrobial properties, offer valuable potential for the food industry. In this study, phenolics were extracted from potato peel using ultrasound-assisted extraction, where key variables such as sonication time (5-25 min), ethanol concentration (0-100%), and extraction temperature (25-65°C) were optimized using a central composite design (CCD). The extraction process was fine-tuned with response surface methodology (RSM) followed by a genetic algorithm (GA) approach to maximize total phenol content (TPC). The optimized conditions for the highest recovery of phenols (621.27 mg/100g dry weight) involved 22.032 minutes of sonication, 61.818°C temperature, and 99.99% ethanol concentration. Ultrasound-assisted extraction proved to be significantly more efficient than conventional solvent extraction, yielding 2.84 times more phenolic compounds. The optimized extraction conditions, along with the predictive model, open up promising opportunities for the food industry, providing products with notable health benefits.

Soluble silicon in diverse Indian soils and its relationship with physicochemical properties

Rahul Panigrahi[1,*], Debmalya Sarkar[1], S. G. Sarowar[1], Aishita Sarkar[1], Sourin Das[1], Mandira Barman[1], M. C. Meena[1], Pravin K. Upadhyay[2], Debarup Das[1,*]
[1]Division of Soil Science and Agricultural Chemistry, ICAR-Indian Agricultural Research Institute, New Delhi, 110012
[2]Division of Agronomy, ICAR- Indian Agricultural Research Institute, New Delhi, 110012
**** Corresponding author emails: pbhu2020@gmail.com; debarupds@gmail.com***
Presenting author email: pbhu2020@gmail.com

Abstract

Silicon (Si) is a beneficial element for plant growth, and the second most abundant element in soil after oxygen, comprising about 28% of Earth's crust. However, soluble Si, which is the plant available form, is only a small part of the total Si in soils. Variations in soluble Si concentration in soils, despite similar total Si content, could be due to the variations in physicochemical properties. The information on the effect of physicochemical properties of soils on its soluble Si concentration is scare. The present study,

therefore, aims to find out the variations in soluble Si content in major soil types of India and its relationship with soil physicochemical properties. To achieve the objectives of the study, soils were collected from 10 different locations across India, representing acidic alluvial, neutral alluvial, alkaline alluvial, red and lateritic, and black soils. The soluble Si concentration in these soils varied widely. The soils also showed huge variations in the physicochemical properties like texture, pH, cation exchange capacity (CEC), and free iron and aluminium oxides. Among the physicochemical properties, the soluble Si content showed significant positive correlation with pH, CEC, and clay content, while significantly negative correlation with free iron oxides, free aluminium oxides, and sand content. Hence, soils with high clay content, CEC and neutral to alkaline reaction tend to have more soluble Si than soils with low clay content, low CEC or acidic reaction.

Keywords*: Soluble silicon, Indian soils, Soil reaction, Iron/Aluminium oxide, Aluminium oxide, Correlation*

Thermal characteristics evaluation of hybrid solar tunnel dryer (HSTD) for drying Dillenia indica (Elephant apple)

Titikha Machahary[1], Prakash Kumar Nayak[2], Radha Krishnan Keshavan[2], Prasadarao Bobbili[3], Rajesh Kondareddy[1*]

[1]Department of Instrumentation Engineering, Central Institute of Technology Kokrajhar, Balagaon, Assam-783370, India

[2] Department of Food Engineering and Technology, Central Institute of Technology Kokrajhar, Balagaon, Assam-783370, India

[3]Department of Electronics and Communication Engineering Vignan's Institute of Information Technology Visakhapatnam-530049, India

****E-mail: r.kondareddy@cit.ac.in***

Abstract

Solar energy provides a cost-effective, environmentally friendly alternative to conventional sources for agricultural drying applications. However, the shortage of efficient solar drying technology leads to excessive post-harvest losses in many tropical developing countries. This type of loss generally affects seasonal, highly perishable, and underutilized fruits, such as elephant apples, which are high in nutritional value. The traditional open-sun drying (OSD) commonly leads to microbial contamination, nutritional deterioration and uneven drying. To overcome these drawbacks, an environmentally friendly IoT-based hybrid solar tunnel dryer (HSTD) with a thermal energy storage system (TESS) has been designed. To boost heat transfer and storage capacity, a blend of paraffin wax and cetyl alcohol was used as a phase change material (PCM). A stored PCM aluminium box was designed, with 5/8 mm copper pipes fitted to draw hot air from the dryer and circulate it at the optimal flow rate. The research work investigates the quality analysis of dried elephant apple using three drying methods: OSD, electrical tray drying (ETD) and HSTD. The drying times were 22, 12, and 15 hrs, respectively. In comparison, the drying time, energy efficiency, and product quality of HSTD indicate a better solution for drying, because

ETD required higher electrical energy use, OSD took longer and was dependent on weather conditions. The drying kinetics were analyzed using thin-layer drying models, and the Page model best fit the HSTD experimental data. With an overall energy efficiency of 67%, HSTD dried elephant apple to a final moisture level of 8 ± 0.012 % effectively from 88.5± 0.9% initial moisture content (wt basis). The system's economic and environmental analysis shows a financial payback period of 2.4 years and a CO2 emission reduction of 10 tonnes over a 20-year life span. The findings demonstrate that the combination of HSTD and TESS provides a quality-preserving, energy-efficient and sustainable solution for traditional drying techniques.

Keywords: *Drying, HSTD, Energy storage, Drying kinetics, Payback period*

Assessment of Erythromycin-induced behavioural responses in *Cyprinus carpio*

Rajni Devi, Anjali, Madhu Sharma, Tarang Shah
Department of Zoology, SCVB Degree College, Palampur H.P. India
Department of Fisheries, DGCN COVAS, CSK Himachal Pradesh Krishi Visva Vidyalaya, Palampur, India

Abstract

The extensive utilization of antibiotics and other pharmaceuticals has led to a concerning transformation of polluted aquatic ecosystems globally. Among these antibiotics, there is an increasing detection of erythromycin, a representative of macrolides, which induces toxic effects on non-target aquatic organisms. The ecotoxicity of erythromycin in freshwater was assessed using *Cyprinus carpio* during a 96-hour acute exposure. Toxicity was evaluated using a sublethal concentration of 2.5 mg/L of erythromycin, with a focus on behavioural endpoints, as behavioural biomarkers are non-invasive, ecologically relevant, detectable at low toxic concentrations, and provide early warning signals regarding the health of the exposed population. Behavioural responses were monitored at 24, 48, 72, and 96 hours. The observed behavioural alterations included hyperactivity, increased operculum movement and swimming rate, dark pigmentation, excessive mucus secretions, loss of equilibrium, surface air gulping, aggregation, lethargy, caudal bending, responsiveness to stimuli or sensitivity, and shedding of scales. These behavioural responses may indicate respiratory impairment, neurotoxic effects, and defensive responses to minimize the irritation caused by erythromycin. Consequently, the findings suggest that behavioural biomarkers serve as a crucial tool for observing and evaluating environmental health conditions. There is an urgent need to monitor erythromycin concentration and its toxicity in aquatic ecosystems.

Keywords: *pharmaceuticals, antibiotics, macrolides, ecotoxicity, behavioural biomarkers.*

Harnessing the Jute Transcriptome: Functional SSR Markers in Stress-Regulatory Networks for Climate-Resilient Breeding

Rakesh Bhowmick, Kanti Meena, Thribhuvan R, K. N. Chourasia, Jitendra Kumar Meena, Jiban Mitra, Gouranga Kar

Crop Improvement Division, ICAR - Central Research Institute for Jute and Allied Fibers (CRIJAF), Barrackpore, Kol-700121
Corresponding author: Rakesh Bhowmick (inforak.007@gmail.com)

Abstract

Jute (Corchorus spp.) is a premier natural bast-fiber crop whose productivity is increasingly threatened by abiotic stresses such as drought, salinity, and waterlogging. To elucidate the regulatory mechanisms underlying stress tolerance, this study integrated differential gene expression profiling with the discovery of transcription factor-derived simple sequence repeat (TF-SSR) markers in the two primary cultivated species, C. capsularis and C. olitorius. Transcriptomic analysis revealed a robust stress-responsive landscape, identifying between 563 and 6,376 differentially expressed genes across treatments. Within this set, 370 transcription factor genes harboring 728 SSRs were identified in C. capsularis, while 348 transcription factor genes containing 702 SSRs were detected in C. olitorius. These markers were predominantly enriched in untranslated regulatory regions and were largely composed of A/T-rich di- and tri-nucleotide motifs. Major stress-responsive transcription factor families, including MYB, bHLH, NAC, WRKY, HB, and AP2/ERF, were highly represented, highlighting their central role in transcriptional reprogramming under environmental stress. Chromosomal mapping revealed distinct genomic hotspots on chromosomes 3, 4, 5, and 6, suggesting specialized regulatory hubs associated with environmental adaptation. Comparative synteny analysis identified 170 conserved TF-SSR gene pairs within collinear blocks, reflecting strong evolutionary conservation between the two species. Population structure analysis (K = 3) clearly differentiated the species while revealing significant admixture within C. olitorius, indicating historical introgression and shared domestication trajectories. Collectively, this integrated genomic framework provides a high-resolution perspective on regulatory evolution in jute and establishes novel TF-SSR markers as valuable resources for marker-assisted selection and the development of climate-resilient cultivars adapted to fluctuating environmental conditions.

Population dynamics of major insect pests on bottle gourd and their relation to weather parameters

Samroj Singh[1], Rinku Poonia[1*], Sunita Yadav[1], Vijay Pal Singh Panghal[2], Manjeet Singh[3], Usha Kumari[4]

[1]Department of Entomology, CCS Haryana Agricultural University, Hisar, Haryana, India-125004
[2]Department of Vegetable Science, CCS Haryana Agricultural University, Hisar, Haryana, India-125004
[3]Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana, India-125004
[4]Department of Soil Science, CCS Haryana Agricultural University, Hisar, Haryana, India-125004
Corresponding authors: rinkupoonia10@gmail.com

Abstract

Bottle gourd (*Lagenaria siceraria*) is an important cucurbitaceous vegetable crop cultivated widely in India. Its productivity is constrained by several insect pests, whose incidence and severity are strongly influenced by climatic factors. Understanding seasonal pest abundance in relation to weather parameters is essential for developing climate-resilient production systems and timely pest management strategies. The study was conducted during the kharif season of 2024 at the Entomology Research Farm, CCS Haryana Agricultural University, Hisar. Bottle gourd variety GH-22 was grown following recommended agronomic practices. Weekly observations on major insect pests viz., red pumpkin beetle, fruit fly, whitefly, and aphid were recorded from the 33rd to 43rd Standard Meteorological Week. Pest population data correlated with weather parameters including maximum and minimum temperature, morning and evening relative humidity, and rainfall obtained from the Department of Agricultural Meteorology. Correlation analysis was performed to determine the relationship between pest incidence and climatic factors. The red pumpkin beetle appeared from the 33rd SMW and attained peak population (2.0 beetles per plant) during the 38th SMW. Fruit fly infestation ranged from 6 to 42 per cent, with maximum infestation recorded during the 39th SMW. Whitefly and aphid populations peaked during later crop stages in 42nd SMW. Red pumpkin beetle and fruit flies population showed a significant positive correlation with maximum temperature while aphid and whitefly populations exhibited strong negative relationships with minimum temperature, rainfall, and evening relative humidity. The study concludes that climatic factors play a decisive role in regulating pest incidence on bottle gourd, and weather-based pest monitoring can significantly enhance climate-resilient crop production strategies.

Keywords: *Bottle gourd, climate factors, fruit fly, red pumpkin beetle, seasonal abundance*

Morpho-phytochemical trait associations for quality-oriented breeding in *Gymnema sylvestre*

Rohini M.R
ICAR-Indian Institute of Oil Palm Research, Research Centre, Palode
Pacha P.O, Trivandrum, Kerala-695562
****Corresponding author email: rohu20@gmail.com***

Abstract

Gymnema sylvestre R.Br. is a commercially important medicinal climber valued for gymnemagenin, the principal aglycone of gymnemic acids responsible for its antidiabetic properties. Ensuring consistent and enhanced bioactive content through trait-based selection is critical for quality-oriented breeding and sustainable raw drug production. The present investigation evaluated 51 germplasm accessions of *G. sylvestre* maintained at ICAR–Indian Institute of Horticultural Research (IIHR), Bengaluru, to elucidate associations between morphological traits, fresh leaf yield, and gymnemagenin content (% w/w). Substantial phenotypic variability was observed across accessions, indicating rich exploitable diversity. Distinct morphotypes of breeding and agronomic significance were identified, including IIHR-GS-18 (late flowering genotype suitable for extended harvesting), IIHR-GS-15 (>2500 fruits plant{ ¹, high reproductive potential), IIHR-GS-24 (velvety broad leaves with insect tolerance), and IIHR-GS-29 (elliptic leaves with characteristic folded lamina). Variation in leaf texture (hairy, medium hairy and

less hairy types) further demonstrated adaptive and selection potential within the germplasm. Pearson's correlation analysis revealed highly significant negative associations between leaf size traits and gymnemagenin content: leaf length (r = "0.703***), leaf breadth (r = "0.711***), and leaf area (r = "0.728***). These results indicate that smaller-leaved accessions accumulate higher levels of gymnemagenin. In contrast, chlorophyll content exhibited a strong positive correlation (r = 0.641***), suggesting a physiological linkage between photosynthetic efficiency and secondary metabolite biosynthesis. Fresh leaf yield per plant showed no significant association with gymnemagenin content (r = "0.021), implying that enhancement of phytochemical quality need not compromise productivity. The study identifies small leaf morphology and higher chlorophyll content as reliable indirect selection markers for improving gymnemagenin content. Integration of morpho-phytochemical associations into breeding strategies can accelerate elite genotype identification and support development of high-quality cultivars of *Gymnema sylvestre* for the expanding medicinal plant sector.

Keywords*: Gymenma sylvetsre, characterization, morphotypes, gymnemagenin, correlation*

Water Productivity and Economics of Soybean as Influenced by Precision Nutrient and Irrigation Management Under System of Crop Intensification

Sachin K.S[1*], Anchal Dass[2]
Division of Agronomy, ICAR- Indian Agricultural Research institute,
Corresponding author- sachinks3134@gmail.com

Abstract

A field experiment was conducted during *kharif* seasons of 2020- 2021 and 2021- 2022 at ICAR- IARI, New Delhi to study the effect of precision nutrient and irrigation management on economics and water productivity of soybean. The experiment was carried out in a split-plot design, wherein main-plot treatments consisted of three irrigation regimes *viz.,* standard flood irrigation at 50% depletion of available soil moisture (DASM) (I_1) for soybean. ii) sprinkler irrigation at 80% ET_C (crop evapotranspiration) (Spr 80% ET_C), and iii) Spr 60% ET_C, whereas sub-plots had five precision nutrient management protocols (PNM): PNM_1- SCI protocol for nutrient management], PNM_2-RDF: Basal dose incorporated (50% N, full dose of P & K)+50% N SPAD based top-dressing, PNM_3-RDF: Basal dose point placement [BDP] (50% N, full dose of P & K) + (50% N SPAD based top-dressing), PNM_4-75% RDF: BDP (50% N, full dose of P & K) + (50% N SPAD based top-dressing) and PNM_5- 50% RDF: BDP (50% N, full P & K) + (50% N SPAD based top-dressing). Total water productivity (0.545 kg m^{-3}), irrigation water productivity (0.66 kg m^{-3}), economic water productivity (27.65 INR ha^{-1} m^3) were significantly under Spr 60 % ETc followed by Spr80% ETc and FI. Further Among PNM practices PNM3 recorded significantly higher water productivity indices Compared to PNM_1.While Highest gross returns (1,26,300 INR) and net returns (75650 INR) were recorded in Spr 80 % ETc whereas in B: C Ratio Spr 60 % ETc recorded highest (1.25). Among PNM practices PNM_3 recorded significantly highest economics.

Keywords: *Water productivity, Economics, Soybean, System of crop intensification.*

Crop Productivity and Yield Dynamics of Direct-Seeded Rice under Integrated Nutrient Management

Sahil* and R S Garhwal
Department of Soil Science, CCS HAU, Hisar, Haryana-125004
Corresponding author E-mail: jangrasahil835@gmail.com

Abstract

The present investigation was undertaken to evaluate the crop productivity and yield dynamics of direct-seeded rice (DSR) under integrated nutrient management at the College of Agriculture (Kaul), CCS Haryana Agricultural University, Hisar. The experiment was laid out in a Randomized Block Design (RBD) with nine treatments involving the integration of two leguminous green manures—Dhaincha (*Sesbania aculeata*) and Mungbean (*Vigna radiata*)—with varying levels of the recommended dose of nitrogen (RDN). The treatments included: T_1 (Control), T_2 (Dhaincha), T_3 (Mungbean), T_4 (50% RDN + Dhaincha), T_5 (50% RDN + Mungbean), T_6 (75% RDN), T_7 (75% RDN + Dhaincha), T_8 (75% RDN + Mungbean), and T_9 (100% RDN). Assessment of yield attributes at harvest revealed that while the maximum plant height (101.1 cm), effective tillers (236.1 per square metre), grain yield (31.35 q per ha), and straw yield (46.15 q per ha) were recorded under T9 (100% RDN), these values were statistically at par with T7 (75% RDN + Dhaincha). The results indicate that incorporating *Sesbania aculeata* as a green manure can effectively replace 25% of the inorganic nitrogen requirement in direct-seeded rice without significant loss in productivity. This synergy between organic and mineral sources highlights the potential of integrated nutrient modules to sustain high yield levels and improve the nitrogen-use efficiency of DSR systems.

Keywords: *Direct-seeded rice, green manure, Sesbania aculeata, Vigna radiata, nitrogen levels, yield attributes.*

Personal care products (PCPs) in the Environment: Occurrence, Transport Pathways and Ecological Implications across Water, Soil, and Plant System

Seko-u Thele[1*], Boopathi Gopalakrishnan[2], Ajay Kumar Singh[2], Paritosh Kumar[3], Sushil Sudhakar Changan[4]
[1]Department of Environmental Science ICAR- National Institute of Abiotic Stress Management, Pune, Maharashtra 413115, India
[2]School of Atmospheric Stress Management ICAR- National Institute of Abiotic Stress Management, Pune, Maharashtra 413115, India
[3]School of Drought Stress Management ICAR- National Institute of Abiotic Stress Management, Pune, Maharashtra 413115, India
[4]Edaphic Stress Management ICAR- National Institute of Abiotic Stress Management, Pune, Maharashtra 413115, India
[*]***Corresponding author e-mail: Theleseko1@gmail.com***

Abstract

Personal Care Products (PCPs) represents a critical class of emerging contaminants (ECs), ubiquitous in daily use yet posing significant risks to the environment due to their persistence, bioaccumulation and toxicity at trace levels (ng/L-µg/kg). This review examines their occurrence, pathways, uptakes and ecological implications across water, soil and plants, drawing from hydroponic, greenhouse and field studies.

PCPs such as triclosan (TCS), triclocarban (TCB), parabens, UV filters, fragrances, phthalates, surfactants enter the environment primarily via domestic wastewater, inadequately treated effluents, biosolids application and informal irrigation - prevalent in India. In water, concentrations vary seasonally (higher in winter for some antibiotics like compounds), soils act as sinks via sludge amendments and leachates, with persistence influenced by log Kow, plants uptake via roots/leaves, with leafy vegetables accumulating up to 100 ng/g dw, risking food chain transfer. Phytotoxicity includes chlorophyll reduction, oxidative stress (ROS), growth inhibition in crops like wheat and cucumber.

Field data reveals lower real-world uptake than lab simulations due to sorption/ microbial degradation, yet gaps remain in Indian contexts and long-term risks. Mitigation strategies and remediation approaches show promise but requires optimization. Additionally, key research gaps such as urgent integration of regulations, monitoring and sustainable reuse is essential to safeguard our environment.

Keywords: *Emerging contaminants, Personal care product, Wastewater irrigation, Plant uptake, phytotoxicity, Ecological Risk*

Formulation and Functional Evaluation of Whey Protein and Plant Protein-Based Egg White Analogue

Shefali Sirame[a], Deep Narayan Yadav[a*], Shaik Abdul Hussain[a], Heena Sharma[a], Sumit Arora[b]

[a] Dairy Technology Division, [b] Dairy Chemistry Division, ICAR-National Dairy Research Institute, Karnal, Haryana 132001

****Corresponding author e-mail: deepyadav18@gmail.com***

Abstract

The increasing demand for sustainable and functional egg alternatives has stimulated research on protein-based substitutes capable of replicating the techno-functional properties of egg white. Whey protein, a high-value dairy by-product with excellent nutritional and functional attributes, offers significant potential for the development of novel food systems. However, its strategic utilization in combination with plant proteins for egg replacement applications remains underexplored. The present study aimed to develop and characterize a whey mung bean protein-based egg white analogue. Formulations were prepared by varying the mung bean protein (MBP) to whey protein (WP) ratio from 1:1 to 1:2.5, along with oil, stabilizer, emulsifier, and salt. The developed systems were evaluated for physicochemical, functional (foaming, emulsifying, and gelation), rheological, textural, and sensory properties. Among the different formulations, the MBP:WP ratio of 1:1.5 exhibited superior foaming stability, emulsification capacity,

and gel strength comparable to egg albumen. Rheological analysis indicated desirable viscoelastic behavior suitable for structured food applications. The optimized formulation was successfully utilized in the preparation of an omelet analogue with acceptable sensory characteristics. The study demonstrates the potential of whey and plant protein blends for value added utilization of whey in the development of functional egg substitutes, contributing to recent advances in dairy and food science technology.

Keywords: *Whey protein, mung bean protein, rheology, techno-functional.*

Effect of Argon Cold Plasma Jet on the Morphological and Physicochemical Properties of Mature Dolichos lablab Bean Seed Starch

Snigdha Chetia[1], Pratyush Saikia[2], Prakash Kumar Nair[2], Nickhil C[1], Sankar Chandra Deka[1]*
[1]Department of Food Engineering and Technology, Tezpur University, India
[2]Department of Food Engineering and Technology, Central Institute of Technology, Kokrajhar, India

Abstract

Non-thermal argon cold plasma jet represents an excellent approach for material processing, such as surface modification. The present study was conducted to investigate the effects of argon cold plasma jet treatment on the morphological and physicochemical properties of underutilized mature Dolichos lablab seed starch (DSS). The DSS was exposed to a range of different voltages (10, 15, and 20 kV) at different durations (15, 20, and 30 min). Both the untreated and treated starch samples were analysed for gel hydration properties such as water holding capacity, water absorption capacity, swelling power, solubility, and amylose content. The plasma treatment resulted in a higher water-absorbing capacity, resulting in higher swelling power. Also, it is seen that there is a significant reduction in the pH of the starch from 7.22 to 5.81, which is caused due to the plasma-induced reactive species and free radicals. It was observed from SEM that there are fissures on the surface, while the granule integrity remains intact. The FTIR results didn't show any new peaks, but changes can be observed in the intensities of the peaks. For example, the broad peak is centered at nearly 3391$cm^{-1,}$ showing an increase in OH stretching, which is strong evidence of increased hydroxyl content due to plasma-induced oxidation. We observed changes such as a decrease in the reducing sugar and an increase in amylose content with an increase in the treatment voltage and duration. Consequently, these plasma voltage/time-dependent changes in the starch structure and properties can be further optimised according to the required characteristics.

Synergistic potential of *Cordyceps javanica* (OM321438) with botanicals and insecticides against tea mosquito bug, *Helopeltis theivora* Waterhouse

Sudeshna Ray[1], Purnima Das[2] & Banna Ushasri[3]
[1]Former M.Sc Student, Department of Entomology, Assam Agricultural University, Jorhat-13
[2]Associate Professor, Department of Entomology, Assam Agricultural University, Jorhat-13
[3] PhD Scholar, Department of Entomology, Assam Agricultural University, Jorhat-13

Corresponding Author: purnima.das@aau.ac.in

Abstract

Cordyceps javanica (OM321438) (Friederichs & Bally) (Hypocreales: Cordycipitaceae) has recently gained attention as a potential microbial biocontrol agent for managing various insect pests which is also showing promising results against tea mosquito bug, *Helopeltis theivora* Waterhouse (Hemiptera: Miridae). In this regards, the current study was aimed to determine the compatibility of *Cordyceps javanica* strain (OM321438) with botanicals- neem oil, pongamia oil, jatropha oil and insecticides Clothianidin 50 WDG, Thiamethoxam 25 WG and Profenofos 50 EC, which are generally advised against this pest. All botanicals and insecticides were tested at recommended dose (RD), half RD and higher than RD using the poison food technique. Results showed that half RD of all botanicals and insecticides produced maximum mycelial growth, conidial density, and sporulation. At half RD (0.5%), neem oil showed the lowest inhibition (31.19%) among botanicals, followed by pongamia oil (43.58%). Among insecticides, Clothianidin 50 WDG (0.01%) recorded the lowest inhibition (12.84%), followed by Thiamethoxam 25 WG (30.50%). Based on T toxicity classification, neem and pongamia oils were compatible at half RD (T > 60). Clothianidin 50 WDG was compatible at all doses, while Thiamethoxam 25 WG was compatible at half RD and RD. The four most compatible combinations were further evaluated against *H. theivora* along with their respective half RDs. *C. javanica* + Thiamethoxam 25 WG recorded the highest mortality at 72 HAT, followed by *C. javanica* + Clothianidin 50 WDG.

Keywords*: Cordyceps javanica, conidial density Helopeltis theivora, mortality and sporulation*

Biovalorization of Silkworm Pupae through Fermentation for Sustainable Aquafeed Development

Sumalini Bora[1*], K.A. Murugesh[1], P. Priyadharshini[1*]

[1]Department of Sericulture Forest College and Research Institute Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu, India

Corresponding authors e-mail: sumalinibora@gmail.com,priyadharshini.p@tnau.ac.in

Abstract

Recent advancements in agriculture and allied sciences increasingly emphasize sustainable resource utilization and circular bio-economy strategies. Sericulture, one of India's prominent agro-based rural industries, generates approximately 40,000 metric tons of silkworm pupae annually as a by-product of silk reeling. Despite being a rich source of high-quality proteins, lipids, and essential micronutrients, silkworm pupae remain underutilized, notwithstanding their considerable potential for value addition in food and feed systems. The present investigation was designed to assess the biovalorization of silkworm pupae through controlled fermentation and to systematically evaluate their efficacy and suitability as a sustainable alternative feed ingredient for *Labeo rohita* (rohu) fingerlings. Deoiled silkworm pupae were subjected to fermentation using *Saccharomyces cerevisiae* and *Lactobacillus casei* under microaerophilic conditions for 48 hours. Proximate and amino acid analyses revealed a significant

increase in crude protein content (69.88%) and improved essential amino acid availability, while fat content was substantially reduced (3.81%). Experimental diets were formulated by replacing fishmeal with fermented silkworm pupae at graded levels (15–35%), along with a control diet. A 60-day feeding trial conducted on *Labeo rohita* (rohu) fingerlings demonstrated significant improvements in growth performance like weight gain and length gain, feed conversion ratio (0.014), and protein efficiency ratio (0.69) in fish fed fermented silkworm pupae-based diets. Optimal performance was observed at 30% fishmeal replacement, while survival rates remained consistently high across all treatment groups. The findings highlight an innovative integration of sericulture and fisheries, transforming sericultural waste into a high-value aquafeed ingredient. This approach reduces dependency on conventional fishmeal, lowers feed costs, and contributes to environmental sustainability. The study underscores the potential of fermented silkworm pupae as a viable strategy for strengthening sustainable aquaculture and promoting circular agricultural systems.

Keywords*: Fermented silkworm pupae, Fishmeal replacement, Labeo rohita, Sericulture by-products, Sustainable aquaculture, Sustainable development*

Diversity of hypolithic microalgae of selected hills of Aravali range in Ajmer city in Rajasthan

Sushri Pooja Suthar*, Anju Banta, Ashish Bhatnagar, Monica Bhatnagar
Department of Microbiology, Maharshi Dayanand Saraswati University Ajmer 305 009
E-mail: pooja@mdsuajmer.ac.in

Abstract

Microbial communities inhabiting extreme arid hills bordering the Thar Desert play a vital role in ecosystem stability and biogeochemical cycling. Hypolithic niches—microhabitats beneath translucent stones—serve as refugia for photoautotrophic and facultatively heterotrophic microorganisms by protecting them from intense solar radiation, desiccation, and temperature extremes. In contrast, adjacent edaphobiontic (soil-dwelling) communities experience greater environmental exposure, enabling comparison between lithic and soil-associated assemblages. This study investigates the diversity of oxygenic microphototrophs inhabiting hypolithic and edaphic niches on a selected hill of the Aravalli Range in Ajmer (Rajasthan), India, characterized by high temperature, low precipitation, and intense ultraviolet stress. Rock samples along with underlying soil were collected from the bottom, middle and top of the hill at Makadwali Village. Mineral composition was determined using XRD and FTIR analyses, revealing dominance of quartzite and granite typical of the Aravalli geological system, with quartzite supporting extensive hypolithic colonization.

Microalgal communities from both niches were analyzed based on morphological characteristics after enrichment in BG-11 medium with and without nitrogen. A total of 27 isolates were screened for heterotrophic growth, of which 21 exhibited metabolic flexibility under heterotrophic conditions. Prokaryotic diversity was further assessed through 16S rRNA gene sequencing using the Illumina platform following genomic DNA extraction from hypolithic scrapings. Cultural diversity revealed dominance of filamentous and unicellular cyanobacteria, including *Nostoc, Phormidium, Synechococcus, Scytonema,*

and *Calothrix*, along with stress-tolerant green algae such as *Chlorella, Chlorococcum,* and *Chlorolobion*. Species richness and community structure varied with substrate type, microclimatic conditions, and moisture availability.

These findings highlight hypolithic niches as important biodiversity reservoirs in arid ecosystems and emphasize their contribution to primary production, soil formation, and nutrient cycling, underscoring their ecological significance under ongoing climate change.

Keywords*: Hypolithic niches, Cyanobacteria, Arid desert ecosystems, Heterotrophy, 16S rRNA sequencing, Aravalli Range*

Solanum torvum Mesoporous Silica Nanotherapy in Diabetic Rats

Swati Ravindra Borse
Sandip University, Nasik, Maharashtra, India. (Pharmaceutical Science)- 422213.

Abstract

The present study investigates the development and in vivo evaluation of a plant-based antidiabetic nano formulation using Solanum torvum extract (STE) loaded into mesoporous silica nanoparticles (MSNs). Diabetes mellitus was induced in male Wistar rats using streptozotocin (60 mg/kg, i.p). Animals were treated for 28 days with STE, STE-MSNs, STE-MSNs tablets, or Metformin (500 mg/kg). The nano formulation demonstrated superior therapeutic efficacy compared to plain extract, achieving 61.3% reduction in blood glucose and 217.2% improvement in serum insulin levels. Significant restoration of antioxidant enzymes (SOD, CAT, GSH) and reduction in lipid peroxidation (MDA) were observed. STE-MSNs also exhibited marked nephroprotective effects and preserved pancreatic â-cell architecture histologically. The findings establish STE-MSNs as a promising multi-target nano-therapeutic system for diabetes management with enhanced bioavailability and organ-protective benefits.

Impact of sex and breeding season on the interdigital gland morphology and chemical constituents of South Indian breeds of Ramnad white sheep, *Ovis aries*

T. Rajagopal and T.R. Gayathri
Department of Zoology, Thiagarajar College (Autonomous), Madurai-625 009,
Tamil Nadu, India.
corresponding author: e-mail: rajagopal_zool@tcarts.in

Abstract

In ruminants, interdigital glands (IDG) are well-developed structures that vary in morphology and chemical composition across species, playing a major role in scent-marking behavior and pheromone communication. This study examined the effects of sex and breeding season on the morphology and chemical constituents of interdigital glands in the South Indian Ramnad White sheep breed. A total of 40 interdigital glands were collected from a slaughterhouse during both breeding and non-breeding

seasons and subjected to anatomical, histological, and volatile compound (pheromone) analysis.Radiographic analysis revealed that the interdigital glands are located between the digits of both the fore- and hind limbs and are shaped like a tobacco pipe. Morphometric examination showed that the mean weight, length, and width of the glands varied significantly between male and female sheep. Histological analysis identified three distinct layers within the glandular walls: (a) the epidermis, consisting of keratinized stratified squamous epithelium organized into the stratum basale, stratum spinosum, stratum granulosum, and stratum corneum. (b) the dermis, containing sebaceous lobules, apocrine lobules, hair follicles, and arrector pili muscles. (c) the fibrous capsule, consisting of parallel bundles of collagen fibers, nerve fibers, and blood vessels. Furthermore, the density and diameter of the sebaceous and apocrine lobules in male sheep were significantly higher during the breeding season compared to the non-breeding season and were also higher than those in females. Histochemical analysis revealed that the secretions reacted positively with Alcian Blue, Periodic Acid-Schiff (PAS), and Sudan Black B, indicating the presence of glycosaminoglycans, glycoproteins, and lipoproteins, respectively. GC-MS analysis identified 39 major chemical constituents in the interdigital gland secretions. Notably, octadecanoic acid and 1-triacontanol were present only in males during the breeding season, whereas 4-methylundecane and 1-iodo-2-methylundecane were exclusive to females during the breeding season; these compounds were absent during the non-breeding season. Compounds such as 1-tetradecanol, hexadecane, heptadecane, octadecane, 1-octadecanol, eicosane, docosane, and cholesterol—known for their antimicrobial properties in mammals—were prominent in both sexes. Based on histomorphological observations and volatile compound profiling, it is concluded that the interdigital gland utilizes sebaceous and apocrine lobules to secrete substances that facilitate olfactory communication and provide antimicrobial protection for the feet against infections.

Keywords: *Ramnad White sheep, Interdigital gland, Breeding season, Sebaceous secretory lobules, 1-tetradecanol, Pheromone communication.*

Influence Of FYM and Zinc on Agronomic Performance of Kharif Fodder Sorghum

Tomar A.*, Patel H.K., Rathod P.H., Raval C.H. And Chavda K.
Department Of Agronomy
B. A. College Of Agriculture, Anand Agricultural University, Anand

Abstract

A field study was carried out during the *kharif* season of 2024 at the MFRS, AAU, Anand, to assess the Effect of FYM and zinc application on yield and quality of *kharif* fodder sorghum". There were total twelve treatment combinations i.e. Main plot two treatments (0 and 10 t FYM/ha) and sub plot six zinc application treatments Z_1 (0 kg Zn/ha), Z_2 (12 kg Zn/ha), Z_3 (25 kg Zn/ha), Z_4 (12.5 kg Zn/ha *fb* ZnSB soil application), Z_5 (12.5 kg Zn/ha *fb* 0.05% Zn foliar application) and Z_6 (12.5kg Zn/ha *fb* ZnSB soil application *fb* 0.05% Zn foliar application), (0.05% Zn foliar application at 30 and 45 DAS and ZnSB soil application after 1st irrigation). Experiment laid out in RBD(Factorial) with three replications. An application of 10 t FYM/ha reported significantly higher green sorghum fodder yield (421.50 q/ha),

DMY (128.93 q/ha) and CPY (11.94 q/ha) compared to control treatment (0 t FYM/ha). Zinc content and uptake (29.91 mg/kg, 41.07 g/ha, respectively) and available zinc (2.96 mg/kg) was observed in higher application of FYM (10 t FYM/ha) while *ZnSB* count was also reported higher in same treatment. Application of 12.5 kg Zn/ha *fb ZnSB* soil application *fb* 0.05% Zn foliar application reported significantly higher GFY (376.33 q/ha), DMY (123.36 q/ha), CPY of (11.59 q/ha) and zinc content (29.64 mg/kg) while after harvest available zinc (2.84 mg/kg) and uptake (41.99 g/ha) was reported higher in treatment Z_5 and Z_6, respectively. Interaction effect of FYM and zinc application has significant response. Combined application of 10 t FYM/ha with 12.5 kg Zn/ha *fb* 0.05% Zn foliar application (F_2Z_5) reported higher DMY (180.73 q/ha) and CPY (18.61 q/ha) while treatment combination F_2Z_6 (10 t FYM/ha with 12.5kg Zn/ha *fb* ZnSB soil application *fb* 0.05% Zn foliar application) noted significantly higher zinc uptake (64.03 g/ha) and after harvest available zinc (3.40 mg/kg).

Keywords: *Acid detergent fiber, crude protein, crude protein yield, dry matter, dry matter yield, zinc solubilizing bacteria*

Soil-Vegetation Responses to Silica Sandstone Mining in a Tropical Dry Deciduous Forest: A Spatial Gradient Based Assessment from Prayagraj, India

[1*]Vandita and [2]Kumud Dubey

[1]Forest Ecology and Climate Change Division, Forest Research Institute, Dehradun, India

[2]ICFRE - Eco-Rehabilitation Centre, Prayagraj, India

[*]***Corresponding Author Email: vandita1313@gmail.com***

Abstract

Open-cast mining reshapes soil properties and vegetation structure in ways that can persist long after extraction ceases. Although many studies document soil degradation and vegetation loss due to open-cast mining, comparatively fewer have employed structured distance gradients from the mining site to quantify how soil and vegetation properties vary spatially and whether such patterns extend through soil profiles in natural forest systems. Addressing this gap, we evaluated soil physicochemical characteristics and plant community structure along a defined distance gradient from a silica sandstone mining site in Shankargarh, Prayagraj, India. Three zones were established: adjacent to the mine, 1 km away, and 2 km away, with 15 sampling points per zone. Soil samples were analyzed for physicochemical properties alongside phytosociological assessment of the vegetation strata.

Soil moisture, water holding capacity, total organic carbon, and available N and P increased consistently with distance from the mine, while available K declined, indicating mining induced alteration of nutrient dynamics and substrate characteristics. Principal Coordinates Analysis revealed clear separation among zones, and two-factor PERMANOVA attributed 64.2% of total soil variation to zonal effect, whereas soil depth effects were insignificant. These findings indicate that mining impacts are predominantly structured across the landscape rather than vertically. The spatial reorganization of soil nutrients was mirrored by vegetation composition; the zone closest to mines exhibited lower species richness and strong dominance, whereas diversity of herbs and trees increased with distance. Shrub diversity peaked at the intermediate zone, suggesting transitional habitat heterogeneity during recovery.

The results highlight that post-mining ecosystem recovery is spatially mediated and closely tied to soil nutrient rebuilding, effective rehabilitation must therefore prioritize nutrient stabilization. While providing a transferable framework the study highlights the urgency of ecological restoration and informed policy interventions to restore soil-vegetation balance and strengthen long term ecosystem stability in post mining landscapes.

Keywords: *Floral Diversity, PERMANOVA, Rehabilitation, Soil Physicochemical Properties, Species Richness*

Molecular Approaches to Plant Genetic Transformation: Crispr–Cas Genome Editing, *Agrobacterium Tumefaciens* - Mediated Gene Transformation and Complementary Techniques.

Vijay Thakur[1], Himani Thakur[2], M.V. Parakhia[3], N.D. Dholariya[4], G.V Marviya[5], G.U. Kulkarni[6], V.R. Akabari[7], C.A. Babariya[8].

[1]M.Sc. Research Scholar, Department of Genetics and Plant Breeding, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

[2]M.Sc. Research Scholar, Department of Environment Studies, Panjab University, Chandigarh, India.

[3]Assistant Professor, Department of Biotechnology, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India.

[4]Associate Professor, Department of Main Oilseeds Research Station, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India.

[5]Associate Research Scientist, Main Dry-Farming Research Station, Junagadh Agricultural University, Targhadiya, Gujarat, India.

[6]Professor, Department of Genetics and Plant Breeding, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India.

[7]Assistant Professor, Department of Main Oilseed Research Station, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India.

[8]Assistant Professor, Wheat Research Station, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India.

Author email ID and Mobile No.: Vijayraajputthakur51297@gmail.com and 9015494008

Abstract

Plant genetic transformation is a cornerstone of modern plant biotechnology, enabling the stable integration of foreign DNA and precise genome modifications for crop improvement, functional genomics and sustainable agricultural development. This abstract presents a comprehensive and systematic overview of molecular approaches to plant transformation, with particular emphasis on *Agrobacterium tumefaciens*-mediated gene transfer and CRISPR–Cas9 based genome editing, while also integrating established and emerging complementary techniques. *Agrobacterium*-mediated transformation, employing Ti plasmid–derived binary and super-binary vector systems, is highlighted as the most widely utilized method due to its high transformation efficiency, low transgene copy number, and stable inheritance across generations. This system also represents the principal delivery platform for CRISPR-

Cas9 components, facilitating precise, targeted genome modifications through site-specific double-strand breaks and subsequent DNA repair mechanisms. In addition, alternative transformation strategies are discussed, including biolistic-particle bombardment approaches for monocotyledonous and transformation-recalcitrant species as well as plastid genome engineering; protoplast-based methods such as polyethylene glycol-mediated and electroporation-assisted transformation for transient expression and genome editing; other physical and chemical techniques including microinjection, silicon carbide whisker-mediated delivery, liposome-mediated transfer and calcium phosphate-mediated DNA uptake. Tissue culture-independent methodologies, including pollen-tube-mediated gene transfer, *in planta* transformation, and the floral dip technique, are also addressed for their operational simplicity and reduced reliance on regeneration systems. Furthermore, emerging technologies such as sonication-assisted, laser-assisted, nanoparticle-mediated gene delivery, and virus-based transformation systems for transient expression, virus-induced gene silencing and genome-editing reagent delivery are reviewed. Collectively, this overview underscores that although *Agrobacterium tumefaciens*-mediated, CRISPR–Cas9 transformation currently represents the most efficient and precise strategy in plant genetic engineering, the successful application of transformation technologies depends on the judicious selection of delivery method, vector design, target tissue, and plant species.

Keywords: *Plant genetic transformation, Agrobacterium tumefaciens, CRISPR-Cas9 genome editing, Biolistic transformation, Protoplast transformation, Tissue culture-independent methods, Nanoparticle-mediated gene delivery, Virus-based transformation.*

Green AI Driven Energy-Efficient Deep Learning for Sustainable Farming Systems: A Vedic-Inspired Computational Framework

***Vipin Kumar Choudhary[1], Vineet Vishnoi[2], Dev Raj Mishra[3] and Anil Kumar[4]**

[1]Senior Scientist, ICAR-Indian Institute of Farming Systems Research, Modipuram Meerut (UP) India-250110

[2]Associate Professor, School of Computational Sciences and Engineering, Shobhit University, Meerut (UP) India-250110

[3]Principal Scientist, ICAR-Indian Institute of Pulse Research, Kanpur (UP) India-208024

[4]Assistant Director General, ICAR HQ, Krishi Bhawan, New Delhi (India)-110011

Corresponding Author: *Vipin Kumar Choudhary,ICAR-Indian Institute of Farming Systems Research, Modipuram Meerut (UP) India-250110

Email: vipinmeerut@gmail.com

Abstract

Deep learning has transformed various fields, from computer vision to agricultural analytics, by providing exceptional predictive accuracy and automation capabilities. However, these advancements come with challenges, including high computational complexity and significant energy consumption. This poses difficulties for large-scale and sustainable implementation, especially in smart sustainable farming systems. The emerging paradigm of Green AI prioritises reducing energy consumption, carbon footprint,

and hardware dependency while maintaining acceptable model performance. This paper presents a Green AI oriented computational framework for sustainable farming systems that integrates algorithmic efficiency strategies with a Vedic-inspired paradigm. Drawing on the distinction between green-in AI (energy-efficient AI design) and green-by AI (AI applied to environmental sustainability), the study situates agricultural deep learning within both dimensions. Specifically, Vedic Sutras such as *Urdhva–Tiryagbhyam* (vertical and crosswise multiplication), *Nikhilam Navatashcaramam Dashatah* (methods of complements), and *Ekadhikena Purvena* (one more than the previous) are explored for their potential to optimize arithmetic operations within neural network architectures. These principles are combined with modern efficiency techniques, such as model pruning, quantization, and hardware acceleration, to facilitate low-power inference and faster computation. The proposed approach illustrates how Vedic mathematics can influence algorithm design and hardware implementation for energy-efficient deep learning models in precision agriculture. Through this interdisciplinary approach, the study outlines a pathway toward sustainable AI ecosystems that reduce carbon footprints while ensuring the robustness needed for real-world agricultural applications.

Keywords: *Computational Sustainability; Green AI; Neural Efficiency; Precision Agriculture. Smart Farming*

Spatiotemporal Dynamics of Groundwater-Dependent Ecosystems (GDEs) in the Central Madhya Pradesh Integrated Corridor: A Multi-Sensor SAR Analysis (2010–2024)

Arpit Shrivastava[1], Surjeet Singh[2], Nidhi Shukla[1]

[1]Department of Environmental Science, Amity School of Life Science, Amity University Madhya Pradesh

[2]Centre for Cryosphere and Climate Change Studies, National Institute of Hydrology, Roorkee, Uttarakhand

Abstract

Groundwater-dependent ecosystems (GDEs) are key indicators of regional hydrological health but are increasingly threatened by anthropogenic pressure and climatic variability. This study investigates spatiotemporal transitions in GDE potential across the Central Madhya Pradesh Integrated Corridor (Bhopal, Raisen, Vidisha, Sehore, and Rajgarh districts) over a 14-year period using a consistent Multi-Criteria Decision Analysis (MCDA) framework integrating L-band Synthetic Aperture Radar (SAR) data from ALOS PALSAR-1 (2010) and ALOS-2 PALSAR-2 (2024). The methodology involved radiometric calibration of HH and HV backscatter, application of a 7×7 Refined Lee filter for speckle suppression, and terrain conditioning using 30 m SRTM DEM data. GDE potential zones were delineated under hydrologically favourable conditions defined by slope gradients below 3°, cross-polarization moisture ratios between 4 and 15, and surface roughness thresholds exceeding “20 dB in HH polarization. Results indicate a resilient baseline, with 91.4% (34.5 million pixels) of the landscape maintaining stable GDE conditions. However, change detection analysis reveals a gross GDE loss of approximately 1,902 km², primarily concentrated around expanding urban centres and intensively cultivated agricultural

zones. This loss is partially offset by a gain of approximately 1,024 km², likely associated with localized irrigation expansion and surface water management interventions. The net decline of 878 km² highlights a progressive reduction in groundwater-supported vegetation across the region. The study demonstrates the effectiveness of SAR-based indicators for long-term monitoring of groundwater-dependent ecosystems and provides a scalable framework to support sustainable aquifer management and climate resilience planning within the Narmada Basin.

Keywords - *SAR remote sensing, ALOS PALSAR, Change detection, MCDA, Backscatter analysis*

Adsorption, desorption, mobility and leaching studies of Broflanilide insecticide from agricultural soils collected from Goa, India

Shefali S. Ainkar, Dr. Rupesh E. Patre*
School of Chemical Sciences, Goa University, Taleigao Plateau, Goa – 403206, India
(chem.shefali@unigoa.ac.in, *rupesh.patre@unigoa.ac.in)
Corresponding author email: rupesh.patre@unigoa.ac.in

Abstract:

As the global population elevates, food security pressures are increasing agricultural production. Pesticides are widely used because they are cost-effective against pests, diseases, and weeds, but as environmental xenobiotics they can persist in ecosystems. Nearly half of foliar-applied pesticides reach the soil, where slow degradation and residue formation allow uptake by crops or leaching into groundwater, creating risks to ecosystems and human health. An efficient, highly sensitive analytical method was developed for the detection of trace levels of the new insecticide broflanilide using HPLC from agricultural soil with mobile phase composition as 75:25 Acetonitrile: 0.1% Formic acid water. QuEChERS extraction method was employed for sample preparation which were then analysed by HPLC-UV. Batch Adsorption and desorption studies revealed maximum adsorption efficiency in soil C which can be attributed to high level organic carbon present in the same. The LOD was found to 0.2112 ppm and LOQ was 0.6402 ppm respectively. Thin layer chromatography was used to study the vertical migration of Broflanilide in different soils and results showed that the insecticide migrated most in soil M. Degradation experiments were carried out to understand the degradation pattern of broflanilide and the degradation mechanism followed Zero order kinetics model with R2 values ranging between 0.9179-0.9963. The half-life (*t1/2*) values were found to be between 32-40 days. The degradation rates increased with the increase of the organic carbon content in the soils. Leaching test was conducted in soil columns to observe the migration of broflanilide through the soil to assess the risk of ground water contamination and the results showed that the majority of the insecticide remained on the column and very less amount was leached into the leachate in all the soils posing less risk of ground water contamination.

Keywords: *QuEChERS, Adsorption, Desorption, Leaching, Soil*

Nanotechnology-Based Seed Treatments for Sustainable Yield Improvement in Rice (*Oryza sativa* L.)

N. N. Makani[1], Sheetal R. Patel[2], Dharmishta M Patel[3]
[1]Polytechnic in Agriculture, Navsari Agricultural University, Vyara-394652, Gujarat, India
[2]Polytechnic in Agriculture, Navsari Agricultural University, Vyara-394652, Gujarat, India
[3]Department. of Fruit Science, ACH, Navsari Agricultural University, Navsari
Email: nnmakani@nau.in

Abstract:

Nanotechnology offers novel solutions for enhancing productivity, nutrient use efficiency, and stress resilience in rice (*Oryza sativa* L.) through advanced seed nano-treatment strategies. Conventional seed treatments often face limitations such as poor nutrient delivery, nutrient losses, and environmental concerns. In contrast, nanomaterials including zinc oxide nanoparticles (ZnO NPs), selenium nanoparticles (Se-NPs), and other nano-fertilizers enable controlled release of nutrients and protective agents directly at the seed interface, promoting early seedling vigor and improved yield formation. Recent studies indicate that seed nano-priming and nano-fertilizer applications significantly enhance physiological and agronomic performance. Seed priming with ZnO NPs has been shown to improve plant height, chlorophyll content, antioxidant enzyme activity (superoxide dismutase and peroxidase), and yield attributes under drought stress. Optimized concentrations, such as 25 ppm ZnO NPs, resulted in higher grain and straw yields compared to untreated controls. Under cadmium stress, nano-priming with ZnO NPs improved seedling growth, enzymatic activity, metabolic profiles, and early vigor, demonstrating enhanced tolerance to heavy metal toxicity. Combined nano-priming with ZnO NPs and Se-NPs further improved germination rate, seedling vigor, and yield-related traits in direct-seeded systems, highlighting synergistic effects. Application of ZnO NPs as nano-fertilizers increased grain yield and its components, including panicle number, spikelets per panicle, 1000-grain weight, and filled grain percentage, likely due to enhanced dry matter accumulation and photosynthetic efficiency. Foliar application at critical stages such as panicle initiation improved net photosynthetic rate, biomass, yield (1.5–6.4% increase), and grain quality, including reduced chalkiness and improved micronutrient content. However, effectiveness depends on nanoparticle size, dosage, surface characteristics, and environmental factors. Field-scale studies, environmental risk assessment, and regulatory standardization remain essential for sustainable adoption.

Keywords: *Nanotechnology, Seed treatment, Nano-fertilizers, Sustainable agriculture, Yield enhancement, Abiotic stress tolerance.*

Prediction of Seed Storability and Longevity using the Accelerated Aging (AA) Test

N. N. Makani[1]; Dharmishtha M. Patel[2]; and S. R. Patel[3]
[1] Assistant Professor, Polytechnic in Agriculture, NAU, Vyara
[2] Assistant Professor, Dept. of Fruit Science, ACH, NAU, Navsari
[3] Assistant Professor, Polytechnic in Agriculture, NAU, Vyara

Email: nnmakani@nau.in

Abstract

The ability to predict the storage potential of seed lots is essential for effective inventory management and carry-over decisions. Standard germination tests often fail to identify seed lots that are viable but possess low vigor and poor storability. This study evaluates the Accelerated Aging (AA) test as a predictive model for the storage life of seed. Seed lots with high initial germination (>90%) were subjected to accelerated aging conditions of 41‟C (±1‟C) and <„100% relative humidity for durations of 72 to 96 hours. The physiological deterioration induced by these stress conditions was compared to natural aging in ambient warehouse storage over a period of (e.g., 12 to 18 months). Results demonstrated a highly significant positive correlation (r>0.85) between germination after accelerated aging and germination after natural storage. Specifically, seed lots that maintained germination above 80% after the AA stress period retained high viability (>85%) after 12 months of ambient storage. Conversely, lots that declined rapidly during the AA test showed a precipitous drop in viability within 4–6 months of storage, despite having high initial standard germination. The study confirms that the Accelerated Aging test is an accurate, rapid prognostic tool for segregating seed lots based on their relative storage potential.

Keywords: *Accelerated ageing, vigor, viability, germination.*

Assessment of Nelumbo nucifera Genotypes for Vegetative Growth and Yield Performance under the Mid-Hill Ecosystem of Meghalaya

Nandha kumar N*, P. Raviteja, H. Rymbai, V.K. Verma, H.D. Talang, M.B. Devi, Praveen G
Scientist, ICAR-RC NEH, Umiam, Meghalaya, India
****For correspondence Mail id: nandhakumarfruits@gmail.com***

Abstract

The present investigation was conducted during 2024–2025 at the Horticulture Section, DSRE Division, ICAR Research Complex for NEH Region, Umiam, Meghalaya, to evaluate the performance of fifteen lotus (*Nelumbo nucifera*) genotypes under the mid-hill ecosystem using a Randomized Complete Block Design (RCBD) with three replications. Significant variation was observed among the genotypes for vegetative growth, flowering behavior, and quality attributes. Thai Dwarf recorded the earliest coin leaf emergence (10.33 days), followed by Raane Red (11.67 days), whereas Yellow Pror Pink (16.33 days) showed the longest duration; Thai Dwarf also exhibited the earliest aerial leaf emergence (21.01 days) and the highest number of leaves per plant (45.04), while Yellow Pror Pink (24.04) and Buccha (25.01) recorded the lowest. The maximum stem length was observed in Hong Taiyang (37.78 cm), followed by Happy Lover (36.14 cm), whereas Thai Dwarf (16.28 cm) had the shortest stems. In terms of floral traits, Yellow Pror Pink flowered earliest (44.31 days), while Octopus (68.36 days) was the latest; however, Octopus produced the highest number of flowers per plant (10.74), followed by Sium Ruby (10.24), whereas Yellow Pror Pink (2.74) produced the fewest. The longest field life of flowers (7.33 days) was recorded in Sium Ruby, and the highest number of petals per flower (145) was observed in

New Star, compared to the lowest (12 petals) in Yellow Pror Pink.

Keywords: *Nelumbo nucifera genotypes, vegetative growth parameters, floral characteristics, genotype performance assessment.*

Berry: A Nutritional Magic in the Health Sector

[1] Prathipati Aditya, [2] Godisela Prashanthi

[1] Dept. of Environment and Agriculture, Anglia Ruskin university Writtle, UK

[2]Dept. of Environment and Agriculture, Anglia Ruskin university Writtle, UK

Corresponding Author: prathipatiadityauk@gmail.com

Abstract

Global nutrition is the key factor for sustainable livelihood. In health nutrition. Fruits and vegetables have a specialised constitution in this industry, especially the most highlighted nutrition in berries, which has a particular position in health nutrition. The pharmaceutical industry is currently developing a new phase that includes berries as a component, enriching the improvement and focusing on maximizing health quality. Berries are best for their accumulation of antioxidants (phytosterols, vitamin C). The amount of nutrients and also the supply of antioxidants will vary, and it always depends on the variety and the type of berries. Berries act as a multi-nutrient solution and also as a supportive medicine for many incurable diseases. Infact in ancient history, berries have a unique significance in ramayan and the Mahabharata to treat people suffering from several cases of nutritional imbalance. It has a high potential. The health environment in urban society is deteriorating day by day due to lifestyle and due to the increase in pollution, which creates new permanent diseases like high blood pressure and diabetes. The influence of the berries in the health development industry created a new impact in reducing the dosage of medication, that effect in the reducing the reduction of hypertension and hyperglycemia. Emerging scientific evidence supports health-promoting and potential factors like oxidative stress and inflammation, as well as vascular dysfunction, and numerous metabolic dysregulations. In vitro studies identify that the anthocyanins and other polyphenols in berries have a range of potential anti -cancer and heart disease properties, including antioxidant, anti-inflammatory, and cell regulatory effects. The longterm intake of berries will influence the organ systems of the organisms and also improve the plasma lipid profile. Hence, berries create a new generative solution for the improvement of the health solution

Keywords: *Global nutrition, pharmaceutical, health environment, anthocyanines, generative solution*

Comparative characterization of yield and quality traits and root plasticity of rice under transplanted and aerobic ecosystems

Rakesh Kumar[1]*, Bhawana[2], Koppula Satya Sai Kumar[2], Prerna Pilania[2]

[1]Rice Research Station, Kaul, Haryana, India

[2] Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India
Corresponding author e-mail: dr.rakesh@hau.ac.in

Abstract

The escalating crisis of freshwater depletion and labor scarcity in major rice-growing belts necessitates a paradigm shift from the conventional puddled transplanted rice (TPR) system to the water-efficient aerobic direct-seeded rice (DSR) system. However, the adoption of DSR is hindered by the lack of specialized genotypes capable of mitigating the yield penalties associated with non-flooded, oxidative soil environments. This investigation evaluated 48 diverse rice genotypes, comprising 24 Basmati and 24 Non-Basmati lines, under two distinct production ecosystems—aerobic and transplanted—to assess genetic variability, character association, and divergence for 21 morpho-physiological and quality traits. Analysis of variance revealed highly significant genotypic differences ($P<0.01$) for all traits in both environments, indicating substantial genetic heterogeneity suitable for selection. Mean grain yield per plant was lower under aerobic conditions (24.14 g) compared to transplanted conditions (27.61 g), reflecting a yield reduction of 12.6% under DSR. Grain yield exhibited high heritability in both systems (84.45% in DSR and 78.80% in TPR), indicating substantial scope for selection. Trait associations differed markedly between systems. Under aerobic conditions, grain yield showed strong positive correlations with biological yield ($r = 0.818^{**}$), harvest index ($r = 0.727^{**}$) and root traits such as root length and root dry weight. Path coefficient analysis revealed that under aerobic conditions, biological yield (direct effect = 0.623) and harvest index (0.656) were major direct contributors to grain yield, with additional indirect contributions from root traits. In contrast, under transplanted conditions, yield improvement was primarily governed by conventional yield components such as number of grains per panicle and test weight, which exerted higher direct effects on grain yield. Root traits, though expressed, played a relatively lesser role under transplanted conditions. Grain quality traits showed relatively stable expression across both systems. Overall, the results emphasize system-specific breeding strategies prioritizing root architecture and resource-use efficiency for aerobic rice while maintaining strong yield components for transplanted systems for future varietal improvement.

Keywords: *Rice, Aerobic rice; Transplanted rice; Genetic variability; Root traits; Grain yield*

Development of Metal Organic Framework (mof) Based Nanosensors For Pesticide Detection

Rauvinsh Kumar, Dr. V. N. Mehta
Department of Soil Science And Agricultural Chemistry
N. M. College of Agriculture, Navsari Agricultural University, NAVSARI – 396 450

Abstract

The present investigation on "DEVELOPMENT OF METAL ORGANIC FRAMEWORK (MOF) BASED NANOSENSORS FOR PESTICIDE DETECTION" was carried out at Division of Plant Biotechnology, ASPEE SHAKILAM Biotechnology Institute, Navsari Agricultural University, Surat and Department of Soil Science and Agricultural Chemistry, N. M. College of Agriculture, Navsari

Agricultural University, Navsari during the year 2023-2024.

Pesticides are widely used in agriculture to control plant pathogens like insects, fungi, herbs and nematodes, significantly boosting crop yields. However, their use comes with health risks, as millions of people suffer from pesticide poisoning, and they harm the environment by affecting biodiversity and contaminating soil and water. Traditional pesticide detection methods such as High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Liquid Chromatography-Mass Spectrometry (LC-MS), Gas Chromatography- Mass Spectrometry (GC-MS), capillary electrophoresis etc. are often expensive and time-consuming. As an alternative, researchers are exploring nanomaterial-based sensors, including Metal Organic Frameworks (MOFs), which offer high surface area, porosity and luminescence properties, making them promising for rapid, cost-effective and sensitive pesticide detection. Despite their potential, MOFs require further development for improved sensitivity and selectivity.

This study explored the synthesis of Zn-MOF using zinc-nitrate hexahydrate and 2-methylimidazole by hydrothermal method at 150 ºC for 8 h. The synthesized Zn-MOF was characterized for their structural, shape, size and functional group using Fourier Transform Infrared Spectroscopy (FT-IR), X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM).

Zn-MOF exhibited strong blue fluorescence under UV radiation at the excitation wavelength of 365 nm, with peak fluorescence at pH 7.0, indicating optimal stability under neutral conditions. Protonation and deprotonation at extreme pH values led to reduced fluorescence stability of Zn-MOF. The Zn-MOF exhibited the emission spectrum at 426 nm at the excitation wavelength at 350 nm. XRD peaks at 2¸ values of 31.55°, 34.19°, 35.99°, 47.24°, 56.31°, 62.58°, 67.57° and 68.71° corresponding to lattice planes of (110) (200) (211) (220) (310) (222) (321) (400) which demonstrated a crystalline system. Furthermore, SEM results showed that the Zn-MOF particle size with 12.37 nm and hexagonal rod shape. FT-IR spectra of Zn-MOF showed the peak of O-H, C-H, C=O, carboxylate groups and zinc ion group. Selectivity studies demonstrated the Zn-MOF's capability to distinguish tebuconazole and tricyclazole from other pesticides (metribuzin, oxyfluorfen, pendimethalin, pyrithiobacsodium, thiram, metalaxyl, isoproturon, isoprothiolane, fipronil and copper-oxychloride), using fluorescence spectrophotometer. Sensitivity analysis revealed effective detection of tebuconazole and tricyclazole pesticides at concentrations between 100 ¼M and 1000 ¼M. Linear relationships were observed between fluorescence turn-on efficiency and pesticide concentration, with detection limits of 65.11 ¼M for tricyclazole and 76.33 ¼M for tebuconazole. Interference studies confirmed that the presence of other pesticides did not affect the Zn-MOF's ability to detect tebuconazole and tricyclazole selectively.

Real sample analysis demonstrated the Zn-MOF's effectiveness for detection of tebuconazole and tricyclazole in river water, agricultural soil, apple, and cabbage. Using the standard addition method, the Zn-MOF achieved high recovery rates (94.32%–99.99%) and low relative standard deviations (RSDs) below 1.46 %, confirming its precision and reliability. These findings highlight the potential of Zn-MOF as a fluorescence-based sensor for detection of tebuconazole and tricyclazole pesticides in complex environmental matrices. Its high sensitivity, selectivity, and strong fluorescence properties makes Zn-MOF a valuable tool for environmental monitoring and food safety. Further research may focus on

improving its performance for broader real-world applications.

In conclusion, the Zn-MOF synthesized by the hydrothermal method demonstrates excellent potential as a fluorescence-based sensor for detection of tricyclazole and tebuconazole with high sensitivity and selectivity. The structural analysis (FT-IR, SEM, XRD) confirmed the successful synthesis, hexagonal rod morphology, and strong fluorescence properties at pH 7.0. The sensor achieved high recoveries (94.32–99.99%) and low RSDs in real samples like river water, agricultural soil, apple, and cabbage with low detection limits of 65.11 ¼M for tricyclazole and 76.33 ¼M for tebuconazole. These results underscore its reliability, stability, and applicability for pesticide detection in environmental and food safety monitoring.

Landslide susceptibility mapping for agricultural land conservation and environmental management: a GIS-based MCDA approach in Uttarakhand himalaya, India

Shalini Polakampalli [1]*, Raju Sarkar [2]

[1] Department of Civil Engineering, Delhi Technological University, New Delhi -110042, India

[2] Department of Civil Engineering, Delhi Technological University, New Delhi -110042, India

**** Corresponding author e-mail: p.shalini_23phdce503@dtu.ac.in***

Abstract

Landslides in the Uttarakhand Himalaya directly threaten agricultural land, forest cover, watershed integrity, and rural livelihoods, yet their spatial relationship with farming landscapes and environmental resources has received far less attention than their structural or infrastructure impacts. This study presents a GIS-based Multi-Criteria Decision Analysis (MCDA) framework, employing the Analytic Hierarchy Process (AHP), to map landslide susceptibility for a part of Uttarakhand and interpret the results explicitly through an agricultural and environmental management lens. Eight conditioning factors — slope, aspect, geomorphology, land use/land cover (LULC), drainage network proximity, road network proximity, rainfall, and lithology — were weighted using AHP and combined into a Landslide Susceptibility Index (LSI). The resulting map classifies approximately 63.34% of the study area as High susceptibility and 18.44% as Very High, collectively covering over 716,000 hectares. Cross-analysis with the LULC layer reveals that significant proportions of cropland, shrubland/grassland, and tree cover fall within high-risk zones, with direct implications for food security, soil conservation, and watershed health. The findings are discussed in the context of sustainable agricultural planning, agroforestry interventions, watershed management, and climate-resilient land-use policy for mountain communities. The study demonstrates that landslide susceptibility maps are not merely hazard documents — when interpreted through an agricultural and environmental framework, they become powerful tools for proactive land stewardship and rural development planning in vulnerable Himalayan ecosystems.

Keywords: *MCDA, Landslide Susceptibility, Agricultural Land Loss, GIS, AHP, Agroforestry*

Analysis of Fatigue Failure Mechanisms in Tillage Tools: Impact of Cyclic Loading and Soil Abrasivity on Component Longevity

Shankar Swarup Das[1], Ng. Devarani[2]
Department of Farm Machinery and Power Engineering, College of Agricultural Engineering and Post harvest Technology (Central Agricultural University Imphal), Gangtok, Sikkim, India
Corresponding author Email: shankarswarup@gmail.com

Abstract

Agricultural soil-engaging tools face premature failure due to the combined effects of abrasive wear and cyclic loading. This study addresses the lack of integrated wear-fatigue models by investigating the transition from surface degradation to catastrophic fracture in tillage components. Finite Element Analysis (FEA) was employed to map stress concentrations in boron steel tines under simulated draft forces. Experimental validation involved hardness mapping, high-cycle fatigue testing (R= 0.1), and fractographic analysis using Scanning Electron Microscopy (SEM) to identify crack initiation sites. Results indicate that abrasive "notches" from soil interaction significantly accelerate crack initiation. Boron steel exhibited superior through-hardenability and a 35% higher fatigue limit compared to traditional high-carbon steel. Cumulative damage analysis using the Palmgren-Miner rule successfully predicted the mean time to failure within a 10% error margin. The study demonstrates that enhancing fracture toughness via tempered martensitic microstructures and introducing surface compressive stresses through shot peening are critical for extending the service life of agricultural implements.

Keywords: *Fatigue Failure; Boron Steel; Agricultural Implements; Abrasive Wear; Finite* Element Analysis

QTL mapping for drought tolerance at reproductive stage in Rice (*Oryza sativa* L.)

Sheetal R. Patel[1], R. K. Patel[2], Gita R. Chaudhari[3], N. N. Makani[4]
[1]Polytechnic in Agriculture, Navsari Agricultural University, Vyara-394652, Gujarat, India
[2]N M college of Agriculture, Navsari Agricultural University, Navsari-396450, Gujarat, India
[3]Main Forage research Station, Anand Agricultura University Anand-388110, Gujarat, India
[4]Polytechnic in Agriculture, Navsari Agricultural University, Vyara-394652, Gujarat, India
Shitalpatel@nau.in

Abstract:

Drought stress during the reproductive stage is a major constraint to rice productivity, particularly in rainfed ecosystems. The present study aimed to identify quantitative trait loci (QTLs) associated with drought tolerance at the reproductive stage in rice (*Oryza sativa* L.). A mapping population comprising 190 F2 individuals derived from a cross between the drought-susceptible parent GNR-6 and the drought-tolerant parent NVSR-2272 was evaluated under controlled reproductive-stage water stress conditions. Phenotyping was conducted for 21 agronomic, yield, root, and physiological traits related to drought

tolerance. Genotyping was performed using 451 SSR markers, of which 35 (7.7%) were polymorphic and used for linkage map construction. A combined linkage map consisting of 11 linkage groups corresponding to 11 rice chromosomes was developed using QTL IciMapping v4.2, covering a total genetic distance of 1679.95 cM. Inclusive Composite Interval Mapping (ICIM) identified 257 significant marker–trait associations across the genome at a LOD threshold of 2.5. QTLs were detected on chromosomes 1, 2, 3, 4, 6, 8, 9, 10, and 11, with the highest density observed on chromosomes 6, 10, 9, and 1. The average LOD score was 8.89, with the maximum LOD value (18.81) recorded for a QTL associated with relative water content under 20 days of drought stress. Individual QTLs explained 0.22–6.49% of the phenotypic variance, indicating predominantly minor-effect QTLs. Several QTLs were identified for key yield-related traits, including grain yield per plant, filled and unfilled grains per panicle, spikelet fertility, and 100-seed weight. Multiple QTLs controlling grain yield per plant were distributed across eight chromosomes, reflecting the complex genetic architecture of yield under drought stress. Root-related traits such as root volume and root-to-shoot ratio were mainly governed by QTLs on chromosomes 3, 6, 10, and 11, highlighting the role of root system architecture in drought adaptation. Notably, clustering of QTLs for multiple morpho-physiological traits was observed. A prominent QTL hotspot on chromosome 1 between markers RM5641 and RM3412 was associated with grain yield per plant, shoot length, relative water content, water use efficiency, photosynthesis, stomatal conductance, transpiration, and chlorophyll content, collectively explaining 24.63% of phenotypic variation. Additional QTL clusters were detected across chromosomes 2, 3, 4, 6, 9, 10, and 11. These genomic regions represent valuable targets for marker-assisted selection aimed at improving drought tolerance and yield stability in rice.

Key words: *Oryza sativa, Reproductive-stage drought stress, Drought tolerance, Quantitative trait loci (QTLs), F, mapping population*

Studies On Genetic Variability, Diversity And Characterization Of Curcuma Caesia Roxb. Germplasm of North-East India

Tasnim Zumaina Mazumder[1]*, Manoj Kumar Sharma[2], Mohan Lal[3]
[1]SAS, Nagaland University, Medziphema, Nagaland, [2] BNCA, Assam Agricultural University, Assam, [3]NEIST, Jorhat.
Corresponding author : tzumaina1@gmail.com

Abstract

Curcuma caesia Roxb. is an erect, perennial, medicinal rhizomatous herb belonging to *Zingiberaceae* family which is commonly known as black turmeric due to its bluish-black rhizome and is native to North-East and Central India. *C. caesia* is now classified as an endangered species and therefore, conservation of this species is of utmost importance. A set of 100 *C. caesia* germplasms were characterized with respect to 26 agro-morphological traits as per DUS guideline. Two of the 26 characters were found to be monomorphic, twelve each were found dimorphic and polymorphic in nature. In case

of yield contributing traits, highest GCV was observed for number of tertiary rhizomes followed by rhizome yield per plant and number of primary rhizomes. Therefore, selection would be effective for these traits. High heritability coupled with high genetic advance as *per cent* of mean was observed for most of the traits under study indicating selection would be effective for these traits. Rhizome yield exhibited positive and significant association with plant height, leaf lamina length, leaf lamina width, petiole length, primary rhizome length, number of primary rhizome, number of secondary rhizome and number of tertiary rhizome. Therefore, these traits might be used to establish the selection criterion for improving rhizome yield. Path- coefficient analysis revealed that number of primary rhizomes exhibited the highest positive direct effect on rhizome yield followed by lamina width. Based on Mahalanobis' D^2-statistics the genotypes were grouped into ten clusters out of which cluster III had maximum number of genotypes. Among all the characters studied, maturity duration exhibited maximum contribution towards divergence. The intra- cluster distance was maximum in cluster VIII. Cluster IV and X showed the maximum inter-cluster distance. The implication of genetic diversity and *per se* performances in planning future breeding programme were discussed.

Keywords: *Black turmeric, polymorphic, genetic variability, heritability, genetic advance.*

Optimization of Natural Dyeing Process Parameters for Banana Fabric Using *Rhododendron arboreum* Flower Extract

Adinath Murlidhar Bele* and Sonu Rani
Apparel and Textiles Science Department, Community Science College, G.B.P.U.A.T., Pantnagar-263145, Uttarakhand
E-mail: adinathbele2000@gmail.com

Abstract

Rhododendron arboreum (Buransh) is an eco-friendly natural dye source belonging to the Ericaceae family. The flowers grow in clusters of up to twenty and exhibit a striking colour spectrum ranging from deep scarlet to pink and white. Buransh flowers were selected as the dye source due to their abundant local availability in the Uttarakhand region. Banana fabric, derived from the banana pseudo-stem, an agricultural waste material, was chosen for the study owing to its biodegradable, eco-friendly and cellulosic nature, making it suitable for sustainable textile applications. Additionally, banana fabric possesses desirable properties such as high absorbency, excellent breathability and good tensile strength. For dyeing optimization, dye concentration, dyeing temperature and dyeing time were selected as independent variables. Dye extraction method, extraction temperature and extraction time were maintained as constant parameters. Colour strength and washing fastness are the dependent variables. The dye was extracted using an aqueous medium without the addition of chemicals. Dye extraction parameters were optimized and maximum colour strength was obtained at an extraction temperature of 70! and an extraction time of 60 minutes. The banana fabric samples were dyed and evaluated for colour strength using a spectrophotometer set at a wavelength of 440 nm. The optimized dyeing

conditions for banana fabric dyed with *Rhododendron arboreum* dye extract were found to be 12g/ 100ml dye concentration, 80! dyeing temperature and 40 minutes dyeing time.

Keywords: *Sustainable, Biodegradable, Natural dye, Buransh, Banana fabric, Optimization*

Sustaining Barnyard Millet Productivity Using Liquid Consortia in Mid Hills of Himalaya

Ajay Kumar*[1], Arunima Paliwal[2], V. Mageshwaran[3], Ankit[1]

[1]ICAR- National Institute of Seed Science & Technology, ICAR Campus, Kushmaur, Mau, Uttar Pradesh, India [2]Department of Agronomy, College of Hill Agriculture, V.C.S.G. Uttarakhand University of Horticulture and Forestry, Chirbatiya, Uttarakhand, India

[3] ICAR National Bureau of Agriculturally Important Microorganisms (NBAIM), Mau, Uttar Pradesh, India

Corresponding author: ajay25912@gmail.com

Abstract

Barnyard millet is traditionally grown in Uttarakhand hills with little to no manure input, even under low-fertility soils, resulting in poor production levels in rainfed areas. To address this, a field experiment was conducted to investigate the benefits of liquid microbial consortia and their mode of application on barnyard millets at REC Gaja, Tehri Garhwal, Uttarakhand during Kharif 2022. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Treatments included varying levels of the Recommended Dose of Fertilizers (RDF) 100%, 85%, and 70% combined with different modes of application of liquid microbial consortia, namely: (i) seed treatment (ST), (ii) soil application (SA), and (iii) a combination of both. The experimental site is located in the rainfed mid hills of North Western Himalayan Zone of Uttarakhand on Silty clay loam soil with slightly acidic pH (5.6) and low available N (236 kg/ha) high P (36 kg/ha), high K (415 kg/ha), but medium organic carbon (0.72%). The plant height of barnyard millet was not significantly influenced by the treatments. The grain and straw yield were significantly higher in all treatments than T5(85% RDF+ ST) and T11(Control). The maximum grain yield was recorded in T1 (100 % RDF+ ST+ SA) which was statistically on par with T4(85 % RDF + ST+SA), T10 (RDF), T2 (100 % RDF + ST), T6(85 % RDF + SA), T3(100 % RDF + SA), T7(70 % RDF + ST+SA), T8 (70 % RDF + ST) and T9(70% RDF + SA). Maximum benefit cost ratio (3.14) was also registered in T4 (85% RDF + ST+SA) Which was followed by T1 (100% RDF+ ST+ SA) and T10(RDF). Maximum harvest index was also recorded in T5 (85% RDF + ST) followed by T8 (70% RDF+ ST) and T2 (100% RDF + ST). The integration of seed treatment and soil application of liquid microbial consortia alongside 85 % of recommended fertilizer doses emerged as the most economical strategy for enhancing the overall growth, grain productivity and profitability of Barnyard millet.

Keywords: *Barnyard millet, Liquid microbial consortia, Seed priming, Soil inoculation*

Millet Based Formulations: Physical, Functional, Nutraceutical, Organoleptic and Storage Study for Development of Snacks

Akkavva Wadakappanavar S[a], Nirmala B. Yenagi[b] and Kashibai Khydagi[c]

[a] Assistant Professor, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

[b]Professor (Retd), Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

[c] Professor and Head, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005

Abstract

Millets are accepted to have a better nutritional quality and are relatively high in dietary fiber, antioxidants, sulphur containing amino acids and essential fatty acids. Composite flours, replacing part of the wheat with other cereal or legume flours and other functional ingredients. Physical and functional properties of the processed raw materials i.e., cereals, pulses and millets used for composite flour formulations resulted the germinated finger millet flour had highest solubility(14.88%) and swelling power was found highest in fermented little millet flour. There were eighteen formulations prepared and studied for their functional and organoleptic characteristics. Among them six composite flour blends were scored similar, and used for analysing functional properties viz., solubility, swelling power, water absorption capacity, oil absorption capacity, bulk density and viscosity properties and they were significantly varied. Significant differences were found among micro-nutrients and physic chemical and functional properties of composite flour blends except calcium content. The finalized composite flour formulation constitutes of germinated finger millet flour, fermented little millet flour, horsegram flour and refined wheat flour in the ratio of 50:30::10:10 respectively. The protein content was 26.86g, crude fiber 2.30g, calcium, copper and iron content was 28.0, 0.64 and 17.31mg respectively. Antioxidant and polyphenol content of composite flour blend were found significantly differed and higher values were observed in fermented finger millet flour (273.28 mg/100g and 131.50trolox/g respectively.) Significant differences found in the organoleptic evaluation of millet fortified composite flour during storage. Significant differences found in the proximate composition and micro nutrient content of millet fortified snacks. Composite mix can be stored up to eight weeks and the benefit to cost ratio is 1:43Rs. It can be concluded that, the composite flour blend can be used in the development of wide range of products including sweet, fried and bakery.

Keywords*: Composite flour, Antioxidant, Fermented, Germinated*

Comparative Study of Green Gram Cultivation under Natural Farming and Recommended Practices in Villages of Gwalior, Madhya Pradesh

Amita Sharma*

Scientist, Agroforestry, KVK, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

asdrsbarwani@gmail.com

Lakhan Singh Mohaniya
Research fellow, Agronomy, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur
lakhansinghmohaniya22@gmail.com
Gyanaranjan Sahoo
Scientist, Forestry, KVK, Odisha University of Agriculture & Technology, Nayagarh
gsahoo.forestry@ouat.ac.in
Sharad Chandra Srivastava
STO Economics, KVK, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior
sharadrvskvv@gmail.com
Mukesh Bhargava
Scientist, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior,
mukeshbhargava2470@gm

Abstract

This research investigates the comparative effectiveness of green gram (*Vigna radiata*) cultivation under two distinct agricultural paradigms—natural farming and conventional recommended practices—in the semi-arid agro-climatic conditions of Rampur and Sahrai villages in Gwalior district, Madhya Pradesh. The natural farming system was based on Subhash Palekar's Zero Budget Natural Farming (ZBNF) model, which emphasizes the use of indigenous and eco-friendly inputs derived from cow-based formulations. Key components included Beejamrit for seed treatment to enhance germination and resistance to soil-borne diseases; Jeevamrit and Ghanjeevamrit as microbial-rich liquid and solid bio-inputs to enrich soil fertility and stimulate plant growth; and Neemastra, a botanical formulation, for the biological management of pests. In contrast, the recommended package of practices followed standard agronomic protocols involving the application of synthetic fertilizers (NPK) and chemical pesticides for nutrient and pest management. Field trials were conducted using a randomized block design to evaluate various agronomic and economic parameters including germination percentage, plant height at different growth stages, pest and disease incidence, overall yield per hectare, input cost, and net economic returns. The findings indicated that although the recommended practices yielded slightly higher grain output, the natural farming system showed a significant reduction in pest infestation and input costs. This resulted in a notably higher benefit-cost (B:C) ratio for the natural farming plots compared to those managed with conventional inputs.

These results highlight the potential of natural farming not only as an environmentally sustainable option but also as a cost-effective model particularly suited for smallholder and marginal farmers. The study concludes that adoption of ZBNF techniques can contribute to improving farm resilience, reducing dependency on external inputs, and promoting long-term soil health, thereby aligning with the broader goals of sustainable and inclusive agricultural development in India's dryland regions.

Keywords: *Green gram cultivation, Zero Budget Natural Farming (ZBNF), Subhash Palekar, Natural farming*

Recent trends in real time monitoring of quality in food Industry

Anamika Das
Associate Professor, Department of Dairy Chemistry, Sanjay Gandhi Institute of Dairy Technology, Bihar Animal Sciences University, Patna-800014
Email: anu2024sgidt@gmail.com

Abstract

The rising demand for safe, high-quality, and minimally processed foods has expedited the advancement of novel technologies designed for real-time monitoring in the food sector. The food system is a multifaceted concept encompassing numerous stages and processes from production to consumption, where evaluating quality and safety at each level is crucial. The existing safety and quality controls depend on microbiological and chemical studies, which are time-intensive, arduous, and yield retrospective data. In this context, Spectroscopy-based sensors coupled with Artificial Intelligence (AI) and Information Technologies (IT), is playing a significant role in real time monitoring food quality across the whole supply chain, from manufacturing to consumption. Biosensors provide swift, sensitive, and frequently non-destructive methods for identifying pollutants, spoilage indicators, nutritional levels, and adulterants in various food matrices. Biosensors provide real-time monitoring of quality in cereal and grain products for mycotoxin detection, for detection of antibiotic and other adulterants in dairy products, pathogen identification in meat and poultry products as well as detection for presence of toxins in sea foods. Other applications of biosensors in fruits, vegetables, drinks, bakery items, and functional foods have been examined for assessing pesticide residues, ripeness and nutrient stability. The incorporation of biosensors into smart packaging systems and portable on-site devices is being investigated as a viable method for real time quality monitoring across the food supply chain.

Keywords*: Real time monitoring, quality, biosensor, active packaging*

Rearing of Srinidhi birds under semi-intensive system enhance rural farmers income in Chandel district of Manipur

Asem Ameeta Devi, Khumlo Levish, K Sonamani Singh, TS Leenda Monsang, Lavid Anal and Chanu Langlentombi
ICAR-KVK Chandel, Monsang, Pantha, Chandel
Corresponding author email: asemameeta2007@gmail.com

Abstract

Poultry farming plays a significant role in improving the socio-economic status of rural households, particularly in hilly region of Manipur. The current study is conducted to enhance income among rural farmers in Chandel district through poultry farming. Srinidhi birds, a dual-purpose backyard poultry breed developed for higher productivity and adaptability, are well-suited to the agro-climatic conditions of the region. The study evaluates their growth performance, egg production, survivability, and economic returns under semi-scavenging conditions commonly practiced by rural farmers. The data collected

from selected households indicate that Srinidhi birds exhibit better disease resistance, higher egg yield, and improved body weight compared to traditional indigenous breeds. The mean value of body weight The average age at first egg lay was observed to be 170.85±2.40 3 cumulative egg production up to 40 weeks of age was recorded as 108.751.70 eggs per bird per year. Farmers adopting Srinidhi bird rearing reported increased household income, improved nutritional rational security through regular egg and meat consumption, and reduced dependency on external income sources. The findings suggest that promoting Srinidhi bird rearing can serve as an effective strategy for rural development and poverty alleviation in Chandel district., Srinidhi poultry farming holds significant potential as a scalable model for improving rural livelihoods.

Keywords*: Bird, Body weight, dual, semi-intensive, rural and Srinidhi*

Physicochemical characterization, motif and domain analysis of the *At GLR* proteins in *Arabidopsis thaliana*

Bidhan Chandra Roy[1*]
[1]Department of Botany, Dinabandhu Mahavidyalaya, Bongaon, North-24-Parganas,
West Bengal, India, Pin-743235
Author for correspondence: bidhanroybot@gmail.com

Abstract

Glutamate (Glu), a neurotransmitter in animals, has been found to function as signaling molecule in plants. Plant Glutamate receptor like channels (GLRs) are homologous to Ionotropic glutamate receptors (iGluRs) that mediate neurotransmission in mammals. GLRs are nonselective cation channels involved in various physiological processes. Therefore, Glutamate is a multifunctional amino acid. Thus, knowledge about *GLR* genes is crucial which can lead to effective way of improving agronomic traits in crop plants. The plant family Brassicaceae possess the model plant *Arabidopsis thaliana* as well as some major crops of the genus *Brassica*. *A. thaliana* possesses 20 *GLR* genes (*AtGLR*s) in its genome which are involved in many functions including light signal transduction and calcium homeostasis. Moreover, plant GLRs preserve the predicted channel structure of animal iGluRs and show high amino acid sequence identity in the ligand binding domains. Different physico-chemical parameters viz. amino acid composition, theoretical pI (isoelectric point) and grand average of hydropathicity (GRAVY) were measured using Prot Param, server (http://web.expasy.org/protparam/). Different phosphorylation, Asn-glycosylation and my ristoilation sites have been predicted using motifscan tool of My Hits. Protein domains were identified with Pfam. Protein disorder content has been studied using IUP red. The different *cis*-elements of promoter regions of the *AtGLR* genes and corresponding transcription factors (TFs) of these binding sites have been predicted from AGRIS i.e. the *Arabidopsis* gene regulatory information server.

Keywords: *Glutamate receptor, Three-dimensional structure, cis-regulatory elements, gene regulatory networks.*

Application of Molecular Markers in Mango (*Mangifera indica* L.) Breeding for Genetic Improvement

Devanshi Limbani[1]*, Dr. M. V. Parakhia[2]
M. Sc. (Agri.)[1]*, Associate Professor[2]
Department of Biotechnology, Junagadh Agricultural University, Junagadh, Gujarat, India
Corresponding author e-mail: devanshilimbani56@gmail.com

Abstract

Mangoes (*Mangifera indica* L.) are highly valued, nutritious tropical fruits, which hold a significant economic importance in tropical and subtropical regions of the world. However, their improvement through conventional methods faces a few obstacles due to their long juvenile phase, perennial nature, high heterozygosity and complex inheritance patterns, which limit the efficiency of varietal improvement. This review aims to evaluate the role of molecular marker technologies in enhancing mango breeding programmes. Various molecular markers including SSRs (Simple Sequence Repeats), SNPs (Single Nucleotide Polymorphisms) and AFLPs (Amplified Fragment Length Polymorphisms) have been extensively used for analysis of genetic diversity, cultivar identification, QTL (Quantitative Trait Analysis) mapping and linkage mapping in mango. Marker-Assisted Selection (MAS) plays a significant role in selection of parents with desirable traits for crop improvement programmes. It also assists in early selection of individuals with desired characters such as fruit yield, fruit quality, abiotic resistance and biotic resistance. NGS (Next Generation Sequencing) and genomics have enhanced marker discovery and enabled high-resolution mapping of complex traits through GWAS (Genome-Wide Association Studies). Despite these advancements, challenges remain in integrating molecular tools with conventional breeding approaches. Therefore, integration of molecular markers with conventional breeding and bioinformatics tools has improved the efficiency, accuracy, and speed of mango improvement programs. This contributes to sustainable horticulture and strengthens the economic value of mango cultivation.

Keywords: *molecular markers; Marker-Assisted Selection (MAS); genetic diversity; NGS; GWAS; crop improvement*

Millet Based Composite Flour Blend for Development of Nutri-Dense Snack to School Children

Akkavva Wadakappanavar S[a], Nirmala B. Yenagi[b] and Kashibai Khydagi[c]
[a] Assistant Professor, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005
[b] Professor (Retd), Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005
[c] Professor and Head, Department of Food and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India, 580 005
Corresponding author: Akkavva Wadakappanavar

email: akkurani20@gmail.com

Abstract

Millets are recognized as potential future crops because of relatively high dietary fiber, antioxidants, micronutrients, sulphur containing amino acids and essential fatty acids. In this present study germinated finger millet, fermented little millet, germinated Horsegram and Refined wheat flour in the ration of 50:30:10:10 respectively were used for the preparation of composite flour. This flour blend were studied for its functional properties and the results revealed that, the colour parameters (L*, a*, b*) showed significant differences (pd"0.01) among the flour samples, highest lightness (L*) was observed in refined wheat flour (93.78) and little millet flour (93.53). Water solubility and Water binding capacity was highest in horse gram flour (19.02, 6.52%respectively). The composite flour (155.03%) demonstrated improved water binding capacity. Oil absorption capacity was significantly higher in composite flour (1.13 g/g). The pasting properties (RVA) also differed significantly. The composite flour exhibited balanced physicochemical, functional, and pasting properties compared to individual flours. The composite flour exhibited enhanced protein and mineral content with adequate energy value. The nutraceutical evaluation revealed significant differences (pd"0.01) among the flour samples with respect to total polyphenol content and antioxidant activity. Further this composite flour blend was used in the preparation of Sev Ladoo, is a sweet snack and analysed for its optimization **75:25 and 50:50** proportions showed good acceptability scores. The nutrient and mineral content, physical attributes, storage study and acceptability by school children were also done. Overall, Sev Ladoo is an energy-dense (438 Kcal/ 100g) snack with good protein (15.72%) content and also it provides appreciable amounts of essential minerals. The storage stability of Sev ladoo is one and half month. The Rural and Urban children (90 and 94%Resp.) accepted the snack. Food based approach is the best way to combat hidden hunger and malnutrition among school children.

Keywords*: Composite flour, Sev Ladoo, Antioxidants*

Field Application of Infrared Thermography for Early Screening of Mastitis

Dr. Reshma Debbarma*, Dr. Sohanvir Singh
Animal Physiology Division, ICAR–NDRI, Karnal, Haryana

Abstract

Mastitis is a major challenge affecting dairy productivity and farmer income. Early identification of subclinical cases is crucial for effective management. This study aimed to assess the field applicability of infrared thermography (IRT) as a rapid screening tool for mastitis detection in dairy animals. Dairy animals were categorized into healthy, subclinical mastitis (SCM), and clinical mastitis (CM) groups. Udder surface temperature was recorded using thermal imaging, and milk samples were evaluated for somatic cell count (SCC). Results showed that mastitic animals exhibited higher udder surface temperature and SCC compared to healthy animals. Infrared thermography successfully identified thermal variations in SCM cases before the onset of visible symptoms. The technique proved to be quick, non-

invasive, and suitable for on-field application. The study suggests that IRT can be effectively used for routine screening of mastitis, enabling timely intervention and reducing economic losses.

Keywords*: Mastitis detection, Infrared thermography, Dairy farming, Somatic cell count, Early screening, Udder health*

Infrared Thermography as a Precision Tool for Early Detection of Subclinical Mastitis

Dr. Reshma Debbarma*, Dr. Sohanvir Singh
Animal Physiology Division, ICAR–NDRI, Karnal, Haryana

Abstract

Early detection of subclinical mastitis is essential for maintaining udder health and improving dairy productivity. This study aimed to evaluate the effectiveness of infrared thermography (IRT) as a precision diagnostic tool for detecting mastitis at an early stage in dairy animals. Animals were grouped as healthy, subclinical mastitis (SCM), and clinical mastitis (CM). Udder surface temperature was recorded using infrared thermography, and milk samples were analyzed for somatic cell count (SCC) and compositional parameters. Results revealed a significant ($p<0.05$) increase in udder surface temperature and SCC in SCM and CM animals compared to healthy controls. Thermal imaging was able to detect subtle temperature changes in SCM animals prior to the appearance of visible clinical signs. A positive relationship between udder temperature and SCC confirmed the reliability of IRT as an early diagnostic indicator. The findings highlight the potential of infrared thermography as a rapid, non-invasive, and field-applicable tool for improving mastitis diagnosis and herd health management.

Keywords*: Subclinical mastitis, Infrared thermography, Udder temperature, Somatic cell count, Precision diagnosis, Dairy cattle*

Physicochemical Characterization and Comparative Evaluation of Four Non-Edible Seed Oils from Malvaceae Plants (Hibiscus cannabinus, Hibiscus sabdariffa, Sida cordifolia, and Abelmoschus esculentus) for Biodiesel Production

Dr. Seema Parveen
Assistant Professor, Department of Chemistry, Jai Narain Vyas University, Jodhpur

Abstract

The search for sustainable and renewable energy resources has increased interest in non-edible plant oils as potential feedstocks for biodiesel production. In the present study, the physicochemical properties of four non-edible seed oils from the Malvaceae family- Hibiscus cannabinus (Kenaf), Hibiscus sabdariffa (Roselle), Sida cordifolia (Country mallow), and Abelmoschus esculentus (Okra) were analyzed and comparatively evaluated for their suitability in biodiesel synthesis. The oils were extracted from dried seeds using a solvent extraction method and analyzed for key physicochemical parameters including acid value, free fatty acids (FFAs) content, saponification value, iodine value, density, and kinematic viscosity.

The results showed that the oil yield ranged from 16.8–27.5%, with Hibiscus cannabinus exhibiting the highest oil content (27.5%), followed by Hibiscus sabdariffa (24.3%), Abelmoschus esculentus (19.6%), and Sida cordifolia (16.8%). The acid values of the oils were found to be 2.4, 3.1, 3.8, and 2.7 mg KOH/g for H. cannabinus, H. sabdariffa, S. cordifolia, and A. esculentus, respectively. The iodine values ranged between 92–108 g I, /100 g, indicating the presence of a considerable proportion of unsaturated fatty acids favorable for biodiesel quality. The saponification values varied from 176–198 mg KOH/g, suggesting the presence of fatty acids with suitable chain lengths for efficient transesterification. The measured viscosities of the crude oils ranged from 32.5–41.2 mm^2/s at 40 °C, while the densities were found between 0.88–0.92 g/cm^3. Comparative analysis revealed that Hibiscus cannabinus oil exhibited the most favorable physicochemical characteristics, including higher oil yield and moderate acid value, making it a promising biodiesel feedstock among the studied species. Overall, the results demonstrate that Malvaceae seed oils possess suitable physicochemical properties for biodiesel production and could serve as sustainable and non-food-based alternatives to conventional diesel fuels.

Keywords*: Biodiesel, Malvaceae family, Physicochemical properties, Non-edible oils, Comparative analysis, Renewable energy.*

Analyzing the Economic Dynamics of Farming Systems in the sub- Mountainous Region of Punjab

Dr. Parminder Kaur
Department of Economics and Sociology, PAU, Ludhiana.

Abstract

The study was undertaken to (i) identify the different integrated farming systems, assess their relative viability and extent of diversification in the sub-mountainous region of Punjab, (ii) analyse profitable agricultural practices for various farm classes, and additionally (iii) examine the factors influencing income from different farming systems in the study area. A sample of 100 farm households adopting different integrated farming systems along with 30 non-adopter IFS farmers practicing traditional cropping systems were selected as control, thus making the sample of 130 farmers for the purpose of study. Four major integrated farming systems viz. Crops+ Dairy+ Agro-forestry, Crops+ Dairy, Crops+ Agro-forestry, Crops+ Poultry designated as IFS-I, IFS-II, IFS-III and IFS-IV respectively were identified in the study area. The highest adoption percent was for IFS-II (38.46%) followed by IFS- III (14.62%), IFS -I (12.30%) and IFS -IV (11.54%) respectively. Overall, per farm income (Rs 2105894.80) from IFS-IV Crop+ Poultry was found the highest followed by IFS-II Crop+ Dairy (Rs 846928.10), IFS-I Crop+ Dairy+ Agro-forestry (Rs 822803.13) and IFS-III Crop+ Agro-forestry (Rs 356852.19) respectively. Across different size-classes of farmers (small, medium and large), crops alone was found least remunerative. There was found consistent declining order of remunerative systems (FS-IV >-I > -II >-III >crops alone) for small farmers, medium farmers (FS-IV > -II >-I >-III >crops alone) and large farmers (FS-IV >-II > -I >crops alone). The results of logit model brought out that age, land holding, family size, income and credit influenced the adoption of IFS significantly. In each farming system, the

components of dairy, agroforestry, and poultry added additional weight to the income generated. By conducting front-line demonstrations and training sessions, it is desirable to encourage farmers to adopt an ideal diversified farming system with all conceivable components. Farmers can effectively reduce farm-related difficulties and hence lessen distress by doing this. Moreover, there is a need for policy makers to promote IFS and provide the necessary support to farmers to adopt the sustainable and resilient agricultural approach.

Keywords*: Agricultural diversification, cost and returns, income generation, integrated farming system, livelihood security, profitability.*

Genetic variability for leaf architectural traits in Burley germplasm accessions

Gangadhara, K[1]., Anuradha, M[1]., Rajappa, J[2]., Sarala, K[2]., and Sheshsu Madhav[2]
[1]ICAR National Institute for Research on Commercial Agriculture, Research Station, Kandukur
[2]ICAR National Institute for Research on Commercial Agriculture, Rajahmundry, A.P.

Abstract

To study the genetic variability for leaf yield and plant architectural traits in 73 Burley germplasms accessions were planted in three replications during 2024-25. The data analysis showed significant differences among genotypes. Plant height ranged from 60 to 155 cm with an average of 97 cm, number of leaves ranged from 12 to 26 with average of 18, leaf length ranged from 25 to 56 cm with an average of 37 cm, leaf width ranged from 12 to 32 cm with an average of 20 cm and internodal length ranged from 3 to 6 cm with average of 4 cm. Leaf angle is an important agronomic trait that affects the leaf orientation, light capture and nutrient utilization in plants. The leaf inclination angle ranged from 30 (Burley CR 179) to 95 degrees (Zlotolist) with an average of 51.5 degrees, whereas leaf curve length ranged from 1.5 (Burley Spartan) to 13cm (BURLEY C-22-1) with average of 5.5 cm. The correlation analysis showed that negative correlation between leaf angle with all the traits except intermodal distance. Genotypes Burley CR 179, Banket A1, Momi 2, Apia, KY 42 and Banket 21 showed low leaf able (30-40°). Cultivars having desirable plant architectural characteristics like leaf angle and yield traits could be utilized as potential donors in a future hybridization programme to generate ideal plant types with high leaf yield and quality.

Keywords*: Leaf architecture, Burley, genetic variability, leaf angle*

Assessment of Genetic Variability of Physico-chemical Parameters and Spectral Vegetation Indices in Diverse Soalu (*Litsea Monopetala* Roxb.) Germplasm

Harisha R[1]*, Laishram Roshni Devi[1], Om Prakash Patidar[1], Sinto Antoo[1], Krishnamoorthy[1], Selva Prakash[1], Yendrembam Surjalata Devi[1], Md. Harron Rashid[1], Palash Datta[1], Kartik Neog[1]
[1] Host Plant Division, CSB-Central Muga Eri Research and Training Institute, Lahdoigarh, Jorhat-785700, Assam

Corresponding author: harishr.csb@nic.in, harish.iari02@gmail.com

Abstract

Muga silkworm rearing and the production of high-quality cocoons are strongly influenced by the quality of host plant leaves. Soalu (*Litsea monopetala* Roxb.), one of the primary host plants, exhibits substantial genetic diversity across Northeast India, necessitating systematic evaluation for identifying superior genotypes for breeding and improvement programs. The present study aimed to assess genetic variability, interrelationships, and distinctness among 22 soalu accessions using spectral vegetation indices (SVIs) and physico-chemical traits. Ten SVIs, including Greenness Index (GI), Normalized Difference vegetation Index (NDVI), Modified Chlorophyll Absorption in Reflectance Index (MCARI), Optimized soil - Adjust Vegetation Index (OSAVI) SPRI (Simple Ratio Pigment Index), NPCI (Normalized Pigment Chlorophyll Index), PRI (Photochemical reflectance Index), ARI (Anthocyanin Reflectance Indices), CRI (Carotenoid Reflectance Indices), RDVI (Renormalized Difference Vegetation Index), were employed as non-destructive indicators of leaf quality and stress tolerance, alongside seven physico-chemical parameters. The experiment was conducted at the Germplasm Conservation Center, CSB-CMERTI, Jorhat, during 2025-2026. Results revealed considerable variability among accessions, with higher variation observed in ARI, PRI, and chlorophyll-related traits, while OSAVI and RDVI exhibited greater stability. Correlation analysis indicated strong positive associations among pigment-related traits (chlorophyll-a, chlorophyll-b, total chlorophyll, and carotenoids), reflecting coordinated biochemical dynamics. Among SVIs, significant interrelationships were observed, particularly positive associations of GI with MCARI and PRI, and a negative association with NDVI. Cross-analysis between SVIs and physico-chemical traits showed predominantly weak to moderate relationships, with a few significant associations involving moisture content and moisture retention capacity.

Principal component analysis explained over 80% of the total variation, with major contributions from moisture content, chlorophyll traits, and key indices (NDVI, PRI, OSAVI), effectively discriminating the accessions. Composite ranking identified Acc-12, Acc-2, Acc-18, and Acc-17 as superior genotypes, followed by Acc-14. Overall, the integration of spectral indices with physico-chemical traits proved effective for capturing variability and identifying promising soalu accessions, supporting their application in precision phenotyping and genetic improvement programs.

Keywords: *Soalu, Litsea monopetala, Physiological traits, Germplasm Characterization, Spectral Vegetation Indices (SVIs), Genetic diversity, Mugaculture*

Ethnomedicinal plant extracts improve heat stress tolerance and productivity of chickpea under late sown conditions

Kavita*

Plant Physiology, Tirhut College of Agriculture, Dholi, Muzaffarpur, Bihar, India

Corresponding author e-mail: kavita@rpcau.ac.in

Abstract

Chickpea (*Cicer arietinum* L.) productivity in eastern India is often constrained by terminal heat stress, particularly under late-sown conditions in rice fallow systems. Elevated temperatures during the reproductive phase accelerate senescence, impair photosynthesis, and reduce seed filling, resulting in significant yield losses. In this context, eco-friendly biostimulants derived from ethnomedicinal plants offer a promising approach to enhance stress tolerance. A field experiment was conducted during Rabi 2023–24 at the Research Farm of Tirhut College of Agriculture, Dholi, Bihar, India, using a two-factor randomized block design with three replications. Two sowing dates, normal (November) and late (December), were used to impose terminal heat stress. Sub-treatments included seed biopriming combined with foliar spray of humic acid, seaweed extract, guma (*Leucas aspera*), and hathisud (*Heliotropium indicum*) extracts. The combined application of biopriming and foliar spray significantly improved physiological traits under heat stress, with total chlorophyll increasing by 7.02–12.51%, relative water content by 5.19–9.20%, and membrane stability index by 7.19–11.04%. These changes indicate improved photosynthetic efficiency, membrane integrity, and delayed senescence. Ethnomedicinal extracts, particularly guma and hathisud, performed at par with or better than conventional biostimulants. Yield attributes also improved significantly, with test weight increasing by 6.34–12.23% and seed yield by 9.46–13.08% under late sowing. Overall, plant-based biostimulants, especially *Leucas aspera* and *Heliotropium indicum*, offer a sustainable and cost-effective strategy to mitigate terminal heat stress and enhance chickpea productivity in rice fallow ecosystems.

Keywords: *Chickpea, Heat stress tolerance, Seed biopriming, Foliar application, Rice fallow systems*

Ergonomic Assessment of Work-Related Stressors among Mango Harvesting Workers

Khumukcham Jenita[1]* and Harpinder Kaur[2]
Ph.D. Scholar[1]* and Professor[2]
Department of Resource Management and Consumer Science,
College of Community Science
Punjab Agricultural University, Ludhiana-141004, Punjab, India
Corresponding author e-mail: jenitakh14@gmail.com

Abstract

Harvesting of mangoes from higher branches poses considerable risks due to unstable ladder placement on uneven ground and the need to maintain balance while climbing trees. The harvesting process involves several sub-activities such as plucking, picking, size sorting, weighing, storing and transporting, which expose workers to significant ergonomic challenges. Traditional harvesting practices using ladders, buckets and manual tools often force workers into uncomfortable working postures, resulting in physical discomfort and increased risk of musculo-skeletal problems. Workers using hand tools frequently experience pain in multiple body parts, emphasizing the importance of adopting safer work practices and ergonomic designs to protect workers' health and improve efficiency. Mango harvesting activities expose workers to multiple ergonomic stressors that contribute to fatigue, reduced work capacity and

occupational health risks, particularly during hot summer conditions when prolonged working hour's further increase physiological strain. Therefore, the present study was undertaken to assess ergonomic stressors experienced by mango harvesting workers. Forty workers were randomly selected from each district of Pathankot, Hoshiarpur and Ropar, making a total sample size of one hundred twenty respondents. Data were analyzed using frequency, percentage, mean score and standard deviation. The findings emphasize the need for ergonomic interventions, improved harvesting practices and safer work methods to reduce ergonomic stressors and enhance workers' health, safety and efficiency. The study highlights the importance of understanding ergonomic risks associated with mango harvesting activities for improving occupational health and promoting sustainable agricultural practices.

Keywords: *Harvesting activities, Postural stress, Worker health.*

Smart Agriculture for Climate Resilience: Integrating Machine Learning and IoT for Detection of Crop Diseases of NEH of India

Leichombam Sophia[1*], Ghanashyam Singh Yurembam[2], Sushma Gurumayum[3]
[1]Dept. of Irrigation and Drainage Engineering
College of Agricultural Engineering & Post Harvest Technology, Ranipool, Sikkim (CAU Imphal)
Ranipool, Sikkim, India
[2] Dept. of Soil and Water Conservation Engineering
College of Agricultural Engineering & Post Harvest Technology, Ranipool, Sikkim (CAU Imphal)
Ranipool, Sikkim, India
[3] Dept. of Basic Engineering and Applied Sciences
College of Agricultural Engineering & Post Harvest Technology, Ranipool, Sikkim (CAU Imphal)
Ranipool, Sikkim, India
Corresponding author e-mail address: leichombamsophia6@gmail.com

Abstract

The climate change and its impact on the environment have resulted an emergence of numerous crop diseases. The rise in the plant diseases has significantly affected the yield in the agricultural sector which directly effects the global food security. The effect in the global food security will again pose a serious threat to the economic loss of a nation. The early detection of the crop diseases is the only measure that can be adopted to avoid the rising issues. However, the traditional means of identification of the diseases through physical and visual will be time consuming and requires an expertise. Therefore, diagnosis of the plant diseases using trained advanced technologies like Artificial Intelligence (AI), Machine Learning (ML) and Internet of Things (IoT) applications in plant stress management can help in detecting the abiotic (drought, saline water and heavy metals) and biotic (fungal, viral and bacterial) stress more efficiently. This study presents bibliographic analysis of crop prone to diseases in NEH region of India and steps to identify the diseases using AI. While ML algorithms like Support Vector Machine (SVM) and Random Forest remain robust for prediction, the field faces hurdles in data imbalance and model interpretability. The combine study of ML with IoT and drones will enable a real time and

high-resolution analysis of the crop diseases. By enhancing the application of ML, AI and real-time diagnostic tools and by overcoming the current data limitations, it can mitigate the rise of crop diseases posed by climate change, thereby safeguarding economic stability and global food security, particularly in vulnerable regions like North Eastern Hill (NEH) region of India.

Keywords*: Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), Support Vector Machine (SVM), Random Forest*

Wide hybridization and QTL mapping for climate-resilience and higher yield in Soybean

Manu Yadav[1,2], Manisha Saini[1], Afroz Alam[2] and Akshay Talukdar[1*]

[1]Division of Genetics, ICAR- Indian Agricultural Research Institute (IARI), New Delhi 110012

[2]Department of Bio-Science and Biotechnology, Banasthali Vidyapith, Tonk District, Rajasthan-304022

[*]***Corresponding author's e-mail: akshay.talukdar1@gmail.com***

Abstract

Soybean [*Glycine max* (L.) Merr.] is a major legume crop valued for its high protein (38-45%) and oil (18-22%) content. However, the productivity and stability of soybean under diverse agro-climate conditions are increasingly challenged by its narrow genetic base and adverse impacts of climate change, particularly drought and biotic stresses. The wild soybean (*Glycine soja*) represents a valuable reservoir of novel allelic diversity for yield improvement and climate resilience. The present study aimed to identify quantitative trait loci (QTLs) associated with yield and agronomic traits using an advanced Recombinant Inbred Line (RIL) population comprising 234 lines at the F• *f* generation, developed from a cross between wild accession DC2008-1 (*Glycine soja*) and cultivated variety DS9712 (*Glycine max*). Field evaluations of the RILs were conducted in the IARI, New Delhi campus during *kharif* seasons of 2024 and 2025 under augmented design. Phenotypic data were recorded over the two years for key yield and agronomic traits such as plant height, number of pods per plant, number of seeds per pod, 100-seed weight, and seed yield per plant, and resistance to Mungbean Yellow Mosaic India Virus (MYMIV), Soybean Mosaic Virus (SMV), etc. Substantial phenotypic variations and trait improvements were observed among the RILs. A set of 142 RILs were identified having higher level of resistance against MYMIV and SMV, which are highly prevalent in the IARI, New Delhi campus. Further, RILs containing more than 900 pods plant and RILs maturing very early (70-80 days) were also identified. This confirms the effective introgression and recombination of alleles from wild type soybean lines. Molecular genotyping has been done using 130 genome-wide polymorphic SSR markers selected from about 500 SSR markers used for initial parental polymorphism survey. The construction of genetic linkage map followed by marker-trait association and QTL mapping are in progress, which are being done using the inclusive composite interval mapping (ICIM) approach. Besides the higher yield-potential lines, this study is expected to identify stable and climate-resilient QTLs associated with yield and its component traits. The identified superior RILs, and the QTLs along with the linked SSR markers will

be valuable resources for developing high-yielding, and climate-resilient soybean cultivars through molecular breeding approach.

Keywords*: RILs, Climate resilience, SSR, QTL, Molecular breeding, Yield and Agronomic traits.*

Zinc Biofortification and Nutrient Uptake in Broccoli through Chemical, Green and PEGylated ZnO nanofertilizer approaches

Meghna Sarkar[1], K.N. Das[2], Pranjal Kumar Kaman[3]
[1,2]Department of Soil Science, Assam Agricultural University, Jorhat, Assam-785013
[3]Department of Plant Pathology, Assam Agriculture University, Jorhat, Assam-785013
Corresponding Author E-mail- meghna.sarkar.adj22@aau.ac.in

Abstract

Zinc (Zn) deficiency in agricultural soils is a widespread problem that limits crop productivity and contributes to micronutrient malnutrition in human populations. Biofortification of crops with essential micronutrients has emerged as an effective strategy to improve nutritional quality and food security. In recent years, nanotechnology-based fertilizers have gained considerable attention due to their enhanced efficiency, controlled release behavior, and improved nutrient delivery compared to conventional fertilizers. The present study investigates the potential of zinc oxide (ZnO) nanofertilizers for Zn biofortification and improved nutrient uptake in broccoli (*Brassica oleracea* var. *italica*). ZnO nanofertilizers were synthesized and characterized using appropriate physicochemical techniques to determine particle size, morphology, and structural properties. A pot experiment was conducted to evaluate the effect of chemical, green and PEGylated ZnO nanofertilizer on plant growth, Zn accumulation, and nutrient uptake in broccoli plants. The application of ZnO nanofertilizers significantly enhanced plant growth parameters and improved soil nutrient status. Moreover, Zn concentration in plant tissues increased markedly, indicating efficient uptake and translocation of zinc within the plant system. The findings demonstrate that ZnO nanofertilizer-mediated biofortification can be an effective and sustainable strategy to enhance micronutrient content in crops. This approach not only improves crop productivity but also contributes to addressing zinc deficiency in human diets, supporting the development of sustainable and nutrition-sensitive agricultural systems.

Keywords: *ZnO nanofertilizer, zinc biofortification, broccoli, micronutrient uptake, sustainable agriculture.*

Proteomic approach for identification of estrus specific biomarkers in cervico-vaginal mucus of Lakhimi cows

Nekibuddin Ahmed[1], Lakshya Jyoti Dutta[2], Dhrubajyoti Borpujari[2], Momi Sarma[2], Lukumoni Buragohain[3] & Durlav Prasad Bora[4]
[1]Department of Animal Reproduction, Gynaecology & Obstetrics, Lakhimpur College of Veterinary Science, Assam Veterinary & Fishery University, Joyhing - 787051, Lakhimpur, India

[2]Department of Animal Reproduction, Gynaecology & Obstetrics, College of Veterinary Science, Assam Veterinary & Fishery University, Khanapara - 781022, Guwahati, India
[3]Department of Animal Biotechnology, Directorate of Research, Assam Veterinary & Fishery University, Khanapara - 781022, Guwahati, India
[4]Department of Veterinary Microbiology, College of Veterinary Science, Assam Veterinary & Fishery University, Khanapara - 781022, Guwahati, India
Corresponding author e-mail: nekibuddin.ahmed@avfu.ac.in

Abstract

The present study was aimed to explore the estrus specific protein biomarkers in cervico-vaginal mucus (CVM) of Lakhimi cows through proteomic. A total of fifty (n=50) number of experimental cows with presence of functional corpus luteum (CL) were induced for estrus using single PGF_{2Q} based estrus induction protocol. CVM samples (n=50) were collected from all the experimental cows during proestrus and estrus which were subjected to proteomic analysis viz. total protein concentration, protein profiling and protein identification for identification of estrus specific protein biomarkers. In the present study, the total protein concentrations of CVM at proestrus and estrus were 0.59±0.03 mg/ml and 0.55±0.01 mg/ml respectively which was statistically non-significant. The molecular weight of protein bands of CVM expressed in Coomassie Brilliant blue stained gel by SDS-PAGE at proestrus were 250, 150, 100, 80, 75, 70, 60, 55, 50, 45, 27 and 25 kDa whereas at estrus were 210, 200, 180, 100, 75, 70 and 60 kDa. The LFQ-LC/MS/MS investigation of CVM samples identified a total of 2166 and 2336 numbers of proteins at proestrus and estrus respectively in Lakhimi cows. LFQ-LC/MS/MS identified a few probable and potential estrus specific CVM protein biomarkers in Lakhimi cows as T-complex protein 1 subunit epsilon (CCT5), BPI fold containing family A, member 2B (BPIFA2B), Histone H2B type 1 and Alcohol dehydrogenase (ADH).

Keywords: *Cervico-vagina mucus, Estrus, Lakhimi cows, Protein biomarkers*

Developing Herbicide-Tolerant Soybean through marker-assisted backcross breeding approach

Nikita Chandila[1,2], Reshma O[3], Meniari Taku[3], Manisha Saini[3], Arun Kumar[1], and Akshay Talukdar[2,3]*

[1]Department of Bioscience, RN Tagore International University of Science and Technology, Faridabad
[2]National Phytotron Facility, Indian Agricultural Research Institute, New Delhi-110012.
[3]Division of Genetics, Indian Agricultural Research Institute, New Delhi-110012;
Corresponding author's email: akshay.talukdar1@gmail.com

Abstract

Soybean productivity in India has remained stagnant at approximately 10 quintals per hectare for the last five decades. In addition to widespread biotic and abiotic stresses, inadequate agronomic practices—

particularly poor weed management—have played a major role in this stagnation. Weeds alone are estimated to cause yield losses of nearly 40%, which may escalate to 75% or more under severe infestation. Existing weed control practices, such as manual weeding, are both labour intensive and expensive, while chemical control measures often prove ineffective, posing significant challenges for farmers. To overcome this constraint, we attempted to develop a glyphosate tolerant soybean variety by introgressing the herbicide tolerant *EPSPS* gene from an American soybean genotype (S14 9017 GT) into an elite Indian soybean cultivar, JS2029 through molecular marker assisted backcross breeding (MABB) strategy. The cross combination is currently at BC*f* F, generation. Foreground selection using *EPSPS* linked markers was complemented by background selection with genome wide SSR markers, initiated from the BC• F• generation onwards. In addition, phenotypic screening was performed through application of glyphosate (Herbicide 'Round up') at 3.0 ml per litre of water. Herbicide application in BC*f* F, populations effectively eliminated susceptible plants lacking the *EPSPS* gene, thereby accelerating the breeding process and enhancing selection efficiency for herbicide tolerance. Plants exhibiting more than 90% recovery of the recurrent parent genome and homozygosity for the target gene (*EPSPS/ EPSPS*) were identified and evaluated for agronomic performance. This initiative aims to provide Indian soybean farmers with a cost effective and efficient weed management solution, ultimately contributing to a substantial improvement in national soybean productivity.

Development and Assessment of Climate Resilience Indicator Traits in Karan Fries Cattle under Tropical Conditions of India

Phoebe C Lalremruati[1], Alex Rani[1], Vohra Vikas[1], Nidhishree NS[1], Dheeraj SG[1], Raja TV[1]*
ICAR-National Dairy Research Institute, Karnal-132001, Haryana, India
Corresponding author: venkatesanraja09@gmail.com

Abstract

Rising global temperatures present serious threats to dairy cattle productivity, with heat stress being a major contributor to milk yield losses worldwide. Improving cattle resilience to climatic stressors has therefore become a critical objective in genetic improvement programs, especially in tropical countries such as India. Since resilience cannot be measured directly, the development of reliable indicator traits is essential. This study aimed to develop and assess climate resilience indicator traits for quantifying heat stress-induced milk losses in Karan Fries cattle, a newly registered synthetic dairy breed in India. A total of 4,22,626 daily milk yield records from 1,502 cows (1990-2024) were analysed along with meteorological data from Karnal, India. The Comprehensive Climate Index (CCI) was used to characterize heat stress, and the Wilmink lactation curve model was employed to estimate expected milk yield, enabling accurate quantification of production deviations under heat stress. Four climate resilience indicator traits were derived: number of heat stress days (NDHS), total milk loss (TML), average milk loss per day (AML), and number of heat stress incidences (NOI). Assessment of the developed traits revealed that Karan Fries cows experienced 53.77 days under heat stress, resulting in a total milk loss of 90.3 kg and a daily loss of 1.67 kg. Among seasons, summer imposed the greatest impact, with August identified as the most critical month. Additionally, animals in mid-lactation were

found to be the most susceptible to heat stress effects. The indicator traits developed in this study provide robust and quantifiable measures for assessing climate resilience in dairy cattle. Incorporating these traits into breeding programs can enhance the selection of heat-resilient animals, thereby contributing to sustainable dairy production under changing climatic conditions.

Keywords: *Climate resilience; Heat stress; Karan Fries cattle; Milk loss; CCI*

Influence of row spacing on seed quality parameters of buffel grass (*Cenchrus ciliaris* L.): an important perennial grass in the Thar desert of Rajasthan

Reena Rani[1,2]* and Archana Sanyal[1,3]
[1]Division of plant improvement and pest management, ICAR-Central Arid Zone Research Institute, Jodhpur-342003, Rajasthan, India
[2]ICAR-Indian Institute of Wheat and Barley Research, Karnal-132001, Haryana, India
[3]ICAR-Indian Institute of Vegetable Research, Varanasi-221305, U.P., India
Corresponding email address- saharanreena23@gmail.com

Abstract

Grasses play a crucial role as a primary fodder source in arid environments mainly due to their palatability and nutritional value. *Cenchrus ciliaris* L., a perennial C_4 grass species, exhibits strong adaptation to the arid climatic conditions of the Thar Desert of Rajasthan. The species holds considerable potential for both fodder production and rangeland rehabilitation. CC is not only valuable for the production but also essential for enhancing rangeland productivity rehabilitating degraded regions and controlling soil erosion. The present study aimed to compare the seed quality parameters (germination %, physical purity and vigor indices) under laboratory conditions of three varieties of *C. ciliaris* (CAZRI Anjan 2178, CAZRI Anjan 358 and CAZRI 75) planted at two different row spacings (70 cm and 140 cm). The seed lots of all the three varieties from both row spacings showed >99 % physical purity with no significant differences. The germination test performed using 25 seeds in four replications in petri plates was found to be approx. 39% in both seed lots harvested from narrow and wide row spacings and there were no significant differences. Though CAZRI 75 was found to have highest germination (%) of 45.1 % followed by CAZRI Anjan 358 (37.4%) and CAZRI Anjan 2178 (34.2%). Overall, the higher physical purity (%) values coupled with good germination (%) for all the three varieties from both row spacings with no significant differences suggests that the row spacing can be reduced without compromising seed quality in buffel grass, which has not been worked upon earlier.

Keywords: *Germination, physical purity, Cenchrus ciliaris, row spacing, fodder and rangeland*

Development of Superior Mulberry Genotypes through Polycross Hybridization

Santosh kumar Magadum[1]*, Yallappa Harijan[2] and N. Sakthivel[3]
[1]Regional Sericultural Research Station, Central Silk Board, Miran Sahib, Jammu, J&K - 181101
[2]Central Sericultural Research and Training Institute, Central Silk Board, Berhampore, WB-742101

[3]Central Sericultural Research and Training Institute, Central Silk Board, Pampore, J&K-192121
Corresponding author E-mail: santoshk.csb@gmail.com

Abstract

Mulberry (*Morus* spp.) is a perennial plant which is the primary and only food plant for silkworm (*Bombyx mori* L.). Mulberry is cross-pollinated and highly heterozygous in nature which contributes to wide range of diverseness in the mulberry genetic stocks. Improved mulberry varieties play an important role in enhancing silk productivity and profitability of sericulture. Development of mulberry varieties through conventional hybridization breeding method is mainly dependent on generation of hybrid seeds from several crosses. Cross hybridisation is a time consuming and tedious process because it involves emasculation, bagging and pollination, needs more labor and resources. In mass or OPH selection, pollen source of hybrid is unknown and several OPH varieties thus developed may have some undesired traits. In contrary, the polycross mating allows natural pollination among several selected parents in isolation to create greater amount of genetic variability and consequently generates large number of segregating population with least manpower and resources, offering greater scope for selection of superior genotypes. To develop high yielding mulberry variety through polycross mating, seed orchard with twenty nine superior divergent parents (16 female and 13 male parents) was established at CSB-CSR&TI, Berhampore. Polycross hybrid seeds were collected from 16 female parents present in Polyclonal Seed Orchard at CSB-CSR&TI, Berhampore and were sown in controlled condition at CSB-RSRS, Jammu. The seedlings nursery was raised with more than 5000 seedlings and was characterized for visual observations of leaf and growth parameters after 8 months of establishment. All the seedlings were screened for different morphological characters *viz*., leaf entireness (lobation), leaf size, leaf greenness, leaf smoothness, leaf thickness, leaf erectness, better plant health/height, plant vigour, plant erectness, disease & pest incidence etc. A total of 936 hybrid progenies were shortlisted among 16 polycross seedling population. The selected hybrid progeny seedlings were transplanted in main experimental field in Augmented Block Design by using four check varieties for further evaluation under progeny row trial (PRT). These hybrid progenies are being evaluated for identification of superior mulberry genotypes with higher leaf yield and quality.

Keywords: *Mulberry, Hybridization, Polycross, Seedlings, Yield.*

A Comparative and Multidimensional Analysis of Women's Empowerment under the ARYA Project in Uttar Dinajpur District, West Bengal

Arpan Bag[1], Saumyadip Chakraborty[2*], Prabhat Kumar Pal[3]
[1,2&3]Department of Agricultural Extension, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal-736165, India
[*]***Corresponding author e-mail: chakraborty.pavel321@gmail.com***

Abstract

This research focuses on the effects of the project Attracting and Retaining Youth in Agriculture (ARYA) on the empowerment of women in the Uttar Dinajpur district of West Bengal. The ARYA project is an

initiative by the Indian Council of Agricultural Research in the form of Krishi Vigyan Kendras, which intends to encourage rural youths to be entrepreneurs in the agricultural and other related fields, and this may have a social-economic implication on women. A comparative ex-post facto research design was adopted, selecting 60 respondents comprising 30 beneficiaries and 30 non-beneficiaries from the Chopra block of Uttar Dinajpur District. Primary data were gathered using a pre-tested interview schedule administered in the local language and subsequently analysed employing descriptive statistics, Chi-square tests, independent t-tests, and Principal Component Analysis (PCA). The results show no significant difference between beneficiaries and non-beneficiaries regarding socio-economic characteristics, which makes the comparison between the two groups possible. However, significant improvements were observed among beneficiaries in social participation, extension participation, mass media exposure, contact with extension personnel, involvement in household decision-making, contribution to family income, and autonomy in time utilization. Conversely, there was no significant influence in economic decision-making, political participation, access to productive resources, control of assets, and financial inclusion. PCA also narrowed down the indicators of empowerment to seven fundamental dimensions, with some of the indicators having eigenvalues above one, meaning a high degree of explanatory power. The research finds that while the ARYA project effectively enhances social and personal aspects of empowerment, Additional measures are necessary to enhance economic and political empowerment, strengthen control over resources, and improve financial inclusion. The results highlight the importance of incorporating interventions based on entrepreneurship with institutional and policy-level assistance to enable a wholesome empowerment of women in rural settings.

Keywords: *ARYA project, Women empowerment, Participation, Access to productive resources, Control of assets, Financial inclusion*

Case report on surgical management of mandibular fracture in a German Shepherd dog using Veterinary Cuttable Plates (VCPs)

Ram Niwas[1], Shweta[2]

[1]Assistant professor, Department of Veterinary Surgery and Radiology,COVS, LUVAS, Hisar
[2]M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology, COVS, LUVAS, Hisar

Abstract

An eight year old male German Shepherd dog of body weight 20kg was presented to VCC, LUVAS, Hisar with a history of fight with another dog, dropped lower jaw and drooling of saliva. According to owner dog was unable to drink and eat. Radiographic examination confirmed complete transverse fracture of caudal third of the left horizontal rami of mandible and incomplete fracture line on right horizontal rami.The fracture was corrected surgically using veterinary cuttable plates (VCPs). Bone plate was applied to ventrolateral mandibular surface. After 1 month of post -operative care, dog recovered and start taking feed.

Synergistic potential of *Cordyceps javanica* (OM321438) with botanicals and insecticides against tea mosquito bug, *Helopeltis theivora* Waterhouse

Sudeshna Ray[1], Purnima Das[2] & Banna Ushasri[3]
[1]Former M.Sc Student, Department of Entomology, Assam Agricultural University, Jorhat-13
[2]Associate Professor, Department of Entomology, Assam Agricultural University, Jorhat-13
[3] PhD Scholar, Department of Entomology, Assam Agricultural University, Jorhat-13
Corresponding Author: purnima.das@aau.ac.in

Abstract

Cordyceps javanica (OM321438) (Friederichs & Bally) (Hypocreales: Cordycipitaceae) has recently gained attention as a potential microbial biocontrol agent for managing various insect pests which is also showing promising results against tea mosquito bug, *Helopeltis theivora* Waterhouse (Hemiptera: Miridae). In this regards, the current study was aimed to determine the compatibility of *Cordyceps javanica* strain (OM321438) with botanicals- neem oil, pongamia oil, jatropha oil and insecticides Clothianidin 50 WDG, Thiamethoxam 25 WG and Profenofos 50 EC, which are generally advised against this pest. All botanicals and insecticides were tested at recommended dose (RD), half RD and higher than RD using the poison food technique. Results showed that half RD of all botanicals and insecticides produced maximum mycelial growth, conidial density, and sporulation. At half RD (0.5%), neem oil showed the lowest inhibition (31.19%) among botanicals, followed by pongamia oil (43.58%). Among insecticides, Clothianidin 50 WDG (0.01%) recorded the lowest inhibition (12.84%), followed by Thiamethoxam 25 WG (30.50%). Based on T toxicity classification, neem and pongamia oils were compatible at half RD (T > 60). Clothianidin 50 WDG was compatible at all doses, while Thiamethoxam 25 WG was compatible at half RD and RD. The four most compatible combinations were further evaluated against *H. theivora* along with their respective half RDs. *C. javanica* + Thiamethoxam 25 WG recorded the highest mortality at 72 HAT, followed by *C. javanica* + Clothianidin 50 WDG.

Keywords: *Cordyceps javanica, conidial density Helopeltis theivora, mortality and sporulation*

A Review on Probiotic Biofilms for Preventing Pathogen Colonization in Fruits and Vegetables.

Sushma Gurumayum[1*], S.K.Meher[1], Ng. Devarani[2], Panchal Purnima M, A. Raleng[3], Indu
[1]Department of Basic Engineering & Applied Sciences, [2]Department of Farm Machinery & Power Engineering, [3]Department of Processing & Food Engineering, College of Agricultural Engineering & Post Harvest Technology, Ranipool -737135, Sikkim
****sushmagurumayum@gmail.com***

Abstract

Fresh cut fruits and vegetables are highly vulnerable to post harvest contamination by foodborne pathogens such as *Salmonella enterica*, *Escherichia coli* O157:H7, and *Listeria monocytogenes*, mainly due to soil contact, contaminated wash water, unhygienic handling, unhygienic surfaces, and lapses during transport and distribution. This review highlights probiotic biofilms composed predominantly

of lactic acid bacteria, particularly *Lactobacillus plantarum*, as an innovative biocontrol strategy that inhibits pathogen colonization via competitive exclusion, production of antimicrobial metabolites (bacteriocins, organic acids), quorum sensing interference, and formation of a physical barrier on cut tissue surfaces. Synbiotic edible coatings that embed prebiotics such as fructooligosaccharides (FOS) into polysaccharide matrices (e.g., alginate, chitosan, or pectin) can help maintain probiotic viability above 10v CFU/g throughout cold chain storage. This can help prolong shelf life of fresh cut produce by minimizing moisture loss, modulating ethylene related ripening, and simultaneously deliver gut health benefits to consumers. These coatings can be applied by immersion or spray onto apples, papaya, pomelo, and leafy greens while preserving sensory attributes such as taste, color, and aroma. Although laboratory studies report promising pathogen reductions in the range of approximately 48–90%, broader industrial adoption will depend on the development and standardization of efficacy assays to ensure reproducible performance. Overall, probiotic biofilms represent a sustainable, generally recognized as safe (GRAS) alternative or complement to chemical preservatives and can be combined with natural plant extracts to provide a holistic approach to fresh produce safety.

Keywords*: Probiotic biofilms; fresh cut produce; shelf life; pathogen control*

A Multicriteria Decision Support Framework for Sustainable Potato Cultivation and Storage Practices in West Bengal

Jamuna Prasad Kundu[1]*, Manik Chandra Das[2], Bivash Mallick[3], Bijan Sarkar[4]

[1]Department of Mechanical Engineering, Mallabhum Institute of Technology, Bishnupur, Bankura, West Bengal, India. Email: jamunaprasad68@gmail.com

[2]Department of Industrial Engineering and Management, Maulana Abul Kalam Azad University of Technology, West Bengal, India. Email: manikchandra.das@makautwb.ac.in

[3]Department of Industrial Engineering and Management, Maulana Abul Kalam Azad University of Technology, West Bengal, India. Email: bivash.mallick@makautwb.ac.in

[4]Department of Production Engineering, Jadavpur University, Kolkata, West Bengal, India. Email: bijan.sarkar@jadavpuruniversity.in

Corresponding author Email: jamunaprasad68@gmail.com

Abstract

Potato (*Solanum tuberosum*) is an important non-grain staple food crop belonging to the Solanaceae family and is widely cultivated across the world. Globally, India is the second-largest potato-producing country after China, while within India, West Bengal ranks as the second-highest potato-producing state after Uttar Pradesh. However, potato farmers in West Bengal face numerous challenges related to resources, capacity building, knowledge management, climate variability, and the adoption of sustainable practices. In this context, fifteen major constraints associated with potato cultivation and storage were identified through focus group discussions, stakeholder interviews, and expert opinions. Data on these fifteen constraints were collected based on four response variables—severity, occurrence, detection,

and environmental impact—through a survey conducted in sixteen potato-growing blocks across the districts of Hooghly, Paschim Medinipur, Purba Bardhaman, and Bankura. The weights of the four response variables were determined using the Entropy Weight Method (EWM), and the constraints were ranked using VIKOR method. The results indicate that Constraint-2 (during peak harvest periods, farmers face unstable and low market price) is the most critical and undesirable factor, whereas Constraint-15 (modern and reliable systems for cold storage maintenance) is identified as the most favourable.

Keywords: *Potato; Cultivation; Constraints; EWM; VIKOR.*

Nanoparticle-based Management of Multidrug-Resistant *Escherichia coli* from Bovine Mastitis Milk in Southern Assam, India

Anuradha Chakroborty[1], Soumitra Nath[2] and Indu Sharma[1*]

[1] Department of Microbiology, Assam University, Silchar-788011, Assam, India

[2] Department of Biotechnology, Gurucharan University, Silchar-788004, Assam, India

Abstract

Raw bovine milk serves as an essential nutritional resource but also acts as a potential vehicle for zoonotic pathogens. *Escherichia coli* is a major etiological agent of bovine mastitis, contributing to antimicrobial resistance (AMR) dissemination and posing significant public health concerns. This study investigated the prevalence, antimicrobial resistance patterns, biofilm formation, and genetic determinants of *E. coli* isolates obtained from raw mastitic milk in Barak Valley, Assam, India. Out of 105 California Mastitis Test–positive samples, 28% were confirmed as *E. coli* through cultural, biochemical, and molecular analyses. Phylogenetic sequencing revealed close genetic similarity between bovine and human *E. coli* strains, suggesting possible zoonotic transmission. Phenotypically, 93.3% of isolates were biofilm producers, with a significant association between strong biofilm formation and the presence of the *fimH* gene. All isolates exhibited multidrug resistance (MDR), with multiple antibiotic resistance (MAR) indices ranging from 0.3 to 1.0, and widespread resistance observed against â-lactams (97%), tetracyclines (97%) and erythromycin (94%). Resistance to metallic antimicrobials was also common; however, Co–Ni oxide nanocomposites demonstrated strong antibacterial and antibiofilm activity, with minimum inhibitory concentrations (MICs) as low as 10 µg/mL, comparable to ciprofloxacin. These findings highlight the urgent need for alternative antimicrobial strategies and strict antibiotic stewardship in dairy farms. Future studies should focus on in vivo validation of Co–Ni nanocomposites and their biosafety assessment for therapeutic application in veterinary and food systems.

Keywords: *Bovine mastitis; zoonotic; biofilm formation; multidrug resistant; nanocomposites*

Leveraging *Trichoderma* spp. for Sustainable Phytopathogen Management in the Unique Agroecology of Northeast India

Pranab Dutta
Chairman, School of Crop Protection, College of Post Graduate Studies in Agricultural Sciences, Central Agricultural university (Imphal), Umiam, Ri Bhoi, Meghalaya-793103
Email: pranabdutta74@gmail.com

Abstract

Trichoderma spp., versatile ascomycetous fungi, represent a powerful bio-control arsenal for sustainable agriculture, particularly in the unique agroecological conditions of Northeast India. These opportunistic plant symbionts thrive in diverse niches and function as multifunctional agents, acting as biopesticides, biostimulants, and biofertilizers. Their efficacy stems from a combination of direct mechanisms—such as mycoparasitism, antibiosis, and competition for space and nutrients—and indirect strategies, including the induction of systemic plant resistance (ISR, SAR) and significant plant growth promotion. Over two decades of study, native *Trichoderma* strains were isolated from Northeast India and West Bengal. *In vitro* and *in vivo* evaluations demonstrated their high efficacy against key soil-borne pathogens (*Rhizoctonia solani*, *Sclerotinia sclerotiorum*, *Fusarium oxysporum*, *Colletotrichum capsici*, *Sclerotium rolfsii*) and the root-knot nematode (*Meloidogyne incognita*). The fungi also showed excellent compatibility with other biocontrol agents (e.g., *Bacillus subtilis*, *Pseudomonas fluorescens*, entomopathogenic fungi), enabling the development of potent consortial bioformulations. Innovative approaches, like intergeneric protoplast fusion with *Metarhizium anisopliae*, yielded hybrid cells with enhanced pest and pathogen suppression capabilities. This research has successfully translated into practical, low-cost technology. Stabilized liquid bioformulations (Org-Trichojal, Um-Tricho, etc.) with extended shelf-life have proven effective in managing diseases while promoting plant growth across various field and horticultural crops. These formulations induce host defense responses, leading to increased chlorophyll, phenolic compounds, lignin deposition, and other biochemical changes that enhance physical and basal resistance. The technology has been commercialized through state government initiatives in Nagaland and Meghalaya, providing farmers with an eco-friendly management tool and creating avenues for local entrepreneurship and cottage industry development in the region

Keywords: *Trichoderma spp., Biocontrol agent, Plant disease management, Agroecology of Northeast India, Bioformulation, Induced systemic resistance (ISR)*

Eco-friendly Conservation of Fruit and Vegetable Wastes for Microalgae Cultivation Media

Saroj Bala[1] and Urmila Gupta[2]
[1]Department of Microbiology, Punjab Agricultural University, Ludhiana-141004 (Punjab), India. email: sarojbala483@gmail.com Phone no. 7988385102
[1]Department of Botany, Government PG college for women, Sector 14, Panchkula-134109 (Haryana), India. email: sarojbala483@gmail.com Phone no. 7988385102

[2]Department of Renewable Energy and Engineering, Punjab Agricultural University, Ludhiana-141004 (Punjab), India. email: urmilphutela@pau.edu Phone no. 9878717711
***Corresponding author: sarojbala483@gmail.com**

Abstract

Fruit and vegetable wastes represent a valuable natural resource for the production of high-value bioproducts. These wastes—comprising peels, seeds, pomace, and latex—are rich in carbohydrates, proteins, lipids, and polyphenols, making them suitable raw materials for diverse biotechnological applications. However, conventional microalgal culture media are expensive, limiting large-scale production. In this study, leachates derived from fruit wastes (banana peels and pomace, papaya, and pineapple) and vegetable peels (cucumber, pumpkin, potato, and radish) were utilized as alternative, low-cost culture media for microalgae cultivation. Valorization strategies, including biological pretreatment, were employed to prepare formulated media from these agro-wastes. A Central Composite Design (CCD) was applied to optimize seven response variables: biomass (dry weight), chlorophyll content (chlorophyll a and b), carbohydrates, lipids, and proteins. The effects of independent variables—pH, percentage of fruit and vegetable leachate, incubation period, and inoculum concentration—were evaluated to determine optimal growth conditions. The influence of process parameters was illustrated using three-dimensional response surface plots.

The results indicate that alternative media prepared from fruit and vegetable wastes can achieve satisfactory microalgal growth and biochemical production comparable to standard media, while significantly reducing production costs. This approach promotes zero-waste technology by converting agro-waste peels into sustainable microalgal cultivation media, thereby minimizing environmental pollution and supporting resource conservation.

Keywords: *Valorization; Central composite design; Formulated media; Fruit and vegetable peels; Pretreatment; Sustainable development*

Emerging Trends and Innovations in Agricultural Nanotechnology

Amita Dhariwal
Department of Chemistry, Jai Narain Vyas University, Jodhpur 342001
Rajasthan, India
Author email address: dhariwalamita78@gmail.com

Abstract

Agriculture is undergoing a technological transformation driven by the need to ensure food security for a rapidly growing global population while minimizing environmental degradation. Nanotechnology has emerged as a promising interdisciplinary tool that offers innovative solutions to modern agricultural challenges. The application of nanomaterials in agriculture has enabled advancements in nutrient delivery, pest management, soil health improvement, and real-time monitoring of crop conditions. Emerging

trends such as nano-enabled fertilizers, nano-pesticides, nano-sensors, and smart delivery systems have demonstrated significant potential to enhance agricultural productivity and sustainability. Additionally, green synthesis approaches utilizing plant extracts and agricultural waste materials have gained attention for producing environmentally friendly nanomaterials. Despite these advantages, concerns regarding nanoparticle toxicity, environmental persistence, and regulatory frameworks remain critical issues. This chapter provides a comprehensive overview of recent innovations, emerging trends, and future prospects in agricultural nanotechnology, highlighting its role in developing sustainable and precision agriculture systems.

Keywords: *Agricultural nanotechnology, Nano-fertilizers, Nano-pesticides, Nano-sensors, Precision agriculture, Green-synthesis, Sustainable agriculture, Smart delivery systems, Nano-enabled farming*

Emerging Trends and Innovations in Agricultural Nanotechnology

Amita Dhariwal
Department of Chemistry, Jai Narain Vyas University, Jodhpur 342001
Rajasthan, India
Author email address: dhariwalamita78@gmail.com

Abstract

Agriculture is undergoing a technological transformation driven by the need to ensure food security for a rapidly growing global population while minimizing environmental degradation. Nanotechnology has emerged as a promising interdisciplinary tool that offers innovative solutions to modern agricultural challenges. The application of nanomaterials in agriculture has enabled advancements in nutrient delivery, pest management, soil health improvement, and real-time monitoring of crop conditions. Emerging trends such as nano-enabled fertilizers, nano-pesticides, nano-sensors, and smart delivery systems have demonstrated significant potential to enhance agricultural productivity and sustainability. Additionally, green synthesis approaches utilizing plant extracts and agricultural waste materials have gained attention for producing environmentally friendly nanomaterials. Despite these advantages, concerns regarding nanoparticle toxicity, environmental persistence, and regulatory frameworks remain critical issues. This chapter provides a comprehensive overview of recent innovations, emerging trends, and future prospects in agricultural nanotechnology, highlighting its role in developing sustainable and precision agriculture systems.

Keywords: *Agricultural nanotechnology, Nano-fertilizers, Nano-pesticides, Nano-sensors, Precision agriculture, Green-synthesis, Sustainable agriculture, Smart delivery systems, Nano-enabled farming*

Indigenous AI-IoT Frameworks for Precision Agriculture: Scaling Sustainable Productivity in India

Babankumar S. Bansod[1,2]
[1]AcSIR - The Academy of Scientific and Innovative Research, Ghaziabad, UP, 201002201, India
[2]CSIR-Central Scientific Instrument Organisation, Chandigarh 160030, India
Author Email ID: **scientist_babankumar.csio@csir.res.in**

Abstract

The integration of Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT) is redefining resource optimisation in modern agriculture. This study examines the technical architecture and application of a converged digital ecosystem designed to address India's unique agricultural constraints, including fragmented landholdings and water scarcity. We detail a multi-layered approach that utilises IoT-enabled sensor networks for real-time monitoring of soil (NPK, pH) and atmospheric conditions, augmented by remote sensing data. We specifically highlight the development of indigenous IoT gateways and nodes by CSIR-CSIO, designed for robust performance in diverse Indian agro-climatic zones. By facilitating precise nutrient and water delivery through predictive modelling, these technologies offer a viable pathway to improve crop health and farmer profitability. The results underscore the necessity of localised hardware in scaling sustainable, data-driven agricultural interventions.

Keywords: *AI and IoT Convergence, Precision Farming, Wireless Sensor Networks (WSN), Edge Computing, Predictive Analytics, Remote Sensing.*

Unveiling the traditional health benefits and food security of fermented soybean products among ethnic tribes of Meghalaya, Northeast India

Florence Lalsiemvar Lungtau[1], Hanna Yumnam[1], Indranil Chattopadhyay[2], Yashmin Choudhury[3], Pompi S Marak[4], Ibanylla Daimon Slong[5], and Indu Sharma[1*]
[1]Department of Microbiology, Assam University, Silchar-788011, Assam, India
[2] Department of Life Sciences, Central University of Tamil Nadu, Thiruvarur – 610101, Tamil Nadu, India
[3] Department of Biotechnology, Assam University, Silchar-788011, Assam, India
[4] Veterinary Department, West Garo Hills, Tura, - 794002, Meghalaya, India
[5] Veterinary Department, West Khasi Hilla, Jowai – 793150, Meghalaya, India
****Corresponding author email: drsharma7652@gmail.com***

Abstract

Fermentation has long been recognized as one of the oldest and most effective methods of food processing, deeply embedded in traditional food systems and cultural practices. In Northeast India, particularly in the state of Meghalaya, fermented soybean products form an integral part of the daily diet and indigenous knowledge systems of local communities. This study explores the traditional preparation methods, cultural relevance, and diversity of naturally fermented soybean products, *Tungrymbai* and *Dodim.* The study was conducted across the Khasi, Jaintia, and Garo Hills, where selected households were visited to observe and document traditional fermentation practices among the Khasi, Jaintia, and Garo tribes. Emphasis was placed on understanding raw material handling, preparation techniques, fermentation conditions, and consumption patterns. The findings reveal that

both *Tungrymbai* and *Dodim* are prepared through spontaneous fermentation using locally available resources and household-level techniques. However, variations in preparation were observed among communities, including differences in fermentation duration, use of plant leaves, and the addition of bamboo ash in *Dodim*. This study highlights the importance of *Tungrymbai* and *Dodim* as culturally significant traditional foods and their preparation practices among tribal communities of Meghalaya, while also emphasising their role in ensuring food security and promoting ethnic health.

Keywords: *Traditional fermentation, food security, fermented soybean products, ethnic communities, ethnic health, Meghalaya*

From Ocean to Innovation: Marine Bioactives for Next-Generation Functional Foods and Nutraceuticals

Kandi Sridhar

Department of Chemical and Petroleum Engineering, Khalifa University of Science and Technology, Abu Dhabi 127788, United Arab Emirates

Abstract

Marine ecosystems represent a rich and sustainable source of bioactive compounds with immense potential for the development of next-generation functional foods and nutraceuticals. With the growing global demand for health-promoting natural diets and the rising prevalence of lifestyle-related diseases, there is an increasing need to explore alternative and sustainable food resources. Therefore, this keynote presentation focuses on the diversity and availability of marine-derived ingredients, including seaweeds, fish by-products, and other marine organisms, as valuable sources of proteins, peptides, polysaccharides, lipids, and antioxidants with proven health benefits. The talk will highlight recent advances in extraction, purification, and processing technologies that enable efficient recovery and stabilization of these bioactive compounds. Special attention will be given to innovative strategies, such as microencapsulation to improve stability, bioavailability, and sensory acceptability. Case studies, including the impact of drying techniques on seaweed quality and the valorization of fish processing waste into high-value products like collagen, will be discussed to demonstrate real-world applications. Furthermore, the presentation will address key challenges, regulatory considerations, and emerging trends in marine-based functional food development. Overall, we can understand the critical role of marine resources in driving sustainable, innovative, and value-added solutions for the future of the food industry.

Keywords: *Marine bioactive compounds; functional foods; nutraceuticals; marine waste valorization; microencapsulation; sustainable food innovation*

Chemometric Fingerprint-Based Detection of $Pb^{2}z$ in Water Using AuNPs-Modified Electrodes via Square Wave Voltammetry

Monika Antil[1,2]

[1]The Academy of Scientific and Innovative Research, Ghaziabad, Uttar Pradesh 201002, India
[2]CSIR-Central Scientific Instrument Organisation, Chandigarh 160030; India
Author Email ID: monuantil09@gmail.com; 0000-0003-0351-988X

Abstract

Accurate monitoring of Pb²z in complex water matrices remains challenging due to interference effects and the dependence on chemically functionalized sensing interfaces. Although electrochemical stripping techniques offer high sensitivity, they often suffer from overlapping signals, background contributions, and matrix-induced distortions, limiting the reliability of conventional peak-based analysis. To overcome these limitations, we present a ligand-free electrochemical sensing strategy based on citrate-capped gold nanoparticles (AuNPs) integrated with square-wave voltammetry (SWV), coupled with chemometric analysis of the complete voltammetric response. The negatively charged AuNP surface promotes efficient preconcentration of Pb²z during the deposition step, enabling sensitive stripping detection without the need for additional recognition layers. Under optimised conditions (“1.1 V deposition potential, 120 s deposition time, pH 6.2), the proposed sensor exhibits a linear response over the 10–100 ppb concentration range, with a sensitivity of 0.50 ¼A ppb{ ¹ and a detection limit of 0.66 ppb. Principal component analysis (PCA) indicates that the voltammetric response is dominated by Pb²z -dependent variance, while partial least squares regression (PLSR) enables accurate multivariate quantification (R² H” 0.997, RMSE H” 1.6 ppb) by leveraging the full electrochemical fingerprint. The sensor demonstrates good selectivity against common interfering ions and reliable performance in tap water samples. This study provides a simple, scalable, and robust platform for chemometric-assisted electrochemical detection of Pb²z in environmental water systems.

Keywords: *Gold nanoparticles; Square-wave voltammetry; Pb²z detection; Electrochemical sensing; Chemometric analysis.*

A Study on Shrikhand Consumption Patterns among Youth in Anand

Dileepkumar V. Kaner
Sheth M.C. College of Dairy Science, Anand Kamdhenu University, Gujarat .India
Email: dileepkaner@gmail.com

Abstract

Shrikhand is a traditional fermented dairy dessert widely consumed in Gujarat and holds considerable cultural and nutritional significance. The present study titled “A Study on Shrikhand Consumption Patterns among Youth in Anand” examines consumption frequency, brand preference, demographic characteristics, and purchasing behaviour among youth in Anand city. The research is based on primary data collected from 91 respondents through a structured questionnaire, and percentage analysis was used for data interpretation. The findings reveal that most respondents belong to the 18–26 age group and are predominantly undergraduate students. Shrikhand consumption is largely occasional rather than regular, indicating its positioning as a dessert product. Amul emerges as the most preferred brand, demonstrating strong brand dominance and consumer trust among youth. Taste is identified as the primary factor influencing purchase decisions, followed by brand reputation and product availability. A majority of respondents express satisfaction with their preferred brand and show strong intention to

continue purchasing in the future. The study highlights moderate consumption frequency but strong brand loyalty, suggesting opportunities for flavour innovation and youth-focused marketing strategies.

Keywords: *Shrikhand, Youth Consumption, Brand Preference, Dairy Marketing, Consumer Behaviour*

Pesticide-Induced Changes in Soil Microbial Diversity in Northern India

Umesh Kumar [1] , Sulochana Kaushik [1*], Vinod Kumar[2]

Research Scholar, Department of Zoology1* Baba Mastnath University, Asthal Bohar, Rohtak, 124021, Haryana, INDIA.

Department of Zoology 2 P K S Govt. College Kanina Mahendergarh 123027, Haryana INDIA

Email Id:- umeshtanwar007@gmail.com

Corresponding Author: sulochanakaushik13@gmail.com

[#1]Umesh Kumar is a Research Scholar in Department of Zoology, Baba Mastnath University, Rohtak (Haryana).

Email Id:- umeshtanwar007@gmail.com

Abstract

The extensive use of chemical pesticides in modern agriculture has raised serious concerns regarding their impact on soil health and microbial diversity. This study investigates the effects of commonly used pesticides on soil microbial communities in agricultural fields of Northern India. Soil samples were collected from pesticide-treated and untreated (control) sites, and microbial diversity was analyzed using standard microbiological and molecular techniques. Soil enzymatic activities and physicochemical properties were also evaluated to assess functional changes.The results revealed a significant decline in microbial biomass, enzymatic activity, and species richness in pesticide-exposed soils compared to control samples. Beneficial microorganisms, including nitrogen-fixing bacteria and decomposers, were particularly affected, leading to reduced soil fertility and ecological imbalance. Furthermore, a shift in microbial community structure was observed, indicating the emergence of pesticide-resistant strains, which may disrupt natural nutrient cycling processes.The findings highlight the long-term ecological risks associated with indiscriminate pesticide use and emphasize the urgent need for sustainable agricultural practices. Adoption of integrated pest management, biofertilizers, and organic farming approaches is recommended to preserve soil biodiversity and ensure environmental sustainability.

Keywords: Pesticides; Soil Microbial Diversity; Soil Health; Sustainable Agriculture; Integrated Pest Management; Biofertilizers; Environmental Impact; Agro-ecosystem

असम विश्वविद्यालय
ASSAM UNIVERSITY

Department of Agricultural Engineering,
TSSOT, Assam University (A Central University)
Silchar, Assam, India
(www.aus.ac.in)

AEDS

Agro Environmental Development Society (AEDS)
Majhra Ghat, Rampur, U.P., India
(Registered under the Society Registration Act XXI, 1860)
(Registered Under the Niti Aayog, Gov. of India)
(www.aedsi.org)

National Press and Publications (NPP)
Lucknow, Uttar Pradesh, India

ISBN 978-81-971575-7-8