द्वितीय क्षेत्रीय सम्मेलन | 2nd ZONAL CONVENTION

on

"प्राकृतिक खेती, स्वदेशी प्रथाओं एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-सहिष्णु कृषि का सुदृढ़ीकरण"

"Strengthening Climate-Resilient Agriculture through Natural Farming, Indigenous Practices and Innovative Approaches"

30th April – 1st May 2026

SOUVENIR CUM ABSTRACT BOOK

Organised by

Vidyarthi Kalyan Nyas, Bhopal

&

Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M.P.)

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30 अप्रैल से 01 मई, 2026

आयोजक : विद्यार्थी कल्याण न्यास, भोपाल

संयुक्त तत्वावधान : राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर

agrivisioncentralzone@zohomail.in | दत्तोपंत ठेंगड़ी सभागार, RVSKVV, ग्वालियर - 474002 (म.प्र.)

2nd Zonal Convention
on

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AGRIVISION–2026.

Dates: April 30 – May 1, 2026

Venue: Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior, Madhya Pradesh, India

Publication Details

Title of Publication: Souvenir-cum-Abstract Book

Publication Identification Number: *RVSKVV Pub. No. 158/2026*

Official Contact Email: drs@rvskvv.net
agrivisioncentralzone@zoho.mail.in

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Publication Identification Number: *RVSKVV Pub. No. 158/2026*

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No. /Reg./P.S./Agrivi./2026-27/126 Dated:15.04.2026

//ORDER//

In a partial modification in office order No./Reg./P.S./Agrivi./2026-27/25 Dated: 02/04/2026, the following Committees (S.No. 1, 5 and 17) are hereby reconstituted for the smooth and flawless conduction of second zonal Convention of Agrivision on **"Strengthening Climate-Resilient Agriculture through Natural Farming, Indigenous Practices and Innovative Approaches".** The convention will be jointly organized by RVSKVV, Gwalior with Vidyarthi Kalyan Nyas at Dattopant Thengadi Auditorium, V.V. Headquarter from April 30 to May 01, 2026.

S. No.	Committee	Coordinator	Members
1.	Reception Committee	Dr. Ajay Kaushal, Registrar, RVSKVV	Dr. R. A. Kaushik, DRS, RVSKVV Dr. S. K. Sharma, o/o Hon'ble Vice Chancellor Dr. Y. P. Singh, DES, RVSKVV, Gwalior Dr. S. S. Tomar, DI, RVSKVV Dr. D. H. Ranade, Dean, CoH, Mandsaur Dr. I. S. Tomar, Dean, CoA, Sehore Dr. Bharat Singh, Dean, CoA, Indore Dr. D. K. Vani, Dean, CoA, Khandwa Dr. Satya Praksh Singh Tomar, Senior Scientist
5.	Publicity, Photography Invitation & Social Media Committee	Dr. D. K. Paliwal, IPRO RVSKVV, Gwalior	Dr. R. N. Sharma, DR Academic Sh. Vinod Patel, RVSKVV, Gwalior Miss Yogita Karn, IPRO Office Dr. M. K. Tarwariya, CoA, Gwalior Dr. Ankita Sharma, CoA, Gwalior Sh. Ajay Upadhyay, YP-I, IPRO, RVSKVV Mr. Umesh Patle (Ph.D) Mr. Yogesh Jhakhad (Ph.D) Mr. Habil Dongre (Ph.D) Mr. Nikhil Khare (M.Sc) Mr. Vikas Gurjar (M.Sc) Mr. Yoyal Uikey (M.Sc) Ku. Jasmine Krish Sahu (M.Sc) Mr. Atul Rai (UG) Mr. Vishal Dhakad (UG) Mr. Shivam Thakur (UG) Mr. Satyam Chaturvedy (UG) Mr. Ayush Upadhyay (UG)

Contd.. page 02

S. No.	Committee	Coordinator	Members
17.	Certificate Committee	Dr. Sushma Tiwari, CoA, Gwalior	Dr. S. C. Shrivastava, KVK, Gwalior Dr. Soumya Shephalika Dash, CoA, Gwalior Ku,. Shraddha Parmar (Ph.D) Ku. Yashika Shrivastava (Ph.D) Ku. Archi Mishra (Ph.D) Ku. Kriti Tiwari (M.Sc.) Mr. Yash Tale (M.Sc.) Mr. Prashant Lodhi (M.Sc.) Ku. Nikita (M.Sc.) Ku. Ananya Pal (UG)

Other organizing committees remains same.

By the order of Hon'ble Vice Chancellor

Registrar

Endt.No. /Reg./P.S./Agrivi./2026-27/127 Dated:15.04.2026

Copy to: for information

1. Dean Faculty of Agriculture, RVSKVV, Gwalior.
2. Director Research/Extension Services, RVSKVV, Gwalior.
3. Director Instruction & DSW, RVSKVV, Gwalior.
4. Comptroller, RVSKVV, Gwalior.
5. Executive Engineer/IPRO, RVSKVV, Gwalior.
6. Dean, College of Agriculture/Horticulture, Gwalior/Indore/Sehore/Khandwa/Mandsaur.
7. All ADR, ZARS, ……..
8. All Senior Scientist & Head, KVK,……
9. Dey./Asst. Registrar (Estt./Gen./Acd.), RVSKVV, Gwalior.
10. Person Concerned……..
11. PS to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Registrar

संचालन समिति

क्रमांक	पद	नाम	स्थान	संपर्क नंबर
1	संचालन समिति प्रमुख	डॉ. आशीष कुमार गुप्ता	जबलपुर	+91 99811 13633
2	कार्यक्रम प्रमुख	श्री अक्षत ताम्रकार	जबलपुर	94253 89670
3	सह कार्यक्रम प्रमुख	श्री प्रमोद पटेल	रायपुर	81206 58795
4	सह कार्यक्रम प्रमुख	श्री निखिल खरे	—	+91 62681 33588
5	नियंत्रक	कु. शिवानी ठाकुर	जबलपुर	79879 24543
6	सह नियंत्रक	श्री निक्की धाकड़	इंदौर	+91 93999 73024
7	सह नियंत्रक	श्री लक्ष्मण सिंह तोमर	—	+91 96309 50148
8	संचालन समिति सदस्य	डॉ. विवेक कुमार सिंघल	—	+91 92449 63232
9	सदस्य	डॉ. सत्यप्रकाश तोमर	ग्वालियर	+91 79994 77022
10	सदस्य	श्री देवेन्द्र धाकड़	—	—
11	सदस्य	श्री अमन सिंह	—	—
12	सदस्य	श्री लवेश मालवीय	रीवा	+91 62602 93589

कार्यक्रम की पृष्ठभूमि

भारत एक कृषि प्रधान देश है, जहाँ कृषि न केवल आजीविका का प्रमुख आधार है, बल्कि हमारी संस्कृति, अर्थव्यवस्था और सामाजिक संरचना का भी अभिन्न अंग है। वर्तमान समय में रासायनिक कृषि के दुष्प्रभावों और जलवायु परिवर्तन की चुनौतियों ने सतत एवं प्राकृतिक कृषि की आवश्यकता को और अधिक प्रासंगिक बना दिया है। ऐसी कृषि पद्धतियाँ खाद्य एवं पोषण सुरक्षा सुनिश्चित करने के साथ-साथ प्राकृतिक संसाधनों के संरक्षण में भी महत्वपूर्ण भूमिका निभाती हैं।

इन्हीं उद्देश्यों को ध्यान में रखते हुए, विद्यार्थी कल्याण न्यास, भोपाल एवं राजमाता विजयराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर के संयुक्त तत्वावधान में "प्राकृतिक खेती, देशी प्रथाओं एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-सहिष्णु कृषि को सुदृढ़ बनाना" विषय पर द्वितीय राष्ट्रीय सम्मेलन का आयोजन किया जा रहा है।

एग्रीविजन अपनी स्थापना वर्ष 2015 से कृषि, पशुचिकित्सा, डेयरी, बागवानी, गृहविज्ञान, वानिकी, मत्स्यपालन, सेरीकल्चर, प्राकृतिक खेती एवं नवाचार जैसे विविध क्षेत्रों में विद्यार्थियों, शोधार्थियों और कृषकों के लिए ज्ञान, कौशल तथा रोजगार के अवसर उपलब्ध कराने हेतु निरंतर कार्यरत है। यह सम्मेलन कृषि शिक्षा, अनुसंधान, नवाचार और किसान कल्याण के लिए एक सशक्त मंच प्रदान करेगा।

About University: RVSKVV



Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior, was established by the Government of Madhya Pradesh through Ordinance No. 4 of 2008, notified in the Extraordinary Gazette dated 19 August 2008, as the second agricultural university of the state following the bifurcation of Jawaharlal Nehru Krishi Vishwa Vidyalaya. The university caters to the agricultural development needs of 25 districts of Madhya Pradesh, encompassing diverse agro-climatic regions characterized by semi-arid to sub-humid conditions, with annual rainfall ranging from 600 to 1000 mm and soils varying from alluvial to medium and heavy black soils. The research and extension framework of the university is extensive and region-specific. Research activities are conducted through five Zonal Agricultural Research Stations located at Morena, Khargone, Jhabua, Indore, and Sehore; four Regional Agricultural Research Stations at Gwalior, Mandsaur, Ujjain, and Khandwa; and specialized research stations at Entkhedi, Bagwai, Jaora, and Badwah. The university also implements 22 All India Coordinated Research Projects along with several ad hoc research programs aimed at enhancing

productivity and profitability in agriculture. Technology dissemination is a key component of its mandate, carried out through 22 Krishi Vigyan Kendras that provide farmer training, demonstrations, and extension services.

The jurisdiction of the university spans six major agro-climatic zones, namely the Gird Zone, Malwa Plateau, Nimar Valley, Vindhya Plateau, Jhabua Hills, and Bundelkhand Zone. This diversity enables RVSKVV to undertake location-specific research and develop technologies suited to varied farming conditions. Its core mission is to promote agricultural productivity, profitability, and sustainability through integrated efforts in education, research, and extension, while contributing to improved rural livelihoods.

The university has undertaken significant infrastructure development and modernization initiatives under various schemes such as Rashtriya Krishi Vikas Yojana and other state-supported programs. These include the establishment of controlled horticulture storage facilities, threshing floors, implement sheds, seed stores, renovation of field laboratories, and development of specialized crop laboratories such as chickpea and pigeon pea labs. Infrastructure development under Krishi Vigyan Kendras includes administrative buildings, farmer hostels, and staff quarters across multiple districts. Additional initiatives include soil health management projects, tribal sub-plan activities, water harvesting structures, and strengthening of agricultural education through facilities like international hostels, girls' hostels, agricultural science museums, sports complexes, and examination halls.

RVSKVV has also expanded its academic programs by introducing doctoral programs in key disciplines such as agronomy, horticulture, soil science, and plant breeding and genetics. Efforts are being made to modernize laboratories, classrooms, libraries, and sports facilities to enhance the quality of education and research. The university is actively engaged in research on crop improvement for major crops including wheat, chickpea, soybean, pearl millet, mustard, pigeon pea, cotton, sorghum, safflower, as well as medicinal and aromatic plants, grapes, and spices. Concurrent research in natural resource management, plant protection, fodder crops, horticulture, farm machinery, and animal husbandry further strengthens its multidisciplinary approach to agricultural development.

Through its integrated system of education, research, and extension, RVSKVV continues to play a vital role in advancing sustainable agriculture, promoting climate-resilient technologies, and supporting the socio-economic development of farming communities in Madhya Pradesh.





About Agrivision

Agrivision, initiated in 2015 by Akhil Bharatiya Vidyarthi Parishad, is a dynamic platform dedicated to strengthening agricultural education, innovation, and youth engagement in India. It works with students from diverse disciplines such as agriculture, veterinary science, dairy science, horticulture, home science, sericulture, fisheries, forestry, natural farming, and indigenous agricultural practices. The primary objective of Agrivision is to provide better educational exposure, skill development, and employment opportunities to agricultural students while fostering a progressive outlook toward the agri-sector.

Agrivision is continuously striving to improve the lives of individuals directly and indirectly associated with agriculture and the farming community. Since its inception, it has organized several national and regional conferences, seminars, and academic engagements on contemporary agricultural issues that are practical, need-based, and aligned with national priorities. These platforms bring together students, researchers, farmers, policymakers, and industry experts to exchange ideas and develop solutions for sustainable agricultural development.

The organization has also actively contributed to policy advocacy by presenting suggestions to institutions such as the Indian Council of Agricultural Research and the Ministry of Agriculture & Farmers' Welfare, Government of India. Notable recommendations include recognizing agriculture as a professional degree course, which has been positively acknowledged, and proposing reforms to strengthen agricultural education and research systems. Agrivision has also submitted a comprehensive ten-point agenda covering key issues such as the formation of an Indian Agricultural Service, introduction of compulsory agricultural education at school levels, filling vacant positions in agricultural universities, and implementation of uniform educational standards.

In the context of a rapidly changing agricultural landscape—characterized by climate change, resource degradation, and declining interest of youth in farming—Agrivision emphasizes the need to integrate innovation, sustainability, and entrepreneurship into agriculture. It promotes eco-friendly farming practices, technological adoption, and climate-resilient agriculture to ensure long-term food and nutritional security. By combining traditional wisdom with modern scientific approaches, Agrivision advocates for a balanced and sustainable agricultural model.

Over the years, Agrivision has organized multiple national-level conferences and numerous regional and state-level events, engaging thousands of students across the country. It has established a strong presence in more than 55 agricultural universities and across several states, where it conducts activities such as seminars, workshops, educational tours, organic farming campaigns, and skill development programs. Initiatives like organic farming awareness internships have provided students with practical exposure while also promoting sustainable practices among the wider community.

Agrivision is not limited to academic engagement; it also focuses on developing leadership, social responsibility, and entrepreneurial skills among youth. It encourages students to actively participate in nation-building by addressing agricultural challenges and contributing to rural development. As a social platform, its broader mission is to create a supportive ecosystem for agriculture graduates and to restore the dignity and respect of farmers in society.

The vision of Agrivision is to transform India through sustainable agriculture by harnessing the energy, creativity, and innovation of youth. By promoting agricultural education, research, and entrepreneurship, it aims to build an inclusive, resilient, and future-ready agricultural system that contributes to a "Viksit Bharat."

Key Objectives of Agrivision

- To provide a common platform for promoting agricultural education, innovation, and research
- To develop technical and entrepreneurial skills among youth for nation-building
- To promote sustainable and eco-friendly farming practices
- To strengthen youth participation and leadership in agriculture
- To bridge the gap between theoretical knowledge and practical application in the agri-sector

About Akhil Bharatiya Vidyarthi Parishad (ABVP)

Akhil Bharatiya Vidyarthi Parishad (ABVP) is one of the largest student organizations in India, established in 1949 and headquartered in Mumbai. Guided by the motto *"Students' Power is Nation's Power,"* it works toward promoting education, leadership, and nation-building among youth. The organization has a wide presence across universities and colleges in India and engages millions of students through academic, social, and developmental activities.

ABVP emerged in the post-independence period with the objective of channelizing student energy toward national reconstruction and educational reform. It draws inspiration from thinkers such as Swami Vivekananda and Prof. Yashwantrao Kelkar, emphasizing values of selfless service, cultural awareness, and youth participation in societal transformation. While it functions as an independent student body, it is ideologically associated with the Rashtriya Swayamsevak Sangh (RSS).

The organization operates through campus-based units and various thematic initiatives such as Students for Development (SFD), Think India, Students' Experience in Interstate Living (SEIL), and Yuva Vikas Kendra. Its activities include leadership development programs, academic seminars, skill-building workshops, community service initiatives, and campaigns for social awareness. ABVP has also been actively involved in disaster relief, educational

outreach programs like *Basti Ki Pathshala*, and women empowerment initiatives such as *Mission Sahasi*.

In the sphere of student politics, ABVP has a strong presence in university elections across India and has played a role in several student movements, including the Bihar student movement of the 1970s. It continues to engage with issues related to education policy, campus governance, and youth development. While widely recognized for its organizational reach and leadership development, it has also faced criticism in certain instances, reflecting its active involvement in campus-level political discourse.

About Vidyarthi Kalyan Nyas

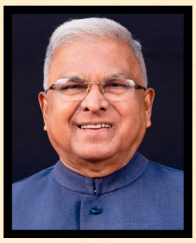
Vidyarthi Kalyan Nyas is a social and educational organization dedicated to the welfare, development, and empowerment of students and youth. The Nyas focuses on creating opportunities for academic growth, skill development, and social awareness, with the broader aim of contributing to nation-building.

It supports students through various initiatives such as educational programs, awareness campaigns, leadership development activities, and community service efforts. By encouraging participation in social and developmental activities, Vidyarthi Kalyan Nyas aims to build responsible, skilled, and socially conscious individuals.

Vidyarthi Kalyan Nyas also collaborates with educational institutions and youth platforms to organize seminars, workshops, and outreach programs that address contemporary issues related to education, employment, and social development. It plays a supportive role in initiatives that promote innovation, entrepreneurship, and capacity building among students, particularly in emerging and socially relevant sectors such as agriculture and rural development.

Through its sustained efforts, the organization contributes to strengthening the link between education and societal needs, while fostering leadership, civic responsibility, and inclusive development among youth.

मंगुभाई पटेल
MANGUBHAI PATEL



सत्यमेव जयते

राज्यपाल, मध्यप्रदेश
GOVERNOR OF MADHYA PRADESH

लोक भवन
भोपाल-462052
LOK BHAVAN
BHOPAL-462052

क्रमांक 1093/लोकभवन/2026
भोपाल, दिनांक-24 अप्रैल, 2026

संदेश

हर्ष का विषय है कि राजमाता विजयराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर एवं विद्यार्थी कल्याण न्यास, भोपाल के संयुक्त तत्वावधान में 30 अप्रैल से 01 मई 2026 तक **"प्राकृतिक खेती, स्वदेशी प्रणालियों एवं नवाचारी दृष्टिकोण के माध्यम से जलवायु-सहिष्णु कृषि का सुदृढ़ीकरण"** विषय पर द्वितीय क्षेत्रीय सम्मेलन **"एग्रीविजन–2026"** का आयोजन किया जा रहा है। इस अवसर पर **स्मारिका** का प्रकाशन सराहनीय है।

कृषि, हमारे देश की अर्थव्यवस्था की आधारशिला है। यह आजीविका का प्रमुख स्रोत है। खाद्य सुरक्षा का मूलाधार है। वर्तमान समय में जलवायु परिवर्तन, संसाधनों का क्षरण तथा बदलते मौसम चक्र जैसी चुनौतियाँ कृषि क्षेत्र के समक्ष गंभीर प्रश्न उपस्थित कर रही हैं। ऐसे में प्राकृतिक खेती, पारंपरिक ज्ञान प्रणालियों तथा नवाचार आधारित उपायों का समन्वय अत्यंत आवश्यक हो गया है।

आशा है, सम्मेलन विद्यार्थियों, शोधार्थियों, वैज्ञानिकों एवं कृषि से जुड़े सभी हितधारकों के विचार-विमर्श का सशक्त मंच सिद्ध होगा। स्मारिका कृषि क्षेत्र को अधिक टिकाऊ, समावेशी एवं जलवायु-सहिष्णु बनाने के निष्कर्ष एवं सुझावों के प्रसार में सफल होगी।

शुभकामनाएं,

मंगुभाई पटेल

(मंगुभाई पटेल)

दूरभाष : 0755-2858828, 2858830, फैक्स : 0755-2858832, ई-मेल : mprajbhavan@mp.gov.in

ऐदल सिंह कंषाना
मंत्री
किसान कल्याण तथा कृषि विकास
मध्यप्रदेश शासन

कार्यालय : कक्ष क्र. VB-II-106,
प्रथम तल, मंत्रालय, भोपाल
दूरभाष क्र. 0755–2708389
निवास : बी–3, श्यामला हिल्स, भोपाल, (म.प्र.)
मोबा. नं. 9425126871, 7697016681
निवास कार्या. : 0755–2441171, 2446073

क्रमांक : 145 /मंत्री/कि.क.कृ.वि.वि./2025

भोपाल, दिनांक 28/04/2026.



// संदेश //

मुझे अत्यंत प्रसन्नता है कि दिनांक 30 अप्रैल से 1 मई 2026 तक दत्तोपंत ठेंगड़ी सभागार, राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर में "प्राकृतिक खेती, स्वदेशी प्रथाओं एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-सहिष्णु कृषि को सुदृढ़ बनाना" विषय पर द्वितीय क्षेत्रीय सम्मलेन AGRIVISION-2026 आयोजित किया जा रहा है।

एग्रीविजन कृषि से जुड़े लोगों के जीवन स्तर को बेहतर बनाने के लिए नवाचार, नीतिगत समर्थन और ज्ञान के आदान-प्रदान को प्रोत्साहित करने के लिए प्रतिबद्ध है। यह भारतीय कृषि अनुसंधान परिषद एवं विभिन्न शासकीय संस्थाओं के साथ मिलकर कृषि शिक्षा, अनुसंधान तथा किसानों के कल्याण को सुदृढ़ बनाने के लिए कार्य करता है। साथ ही, यह कृषि स्नातकों के लिए बेहतर अवसर सृजित करने और किसानों के सम्मान को पुनर्स्थापित करने की दिशा में भी प्रयासरत है।

यह सम्मेलन शोधकर्ताओं, शिक्षाविदों, नीति-निर्माताओं और किसानों को एक उत्कृष्ट मंच प्रदान करता है, जहाँ वे जलवायु परिवर्तन से उत्पन्न चुनौतियों का सामना करने हेतु सतत कृषि पद्धतियों पर विचार-विमर्श कर सकते हैं। प्राकृतिक खेती, स्वदेशी ज्ञान प्रणालियों और नवाचारी दृष्टिकोणों पर केंद्रित यह विषय दीर्घकालिक कृषि स्थिरता, पर्यावरण संरक्षण और किसानों के कल्याण को सुनिश्चित करने के लिए अत्यंत समयोचित और प्रासंगिक है।

मुझे विश्वास है कि इस सम्मेलन के दौरान होने वाले विचार-विमर्श और ज्ञान के आदान-प्रदान से महत्वपूर्ण निष्कर्ष प्राप्त होंगे, सहयोगात्मक प्रयासों को बढ़ावा मिलेगा तथा देश में जलवायु-सहिष्णु कृषि प्रणालियों को सुदृढ़ बनाने में महत्वपूर्ण योगदान मिलेगा। ऐसे प्रयास किसानों को सशक्त बनाने, उत्पादकता बढ़ाने तथा खाद्य एवं पोषण सुरक्षा सुनिश्चित करने में महत्वपूर्ण भूमिका निभाते हैं।

मैं इस सम्मेलन की भव्य सफलता के लिए आयोजकों, प्रतिभागियों एवं सभी संबंधित पक्षों को अपनी हार्दिक शुभकामनाएँ देता हूँ।

(ऐदल सिंह कंषाना)

पंजीयन क्र.– एस 395/1949–50

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अखिल भारतीय विद्यार्थी परिषद्

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प्राक्कथन

यह अत्यंत संतोष और प्रसन्नता का विषय है कि एग्रीविजन 30 अप्रैल से 1 मई 2026 तक राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर, मध्य प्रदेश में "प्राकृतिक खेती, स्वदेशी पद्धतियों एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-लचीली कृषि को सुदृढ़ करना" विषय पर द्वितीय क्षेत्रीय सम्मेलन (AGRIVISION-2026) का आयोजन कर रहा है।

अखिल भारतीय विद्यार्थी परिषद के एक आयाम के रूप में, एग्रीविजन अपनी स्थापना (2015) से ही सराहनीय सेवाएं प्रदान कर रहा है। यह छात्रों, शोधकर्ताओं, किसानों और युवा उद्यमियों के लिए कृषि और ग्रामीण विकास पर सार्थक संवाद का एक सशक्त मंच उपलब्ध कराता रहा है। अपने सतत प्रयासों के माध्यम से, एग्रीविजन नवाचार, युवा सहभागिता और कृषि उन्नति के प्रति प्रगतिशील दृष्टिकोण को बढ़ावा देने वाली एक महत्वपूर्ण पहल के रूप में उभरा है। यह भारतीय कृषि अनुसंधान परिषद तथा अन्य सरकारी संस्थाओं के साथ सहयोग के माध्यम से नीतिगत संवाद, कृषि शिक्षा एवं अनुसंधान को सुदृढ़ करने तथा किसान कल्याण को समर्थन देने में भी सक्रिय योगदान दे रहा है।

कृषि हमारे राष्ट्र की समृद्धि की रीढ़ बनी हुई है, जो आजीविका और खाद्य सुरक्षा सुनिश्चित करती है। तथापि, जलवायु परिवर्तन, मृदा स्वास्थ्य में गिरावट और जल संकट जैसी चुनौतियां हमें टिकाऊ और लचीली कृषि पद्धतियों की ओर अग्रसर होने के लिए प्रेरित करती हैं। इस संदर्भ में, इस सम्मेलन का विषय अत्यंत प्रासंगिक और समयानुकूल है। प्राकृतिक खेती, स्वदेशी ज्ञान प्रणालियों और नवाचारी दृष्टिकोणों पर दिया गया जोर पारिस्थितिक संतुलन और दीर्घकालिक कृषि स्थिरता की दिशा में एक समग्र मार्ग प्रस्तुत करता है।

मुझे विश्वास है कि यह सम्मेलन ज्ञान के आदान-प्रदान को प्रोत्साहित करेगा, नवाचारी सोच को प्रेरित करेगा और सभी हितधारकों के बीच सहयोग को सुदृढ़ करेगा। इस प्रकार की पहलें देश में टिकाऊ, जलवायु-लचीले और आत्मनिर्भर कृषि विकास को बढ़ावा देने में महत्वपूर्ण भूमिका निभाएंगी।

मैं इस महत्वपूर्ण आयोजन के लिए अखिल भारतीय विद्यार्थी परिषद, एग्रीविजन, विद्यार्थी कल्याण न्यास एवं राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर के संयुक्त एवं समर्पित प्रयासों की सराहना करता हूँ तथा सभी प्रतिभागियों को सफल विचार-विमर्श और सम्मेलन की भव्य सफलता के लिए अपनी हार्दिक शुभकामनाएं देता हूँ।

डॉ. रघुराज किशोर तिवारी
राष्ट्रीय अध्यक्ष
अखिल भारतीय विद्यार्थी परिषद

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

Vice-Chancellor
कुलगुरु

Prof. Arvind Kumar Shukla
प्रो. अरविन्द कुमार शुक्ला

No./VC/2025-26/ 104
Dated: 21.04.2026



MESSAGE

It gives me immense pleasure to welcome all distinguished guests, scientists, policymakers, farmers, and participants to the 2nd Zonal Convention of AGRIVISION 2026 on ***"Strengthening Climate-Resilient Agriculture through Natural Farming, Indigenous Practices, and Innovative Approaches"*** being organized from 30th April to 1st May 2026 at Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior, Madhya Pradesh, this convention is both timely and significant in the context of global climate challenges.

AGRIVISION is committed to improving the agricultural community through policy advocacy, collaboration, and initiatives that support farmers' welfare, agricultural education, and opportunities for graduates. Natural farming and indigenous practices offer sustainable solutions, and their integration with modern innovations can strengthen climate-resilient agriculture.

RVSKVV is proud to host this convention, which serves as a platform for knowledge exchange and collaboration. I am confident that the deliberations will lead to meaningful insights and actionable strategies for sustainable agriculture.

I extend my best wishes to all participants for a productive and enriching convention. Let us work together towards a resilient and sustainable agricultural future.

(Arvind Kumar Shukla)

पंजीयन क्र.– एस 395/1949–50

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संदेश

"प्राकृतिक खेती, स्वदेशी प्रथाओं एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-सहिष्णु कृषि को सुदृढ़ बनाना" विषय पर AGRIVISION-2026 के द्वितीय क्षेत्रीय अधिवेशन के अवसर पर अपनी हार्दिक शुभकामनाएँ एवं बधाई प्रेषित करता हूँ, जिसका आयोजन 30 अप्रैल से 1 मई 2026 तक राजमाता विजयराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर में किया जा रहा है।

यह जानकर प्रसन्नता हुई कि अखिल भारतीय विद्यार्थी परिषद का एक आयाम 'एग्रीविजन' इस महत्वपूर्ण कार्यक्रम का आयोजन कर रहा है। अपनी स्थापना के बाद से ही एग्रीविजन युवाओं को कृषि, नवाचार एवं ग्रामीण विकास से जोड़ने में सक्रिय भूमिका निभा रहा है तथा विद्यार्थियों एवं शोधार्थियों के बीच नेतृत्व एवं रचनात्मक सहभागिता को प्रोत्साहित कर रहा है।

एग्रीविजन नवाचार, नीति समर्थन एवं ज्ञान के आदान-प्रदान को बढ़ावा देने में भी सराहनीय कार्य कर रहा है। भारतीय कृषि अनुसंधान परिषद तथा अन्य सरकारी संस्थानों के साथ इसके सहयोग ने कृषि शिक्षा, अनुसंधान एवं किसानों के कल्याण को सुदृढ़ करने में महत्वपूर्ण योगदान दिया है।

यह अधिवेशन शिक्षाविदों, नीति-निर्माताओं एवं किसानों के लिए सतत कृषि पद्धतियों पर विचार-विमर्श का एक उत्कृष्ट मंच प्रदान करता है। प्राकृतिक खेती, स्वदेशी ज्ञान प्रणालियों एवं नवाचारी दृष्टिकोणों पर केंद्रित यह प्रयास समयानुकूल एवं जलवायु-सहिष्णु तथा सतत कृषि सुनिश्चित करने के लिए अत्यंत आवश्यक है।

मुझे विश्वास है कि यह अधिवेशन सार्थक संवाद को बढ़ावा देगा तथा कृषि क्षेत्र को सुदृढ़ बनाने में महत्वपूर्ण योगदान देगा। मैं इस महत्वपूर्ण आयोजन के लिए अखिल भारतीय विद्यार्थी परिषद, एग्रीविजन, विद्यार्थी कल्याण न्यास एवं राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर के संयुक्त एवं समर्पित प्रयासों की सराहना करता हूँ तथा सभी प्रतिभागियों को सफल विचार-विमर्श और सम्मेलन की भव्य सफलता के लिए अपनी हार्दिक शुभकामनाएं देता हूँ।

डॉ. वीरेन्द्र सिंह सोलंकी
राष्ट्रीय महामंत्री
अखिल भारतीय विद्यार्थी परिषद

Dr. (Col.) Girish Chandel
डॉ. (कर्नल) गिरीश चंदेल
Vice Chancellor
कुलपति

INDIRA GANDHI KRISHI VISHWAVIDYALAYA
इंदिरा गांधी कृषि विश्वविद्यालय
Krishak Nagar, Raipur, 492012
कृषक नगर, रायपुर 492012
Chhattisgarh, INDIA
छत्तीसगढ़, भारत



No. PA/VC/188/2026/23
Date: 24/04/2026

// संदेश //

मुझे AGRIVISION-2026, द्वितीय क्षेत्रीय सम्मेलन के अवसर पर अपनी हार्दिक शुभकामनाएँ प्रेषित करते हुए अत्यंत प्रसन्नता हो रही है, जिसका उद्देश्य प्राकृतिक खेती, स्वदेशी प्रथाओं तथा नवाचारी दृष्टिकोणों के माध्यम से जलवायु– सहिष्णु कृषि को सूदृढ़ बनाना है।

वर्तमान में कृषि क्षेत्र जलवायु परिवर्तन, घटते प्राकृतिक संसाधनों एवं बदलती सामाजिक–आर्थिक परिस्थितियों के कारण तीव्र परिवर्तन से गुजर रहा है। ऐसी परिस्थिति में सतत एवं पर्यावरण–अपुकूल कृषि प्रणालियों को अपनाना अनिवार्य हो गया है। प्राकृतिक खेती एवं स्वदेशी ज्ञान–प्रणालियाँ किफायती, पर्यावरण–संतुलित तथा सामाजिक रूप से समावेशी समाधान प्रदान करती हैं।

यह सम्मेलन प्राचिन ज्ञान एवं आधुनिक नवाचारों के समन्वय की आवश्यकता को रेखांकित करता है। एग्रीविजन एवं विद्यार्थी कल्याण न्यास द्वारा निर्मित यह मंच विद्यार्थियों, शोधकर्ताओं, किसानों एवं अन्य हितधारकों के मध्य संवाद और ज्ञान–विनिमय को सशक्त बनाता है, जिससे वैज्ञानिक अनुसंधान को जमीनी स्तर पर लागू करने में सहायता मिलती है। युवा कृषि विद्यार्थियों की सक्रिय भागीदारी विशेष रूप से सराहनीय है, जो भविष्य में कृषि क्षेत्र के नेतृत्व को सुदृढ़ करेगी।

मैं आयोजन समिति को हार्दिक बधाई देता/देती हूँ तथा विश्वास व्यक्त करता/करती हूँ कि यह सम्मेलन भारत में सुदृढ़ सतत एवं आत्मनिर्भर कृषि व्यवस्था के निर्माण में महत्वपूर्ण योगदान देगा। सभी प्रतिभागियों को सफल एवं सार्थक आयोजन हेतु शुभकामनाएँ।

(गिरीश चंदेल)

प्रो. प्रमोद कुमार मिश्रा
कुलपति
Prof. Pramod Kumar Mishra
Vice Chancellor

जवाहरलाल नेहरू कृषि विश्वविद्यालय
कृषि नगर, अधारताल, जबलपुर ४८२ ००४ (म.प्र.)
Jawaharlal Nehru Krishi Vishwa Vidyalaya
Krishi Nagar, Adhartal, Jabalpur 482 004 (M.P.)
Ph.: 0761-2681706 (O), Fax: 0761-2681389
E-mail: mishravcjnkvv@gmail.com

संदेश

मुझे यह जानकर अत्यंत हर्ष एवं संतोष की अनुभूति हो रही है कि प्राकृतिक खेती, स्वदेशी प्रथाओं एवं नवाचारी दृष्टिकोणों के माध्यम से जलवायु-सहिष्णु कृषि को सुदृढ़ बनाना विषय पर आधारित द्वितीय क्षेत्रीय सम्मेलन (AGRIVISION–2026) का आयोजन 30 अप्रैल से 1 मई, 2026 तक राजमाता विजयराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर में किया जा रहा है। इस महत्वपूर्ण अवसर पर मैं अपनी हार्दिक शुभकामनाएँ प्रेषित करता हूँ।

वर्तमान समय में कृषि एक ऐसे निर्णायक मोड़ पर खड़ी है, जहाँ खाद्य सुरक्षा सुनिश्चित करने और पारिस्थितिक संतुलन बनाए रखने की दोहरी चुनौतियों का समुचित समाधान आवश्यक है। इस संदर्भ में प्राकृतिक खेती, स्वदेशी कृषि पद्धतियों तथा नवाचारी उपायों पर दिया गया विशेष बल अत्यंत समयोचित एवं प्रासंगिक है। ये पहल न केवल बाह्य संसाधनों पर निर्भरता को कम करती हैं, बल्कि मृदा स्वास्थ्य के संरक्षण, जैव विविधता के संवर्धन तथा दीर्घकालिक स्थिरता को भी सुनिश्चित करती हैं।

एग्रीविजन एवं विद्यार्थी कल्याण न्यास द्वारा विद्यार्थियों, वैज्ञानिकों, कृषकों एवं नीति-निर्माताओं को एक मंच पर लाने का प्रयास अत्यंत सराहनीय है। विविध हितधारकों का यह समागम सार्थक संवाद, ज्ञान-विनिमय तथा स्थानीय परिस्थितियों के अनुरूप व्यावहारिक समाधान विकसित करने में सहायक सिद्ध होगा।

मेरा दृढ़ विश्वास है कि पारंपरिक ज्ञान एवं आधुनिक वैज्ञानिक उपलब्धियों का समन्वय ही सशक्त एवं जलवायु-सहिष्णु कृषि की कुंजी है। इस प्रकार के आयोजन युवाओं को प्रेरित करते हैं, किसानों को सशक्त बनाते हैं तथा अनुसंधान एवं व्यवहारिक क्रियान्वयन के मध्य सेतु स्थापित करते हैं।

मैं इस उत्कृष्ट पहल के लिए आयोजकों को हार्दिक बधाई देता हूँ तथा AGRIVISION–2026 की सफलता हेतु अपनी मंगलकामनाएँ प्रेषित करता हूँ। मुझे पूर्ण विश्वास है कि यह सम्मेलन देश में नवाचारपूर्ण, सतत एवं जलवायु-अनुकूल कृषि पद्धतियों को प्रोत्साहित करने में महत्वपूर्ण योगदान देगा।

Mishra 24/4/26

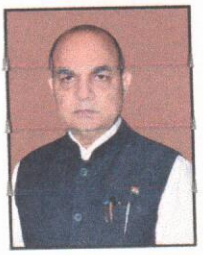
(प्रमोद कुमार मिश्रा)

नानाजी देशमुख पशुचिकित्सा विज्ञान विश्वविद्यालय
अधारताल, जबलपुर 482004 (म.प्र.) भारत
NANAJI DESHMUKH VETERINARY SCIENCE UNIVERSITY
ADHARTAL, JABALPUR, 482004 (M.P.) India
(Established by MP Act no. 16 of 2009)

प्रो. (डॉ.) मनदीप शर्मा
कुलगुरू
Prof. (Dr.) Mandeep Sharma
Vice-Chancellor

Phone cum Fax: 0761-2681022
Mob. No.: 9816030349
Email: vcnduvs@gmail.com
Website: www.ndvsu.org

संदेश



AGRIVISION–2026, द्वितीय क्षेत्रीय सम्मेलन के आयोजन के विषय में जानकर मुझे अत्यंत हर्ष की अनुभूति हो रही है। यह सम्मेलन प्राकृतिक खेती एवं स्वदेशी कृषि पद्धतियों के माध्यम से जलवायु-सहिष्णु कृषि को सुदृढ़ बनाने के लिए समर्पित है, जो वर्तमान समय की एक महत्वपूर्ण आवश्यकता है।

कृषि, हमारे राष्ट्र की अर्थव्यवस्था की रीढ़ होने के नाते, निरंतर नवाचार एवं बदलती परिस्थितियों के अनुरूप अनुकूलन की अपेक्षा करती है। जलवायु परिवर्तन की बढ़ती तीव्रता, मृदा उर्वरता में गिरावट तथा पर्यावरणीय चुनौतियाँ कृषि पद्धतियों में मूलभूत परिवर्तन की मांग करती हैं। इस संदर्भ में प्राकृतिक खेती एवं पारंपरिक कृषि ज्ञान-प्रणालियाँ ऐसे सतत विकल्प प्रस्तुत करती हैं, जो पारिस्थितिक संतुलन के अनुरूप हैं।

एग्रीविजन एवं विद्यार्थी कल्याण न्यास द्वारा इस प्रकार के सम्मेलन का आयोजन अत्यंत सराहनीय पहल है। यह मंच शिक्षाविदों, कृषकों, नीति-निर्माताओं एवं उद्यमियों को एक साथ लाकर अंतर्विषयक सहयोग को प्रोत्साहित करता है तथा नवाचारी विचारों के आदान-प्रदान का अवसर प्रदान करता है।

ऐसे सम्मेलन वैज्ञानिक अनुसंधान एवं उसके व्यावहारिक अनुप्रयोग के मध्य की दूरी को कम करने में महत्वपूर्ण भूमिका निभाते हैं। साथ ही, यह युवा शोधार्थियों एवं विद्यार्थियों को सतत कृषि समाधान विकसित करने हेतु प्रेरित करते हैं, जिससे राष्ट्र के समग्र विकास को गति मिलती है।

मुझे पूर्ण विश्वास है कि AGRIVISION–2026 सार्थक विचार-विमर्श एवं व्यावहारिक सुझावों के माध्यम से कृषि समुदाय को लाभान्वित करेगा। आयोजकों को हार्दिक बधाई एवं इस आयोजन की सफलता हेतु मेरी शुभकामनाएँ।

मनदीप शर्मा

प्रो. रवि आर. सक्सेना
Prof. Ravi R. Saxena
M.Sc. (Ag.), Ph.D.
N.E. Borlaug Fellow (USA), LEAP (Australia)
कुलपति
Vice-Chancellor

महात्मा गांधी उद्यानिकी एवं वानिकी विश्वविद्यालय,
दुर्ग (छत्तीसगढ़)
Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg (Chhattisgarh)

क्र. / कुलपति प्रकोष्ठ / 2026–27 / ....19.....

दिनांक: 24 / 04 / 2026



संदेश

मुझे AGRIVISION-2026, द्वितीय क्षेत्रीय सम्मेलन के अवसर पर अपनी हार्दिक शुभकामनाएँ प्रेषित करते हुए अत्यंत प्रसन्नता हो रही है। यह सम्मेलन प्राकृतिक खेती, स्वदेशी प्रथाओं तथा नवाचारी रणनीतियों के माध्यम से जलवायु–सहिष्णु कृषि को सुदृढ़ बनाने पर केंद्रित है।

वर्तमान समय में कृषि क्षेत्र जलवायु परिवर्तन, संसाधनों की कमी तथा बढ़ती उत्पादन लागत जैसी गंभीर चुनौतियों का सामना कर रहा है। इन समस्याओं के समाधान हेतु एक समग्र एवं सतत दृष्टिकोण अपनाना अत्यंत आवश्यक है, जो पारिस्थितिक संतुलन, कृषक हित तथा दीर्घकालिक उत्पादकता को प्राथमिकता प्रदान करे। इस संदर्भ में प्राकृतिक खेती एवं स्वदेशी कृषि पद्धतियाँ कम लागत, पर्यावरण–अनुकूल तथा लचीली कृषि प्रणालियों को बढ़ावा देते हुए एक प्रभावी विकल्प प्रस्तुत करती हैं।

एग्रीविजन एवं विद्यार्थी कल्याण न्यास द्वारा इस सम्मेलन का आयोजन अत्यंत सराहनीय है। विभिन्न हितधारकों–विद्यार्थियों, शोधकर्ताओं, किसानों एवं नीति–निर्माताओं को एक मंच पर लाने का उनका प्रयास ज्ञान–विनिमय तथा सामूहिक समस्या–समाधान को सुदृढ़ करता है।

यह सम्मेलन नवाचारी विचारों के आदान–प्रदान, शोध निष्कर्षों के प्रसार एवं व्यावहारिक समाधान तलाशने हेतु एक महत्वपूर्ण मंच सिद्ध होगा। विविध प्रतिभागियों की सहभागिता विचार–विमर्श को समृद्ध करते हुए समावेशी एवं सतत कृषि नीतियों के निर्माण में सहायक होगी।

मेरा विश्वास है कि ऐसे प्रयास आत्मनिर्भर कृषि के लक्ष्य को साकार करने तथा भावी पीढ़ियों के लिए खाद्य एवं पोषण सुरक्षा सुनिश्चित करने में महत्वपूर्ण भूमिका निभाते हैं।

मैं आयोजकों एवं सभी प्रतिभागियों को इस महत्वपूर्ण आयोजन की सफलता हेतु हार्दिक शुभकामनाएँ प्रेषित करता हूँ।

भवदीय

24/04/26

(रवि आर. सक्सेना)

पता: सांकरा–पाटन, दुर्ग–491 111 (छत्तीसगढ़)
Address: Sankara-Patan, Durg - 491 111 (Chhattisgarh)
E-mail: vc@mguvv.ac.in; drravirsaxena@gmail.com Website: mguvv.ac.in

Role Model Session Speaker

SN	Name	Area of Work	Title	Email and contact no.
1	Shri Akash chourasiya	Inventor of multilayer agriculture technology	Multilayer agriculture A sustainable way of Indian agriculture	akashchourasiya05@gmail.com Mo.9179066275
2	Dr. Bhekh Ram Chandravanshi	Founder of Vedantra Nursery)	Integrated Farming system	Mobile: +91 9713366448 Chandravanshi.bhekh@gmail.com
3	Shri. Shivankur Gupta	CEO of Tractor Gyan	Agriculture plus internet and unlimited opportunities	mo 9589229123 ceo@tractorgyan.com
4	Shri. Ram Gopal Verma	Seed society,Shivpuri	Society to seed Industry	Mo 9755743352

Invited Lectures

S N.	Name	Designation	Title	Email and contact no.
1	Dr. Shankar Jha	Associate Professor (Soil Science) Post Graduate College of Agriculture, RAU Pusa Bihar	Cow based green energy system	9430259387 shankarjha@rpcau.ac.in
2	Dr. Suresh Motwani	Program Head – Solidaridad & Founder Bhartkhand FPO consorti	"Strengthening India's Food Systems: Leveraging Regenerative Agriculture and Empowered FPOs for Climate Resilience and Global Leadership."	9425010530 suresh.motwani @solidaridadnetwork.org
3	Dr. Ankit Tiwari	Assistant Professor, Electrical Engineering Dept, In-Charge, Startup Cell, Entrepreneurship Development Cell, Madhav Institute of Technology & Science, Gwalior,	Topics " Socio-Technical Transformation of Agriculture: Bridging Technology, Policy and Society	9826375215 ankittiwari@mitsgwalior.in
4	Dr. Anurag Shrivashtava	IIITM, Gwalior	"Ideation to Startup: A journey"	9826189049 profanurag@gmail.com
5	Shri. Chetas Sukhadia	Zonal organising secretary (ABVP)	Special dialect Session	
6	Dr. Sanjay K. Dwivedi	Principal Scientist/Professor Department of Agronomy, CoA, IGKV, Raipur (C.G.)	Climate-Resilient Agro-Management Strategies for Sustainable Profitability in Rice-Based Cropping Systems	Mo: 7000096969 skd@igkv.ac.in
7	Shri. Rajeev Gupta	Unnat seeds private limited	Seed Production unit and seed industry	rajeevg610@gmail.com Mo 9826333664

		Gwalior		
8	Nisha Niranjan	C E O VN ORGANICS PVT. LTD	Future and scope of Agriculture and business in agri startup	8878868783 nishavnorg@gmail.com
9.	Dr. Gourav Sharma	Prof, Horticulture RLBCAU, Jhansi	Empowering youth through value addition in floriculture	8817641992

Invited Speakers

Sr. No.	Name	Designation	Email and contact no.
1.	Dr. A.K. Singh	Vice Chancellor (RLBCAU) Jhansi	Mo. 9582922324 vcrlbcau@gmail.com
2.	Dr. P.K. Mishra	Vice Chancellor JNKVV, Jabalpur	Mo 9425359690 mishravcjnkvv@gmail.com
3.	Dr. Girish Chandel	Vice Chancellor (IGKVV) Raipur	Mo. 9406382169 vc@igkv.ac.in patovc@igkv.ac.in
4.	Prof. Mandeep Sharma	Vice Chancellor (NDVSU) Jabalpur	Mo. 07612681022 vcnduvs@gmail.com
5.	Dr R. R. Saxena	Vice Chancellor, MGUVV, Durg, CG	9406009400 pa.vc@mguvv.ac.in
6.	Dr S.K. Chaturvedi	DRS (RLBCAU) Jhansi	Mo .9336214977 directorresearch.rlbcau@gmail.com
7.	Dr R. A. Kaushik	DRS , RVSKVV Gwalior	9887281595 drs@rvskvv.net
8.	Dr. Sanjay Sharma	Ex DRS (RVSKVV) Gwalior	Mo 9893946434
9.	Dr. Vivek Tripathi	DRS (IGKVV) Raipur	Mo .07712443035 Drs@igkv.ac.in
10.	Dr. Y.P. Singh	DES , RVSKVV Gwalior	Mo .9425719950 Des@rvskvv.net
11.	Dr. Amit Goswami	Professor Horticulture (IARI) Delhi	Mo .7428928799 amitgoswami@iari.res.in
12.	Dr. Pramod Kumar Pandey	Dean, College of Fisheries, Datia	6393032085 deanfishries.rlbcau@gmail.com
13.	Dr. Gourav Sharma	Prof, Horticulture RLBCAU, Jhansi	gauravhort@gmail.com 8817641992
14.	Dr. Pradeep Kumar	DI , RVSKVV Gwalior	di@rvskvv.net 8894439999
15.	Dr. Bharat Singh	Dean, CoA, Indore	9425029424
16.	Dr. I. S. Tomar	Dean, CoA, Sehore	9425188028
17.	Dr. Deepak Hari Ranade	Dean, CoH, Mandsaur	9826605965

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SUB THEME-I



Natural Farming/ZBNF, ITK (Indigenous Technical Knowledge) and IKS(Indian knowledge system), Traditional pest & disease management practices, Krishi Shastra

IIZCAGV-26-T1-001

Traditional Orchard Management Practices for Climate Resilience and Natural Farming in Fruit Crops

Harshit Jangid[1], Indar Raj Naga[2] and Renu Jayant[3]

[1]Ph. D. Scholar, Department of Horticulture (Fruit Science), Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)
[2]Ph. D. Scholar, Department of Soil Science and Agricultural Chemistry, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)
[3]Ph. D. Scholar, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

Corresponding Email: hjangid771@jnkvv.org

Abstract

Climate change poses serious challenges to fruit production systems by increasing temperature fluctuations, water scarcity, and pest–disease incidence. In this context based traditional orchard management practices offer sustainable and eco-friendly solutions to enhance climate resilience and promote natural farming. The present study highlights the role of traditional practices in improving soil health, plant growth, and productivity of fruit crops under changing climatic conditions. Traditional orchard management practices such as organic mulching, use of farm-derived inputs (Jeevamrit, Beejamrit), basin irrigation, mixed cropping and botanical pest management were evaluated for their effectiveness in orchard. These practices contribute to improved soil moisture retention, enhanced microbial activity, and better nutrient cycling, leading to improved plant vigour and stress tolerance. Additionally, traditional canopy management and pruning techniques help in maintaining plant architecture and optimizing light interception. The findings indicate that traditional orchard management significantly reduces dependency on chemical inputs while maintaining soil fertility and ecological balance. Improved physiological performance of plants, including enhanced nutrient uptake and resilience to abiotic stress, was observed. Moreover, these practices support biodiversity conservation and reduce environmental degradation. The study concludes that integrating traditional orchard management with natural farming principles can serve as a viable strategy for sustainable fruit production under climate variability. Adoption of such practices can enhance long-term productivity, reduce input costs, and contribute to climate-resilient horticulture.

Keywords: Indigenous Technical Knowledge, Natural farming, Climate resilience, Orchard management, Fruit crops

IIZCAGV-26-T1-002

Assessment of Potato (*Solanum tuberosum* L) for Growth and Yield Attributes Under Natural Farming in the Gird Region of M.P.

Aman Pratap Singh Chauhan

Ph.D. Scholar,Department of Agronomy,College of Agriculture Rajmata Vijayaraje Scindia K rishi Vishwa Vidhalaya, Gwalior (M.P)

Corresponding Email: chauhanaman605@gmail.com

Abstract

The present study titled "Assessment of potato (*Solanum tuberosum* L.) for growth and yield attributes under natural farming in the gird region of M.P." was carried out during the rabi season of 2022–23 at the research farm of ICAR-CPRI Regional Station, Gwalior, located in northern Madhya Pradesh. The experiment was conducted under prevailing agro-climatic conditions using an RBD design, comprising seven treatments and four replications. The maximum plant emergence percentage (92.88%), highest growth parameters viz. plant height (73.700 cm), number of stems per plant (6.887), number of compound leaves per plant (58.250), root length (13.400 cm), and yield parameters viz. total tuber yield (48.801 kg/plot) were recorded with treatment T7 (Integrated practise 90% inorganic and 10% organic).
Key words: Natural farming, Potato, RBD, Growth attributes, Total tuber yield

IIZCAGV-26-T1-003

Natural Farming as a Pathway for Ecological Restoration and Sustainable Agriculture in India

Vaibhav Laxmi Tiwari[1], Shubham Kumar Thakur[2] and Sujit[2]

[1]ICAR-National Institute of Biotic Stress Management, Raipur, 493225 Chhattisgarh, India
[2] College of Horticulture and Research Station, Chirmiri, M.C.B, Chhattisgarh, India

Corresponding Email: vibhatiwari131998@gmail.com

Abstract

Indian agriculture is facing severe ecological stress, with nearly 32% of land degraded and 25% undergoing desertification (Food and Agriculture Organization, 2024). This study evaluates the role of natural farming and Indigenous Technical Knowledge (ITK) in restoring agro-ecosystems and enhancing environmental sustainability. Evidence suggests that excessive use of chemical fertilizers and pesticides has contributed to soil degradation, declining biodiversity, and water contamination. Natural farming practices, supported under Paramparagat Krishi Vikas Yojana, promote soil organic carbon, microbial activity, and ecological balance. Indigenous practices such as mixed cropping and botanical pest control enhance resilience while reducing chemical load. Studies indicate that improving soil organic matter is critical, as Indian soils have low average organic carbon (~0.5%), affecting productivity and sustainability. However, adoption remains limited due to knowledge gaps and market constraints. The study recommends integrating natural farming into climate policies, incentivizing ecosystem services, and strengthening agroecological extension systems to ensure long-term environmental sustainability in Indian agriculture.
Keywords: Natural farming, ITK, Soil health, Biodiversity, Ecosystem restoration

IIZCAGV-26-T1-004

Krishi Shastra to Krishi Arthashastra: An Integrated Framework of Indigenous Knowledge for Sustainable Farming

Sachin Rathour[1], Shalini Singh[2], Anand Pratap Singh[2] and Jasmeet Kaur[2]

[1]Assistant professor (Contractual), Department of Agricultural Economics, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKVV), Gwalior Pin Code: 474002. Madhya Pradesh, India. ORCiD ID: 0000-0001-9014-5219
[2]PhD Research Scholar, Institute of Agricultural Sciences, Banaras Hindu University Varanasi. 221005. Uttar Pradesh India.

Corresponding address: sachinrt638@bhu.ac.in

Abstract

This study examines Indigenous Knowledge Systems (IKS) in agriculture using a historical-documentary approach, drawing on ancient texts, archival records, and ethnographic evidence. Thematic analysis categorizes practices into soil health, pest management, crop care, and livestock health. Rooted in the principles of **Krishi Shastra (Agricultural Science)**, classical treatises such as *Vrikshayurveda* document seed treatment, soil fertility, irrigation, and pest control, while traditional inputs like *Panchagavya* emphasize organic crop nutrition. Farming practices including mixed cropping, crop rotation, and lunar-based calendars ensured resilience, biodiversity, and sustainability in pre-modern agriculture. The findings highlight a diverse range of Indigenous Technical Knowledge (ITK) with strong ecological and socio-economic relevance. Pest management techniques include scarecrows, bamboo perches, neem-based formulations, and innovative local practices such as light traps and biological attractants. Herbal remedies using turmeric, garlic, and plant extracts support livestock health. These practices enhance biodiversity, reduce input costs through resource recycling, and strengthen household food security, with women playing a key role in knowledge transmission. Importantly, IKS demonstrates strong linkages with **Krishi Arthashastra (Agricultural Economics)** by improving cost efficiency, optimizing resource use, and strengthening risk management. While Krishi Shastra contributes to sustainable production systems, Krishi Arthashastra ensures economic viability through better allocation of resources, reduced costs, and enhanced farm profitability. The study concludes that integrating IKS with modern agricultural science and economics can promote sustainable, climate-resilient, and inclusive agricultural development.

Keywords: Indigenous Knowledge Systems, Krishi Shastra, Krishi Arthashastra, sustainable agriculture, climate-resilient agriculture.

IIZCAGV-26-T1-005

Role of Indigenous Technical Knowledge (ITK) in Eco-friendly Insect Pest Management in Indian Cropping Systems

Bazar Thimmappa Charan Kumar[1], S.P.S. Tomar[2], Soumya Shephalika Dash[3], Neha Sharma[4] and Shubham Singh[1]

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[2]Senior Scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[3]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[4]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding Email: charankumarbt@gmail.com

Abstract

Indigenous Technical Knowledge (ITK) represents a rich repository of location-specific, experience-based practices developed by farming communities over generations. In the context of increasing concerns over pesticide misuse, environmental degradation, and pest resistance, ITK offers viable eco-friendly alternatives for insect pest management in Indian cropping systems. This review examines the role of traditional practices such as botanical formulations, crop diversification, mixed cropping, ash application, and use of locally available plant extracts in managing insect pests sustainably. These practices function through mechanisms like repellency, antifeedant action, and enhancement of natural enemy populations, thereby reducing pest pressure without disturbing ecological balance. Evidence from various regions of India indicates that ITK-based pest management not only lowers input costs but also improves soil health, biodiversity, and long-term farm sustainability. The integration of ITK with modern Integrated Pest Management (IPM) approaches can further strengthen pest control strategies while minimizing dependence on synthetic chemicals. However, challenges such as lack of scientific validation, standardization, and limited dissemination restrict wider adoption. The study highlights the need for systematic documentation, validation, and promotion of ITK practices through research and extension systems. Strengthening farmer–scientist collaboration and incorporating traditional knowledge into formal agricultural frameworks can enhance climate resilience and support sustainable crop production. Overall, ITK serves as a valuable, eco-friendly tool for insect pest management and holds significant potential for developing resilient and sustainable agricultural systems in India.

Keywords: Indigenous Technical Knowledge, Eco-friendly pest management, Botanical pesticides, Integrated Pest Management, Sustainable agriculture, Traditional practices

IIZCAGV-26-T1-006

Indian Knowledge & Traditional Ecological Practices

Pratha Shukla

JNKVV, College of Agriculture, Rewa. 486001. Madhya Pradesh, India

Corresponding Email: prathashukla732@gmail.com

Abstract

Indian traditional knowledge and their traditional ecologies have been known as an effective approach in ensuring sustainable agriculture and environmental conservation. In this paper, an effort will be made to evaluate the various indigenous methods used for ensuring sustainable agricultural processes, which will lead to soil quality improvement, water conservation, biodiversity conservation, and reduction of chemical substances usage. Indigenous methods examined included such methods as intercropping, rotations, seeds conservation, water harvesting, application of neem oil, and utilization of cow dung and urine. From the evaluation, it emerged that indigenous techniques ensure sustainability in that they ensure soil quality maintenance, pest and disease reductions, water resources conservation, and offer solutions on how to deal with climate change. Further, from the analysis, it was found out that intercropping and rotations prevent pest increase, seeds conservation ensures germplasm conservation, and use of botanicals lowers pest management costs, while use of organic materials improves soil fertility. It can therefore be concluded that Indian traditional knowledge system offers sustainable solutions for agricultural practices.
Keywords: Indian knowledge, Traditional ecological practices, Sustainable agriculture, Biodiversity conservation, Climate resilience

IIZCAGV-26-T1-007

Study on Growth, Yield and Quality of Seed in Pea under Different Organic Sources of Nutrients

Rahul Patel, S.S. Kushwah, R.K. Sharma, B.K. Kachouli and G.P.S. Rathore

College of Horticulture, Mandsaur-458002, RVSKVV, Gwalior

Corresponding Email: kushwahhort@gmail.com

Abstract

A field investigation was carried out at the Bahadari farm, College of Horticulture, Mandsaur, (M.P.) during the *Rabi* season of 2020-21. Ten treatments (T_1-FYM (Farm Yard Manure) @ 20 t/ ha, T_2 - Poultry manure @ 15 t / ha, T_3 - Vermicompost @ 5 t/ ha, T_4 - FYM @ 15 t/ha + *Rhizobium* + PSB + KMB, T_5 - Poultry manure @10 t/ha + *Rhizobium* + PSB + KMB, T_6 - Vermicompost @ 3 t/ ha + *Rhizobium* + PSB + KMB, T_7 - FYM @ 10 t/ha + *Rhizobium* + PSB + KMB + Panchgavya, T_8 - Poultry manure @ 8 t/ha + *Rhizobium* + PSB + KMB + Panchgavya, T_9 - Vermicompost @ 2 t/ ha + *Rhizobium* + PSB + KMB + Panchgavya, T_{10}-RDF (45 N + 90 P_2O_5 + 60 K_2O kg/ha) were evaluated in randomized block design with three replications. Findings of the experiment revealed that application of (T_8) 8 t/ha Poultry manure + *Rhizobium* + PSB + KMB + PG (Panchagavya) was superior in terms of growth attributes viz., plant height, number of leaves per plant, number of branches per plant and earliest for 50% flowering and 50% maturity. The highest yield attributes and yield viz., number of pods per plant, length of pod (cm) and seed yield per hectare(q) were registered with this treatment. Treatment (T_8) had also secured highest net profit. Hence, it can be concluded that application of (T_8) is superior and may be adopted for more profitable seed production of pea cv. Kashi Samarth.
Keywords: Pea, Seed, Growth, Yield, Quality, Organic Sources of nutrients

IIZCAGV-26-T1-008

Natural farming, Precision Agriculture and Smart Farming Technologies

Kirti Singh[1]

[1]UG Student, College of Agriculture, JNKVV, Rewa 486001(Madhya Pradesh), India

Corresponding Email: kirtisingh9926864600@gmail.com

Abstract

A shift in our farming techniques towards the nature from the chemicals. By depending upon the earth's resources rather the resources from outer field. Researchers try to find whether the method natural farming is effective for the soil's health as well as provide production suitable for our growing population. Outside, plots were tested side by side - one following usual routines including chemicals, High yielding varieties and the other having mixing compost teas, seed treatments, ground covers (mulching), and varied plantings. Measurements came back on soil richness, productivity, cost of cultivation, and pest around crops. The use of natural methods makes soil mor richer in carbon as well as microbes become more active making soil's water holding capacity better along with giving a good rhizosphere. At first there was a short shift in the harvest but after some time, the harvest amounts matched with regular techniques even though spending dropped sharply. Fewer pest damaged crops because nature found a steadier rhythm on its own. In the dry spell these crops survived tough times far more easily than expected. Soil thrives more when chemicals fade from the scene. Costs drops as synthetic supply becomes less. Precision agriculture takes different route it uses data and technology for increasing the efficiency. Technologies such as GPS mapping satellite images, GIS and many more along with several equipment which helps to detect soil health, environment conditions, helps in several cultural management by the help of AI these helps to know about the what plant actually needs. this will help to decrease the use of chemical and promote crop growth, minimize the water loss etc.

Keywords: Natural farming, Soil health, Crop productivity, Eco-friendly practices, Bio-Inputs

IIZCAGV-26-T1-009

Reviving Bhartiya Gyan Parampara: Sustainable Agricultural Practices Through the Use of Natural Resources

Aparna Jaiswal[1], Surendra Kumar Rai[2], Aradhana Kumari[1] and Vinita Parte[1]

[1]Assistant Professor, College of Agriculture, Ganjbasoda, Vidisha (M.P)
[2]Assistant Professor, College of Agriculture, Waraseoni, Balaghat (M.P)

Corresponding Email: rituparnika@gmail.com

Abstract

The use of natural products such as *Azadirachta indica* (Neem), *Pongamia pinnata* (Karanj), and buttermilk in agriculture forms an integral part of the Bhartiya Gyan Parampara, the traditional Indian knowledge system rooted in sustainability and harmony with nature. For centuries, Indian farmers have relied on these indigenous resources to maintain soil fertility,

protect crops, and ensure sustainable yields without disturbing the ecological balance. Neem, known for its antifungal, antibacterial, and insecticidal properties, serves as an effective organic pesticide and soil conditioner. Similarly, karanj oil and its extracts act as natural pest repellents and nitrogen fixers, enriching the soil and enhancing crop productivity. Buttermilk, a byproduct of traditional dairy practices, contains beneficial microorganisms that foster soil microbial activity, improve nutrient availability, and strengthen plants' natural immunity. These bio-based inputs not only reduce the dependence on chemical fertilizers and pesticides but also contribute to long-term soil health and environmental conservation. The use of such natural resources demonstrates the deep scientific wisdom embedded in Indian agricultural traditions knowledge developed through observation, experience, and reverence for the environment. In the era of modern agriculture, where sustainability has become a global priority, revisiting and integrating these traditional practices can offer effective solutions to current challenges such as soil degradation, pest resistance, and climate change. Thus, the use of neem, karanj, and buttermilk in agriculture symbolizes the timeless value of Bhartiya Gyan Parampara and its contribution toward achieving eco-friendly and self-reliant farming systems.

Keywords: Bhatiya Gyan Parampara, Harmony, Indigenous

IIZCAGV-26-T1-010

Impact Assessment of Jeevamrit on Soil Health and Nutrient Uptake in Mustard (*Brassica Juncea*) Under Gird Zone of Madhya Pradesh

Vikas Tripathi, H.L. Khapadia, O.P. Singh and S.K. Trivedi

College of Agriculture, Gwalior (M.P.) 474002

Abstract

A field experiment entitled "Impact assessment of Jeevamrit on soil health and nutrient uptake in mustard (*Brassica juncea*) under gird zone of Madhya Pradesh" was conducted during the Rabi season of 2024–25 at the Research Farm, College of Agriculture, RVSKVV, Gwalior, to evaluate the effects of Jeevamrit (liquid and solid formulations) on growth, yield, nutrient uptake, and soil health in mustard (*Brassica juncea*). The trial followed a randomized block design with eight treatments including absolute control, 100% recommended NPK, and various combinations of GhanJeevamrit, irrigation-applied Jeevamrit, and foliar sprays at different concentrations (5%, 10%, 15%, 20%), replicated thrice. Results demonstrated significant improvements in growth attributes, yield, and oil content with integrated Jeevamrit application, particularly with 15% foliar sprays combined with soil and irrigation treatments. This integrated treatment achieved a yield of 90% of that of 100% NPK fertilization (19.84 q ha^{-1}), enhanced soil organic carbon by nearly 20%, and improved water-holding capacity by 24% compared to the conventional fertilizer treatment. Nutrient uptake (N, P, K, S) in seed and stover increased markedly, reflecting improved nutrient mobilization and plant assimilation. Soil microbial biomass carbon and enzymatic activities (dehydrogenase and fluorescein diacetate hydrolysis) showed substantial elevations, indicating restored microbial function and enhanced soil biological health. The treatment also lowered soil pH moderately and reduced electrical conductivity compared to chemical fertilization, indicating improved soil chemical balance. Economic analysis indicated that the

15% Jeevamrit foliar spray treatment was economically viable with a benefit-cost ratio of 2.33 and a net return of ₹84,230 per hectare, highlighting the cost-effectiveness of sustainable organic nutrient management. The findings affirm Jeevamrit's potential as a viable organic alternative for enhancing mustard productivity, soil fertility, and farmer profitability in semi-arid agro-ecosystems.

Keywords: Jeevamrit, GhanJeevamrit, ZNBF, Natural farming, Mustard (*Brassica juncea*), Soil health, Nutrient uptake, Gird Zone (Madhya Pradesh)

IIZCAGV-26-T1-011

Bharatiya Prakritik Krishi Paddhati (BPKP)

Pratibha Rani[1], Kurru Charitha[1] and Bhumika Kumari[2]

[1]College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior – 474002, M.P., India
[2]College of Agriculture, IGKV, Raipur -492012, C.G, India

Corresponding Email: pratibhapandit1903@gmail.com

Abstract

A viable strategy for bolstering climate-resilient agriculture is Bharatiya Prakritik Krishi Paddhati (BPKP), an Indian version of Zero Budget Natural Farming (ZBNF). In order to improve soil fertility and agricultural productivity, BPKP- which was conceived and pushed by Subhash Palekar-focuses on doing away with synthetic inputs and making use of locally accessible natural resources like Jeevamrut, Beejamrut, mulching, and soil aeration. The strategy places a strong emphasis on inexpensive, environmentally friendly farming techniques that enhance soil health, increase water retention, and foster biodiversity. According to research, BPKP's natural farming systems greatly lower cultivation expenses while strengthening farmers' resistance to climatic challenges including drought and unpredictable rainfall. For example, research on climate-resilient ZBNF models in Andhra Pradesh shows that smallholder farmer are more adaptable, sustainable, and have stable incomes. Additionally, it has been demonstrated that natural farming methods regenerate soil ecosystems and lessen reliance on chemical-intensive agriculture, which is consistent with more general agroecological objectives. Nonetheless, issues with initial transition, regional adaptability, and knowledge diffusion continue to exist. All things considered, BPKP is a workable and expandable plan for developing climate-resilient and sustainable agriculture system in India.

Keywords: Jeevamrut, Beejamrut, Climate-resilient agriculture, Agroecology, Sustainable.

IIZCAGV-26-T1-012

Thermal Response of Scented Rice Under Different Weed Management Practices in Organic Production System

Malviya Lavesh, Maurya B. M.,Patidar Ramnivas, Anchal Sachin, Chouhan Laxmi and Madan Vijay

All India Coordinated Research Project on Farming System, Kuthulia farm JNKVV, College of Agriculture, Rewa (MP) 486001

Corresponding Email: laveshmalviya13@gmail.com

Abstract

A field experiments on evaluation of weed management practices in scented rice under organic production system was conducted during 2018-19 and 2019-20 at All India Coordinated Research Project on Farming System, Rewa (M.P). The study reveals that weed control efficiency and grain yield of rice were maximum under incorporation of mustard oil cake 5 t/ha+1 HW and two hand weeding at 25 and 50 DAT. The net profit and B:C ratio were maximum under 2 HW at 25 and 50 DAT followed by mulching with locally available weed mulch @ 3 t/ha+1 HW under organic production system which also gave B.C ratio more than 2. Heat use efficiency was maximum 7.94 kg/ha per GDD under incorporation of mustard oil cake @5t/ha with one hand weeding followed by 2 HW at 25 and 50 DAT.

Keywords: Cropping system, Organic rice, Weed control

IIZCAGV-26-T1-013

Isolation, Identification and Pathogenicity Assessment of *Myrothecium roridum* Causing Leaf Spot Disease in Soybean (*Glycine max* L.)

Satyaprakash Kurre[1], Dr. Ashwarya Lalit Tandon[2] and Ajay Kumar Patel[3]

Department of Plant Pathology, Indira Gandhi Krishi Vishwavidyalaya, Raipur - 492012, Chhattisgarh, India

Corresponding Email: satyaprakashkurre8@gmail.com

Abstract

Soybean (*Glycine max* L. Merrill) is a major oilseed crop valued for its protein and oil content, but its productivity is constrained by several diseases, including leaf spot caused by *Myrothecium roridum*. The present study aimed to isolate, identify, and establish the pathogenicity of the organism associated with soybean leaf spot. Symptomatic leaves were collected from the research farm, surface sterilized, and cultured on potato dextrose agar. Pure cultures were obtained using the hyphal tip technique, and cultural as well as morphological features were examined. Colonies were initially white, later developing concentric black sporodochia, while conidia were unicellular, cylindrical to rod-shaped, and ranged from hyaline to olive-green. Pathogenicity was confirmed through attached and detached leaf inoculation assays. In attached leaves, necrotic lesions appeared within 3–7 days, enlarging and coalescing into blight, whereas detached leaves developed lesions within 36 hours followed by sporodochia under humid conditions. The pathogen was successfully re-isolated, and its morphology matched the original culture, thereby fulfilling Koch's postulates. The study confirms *M. roridum* as the causal agent of soybean leaf spot and provides insights into its biology and pathogenicity, which are vital for devising effective disease management strategies.

Keywords: Soybean, *Myrothecium roridum*, Leaf spot, Pathogenicity, Koch's postulates

IIZCAGV-26-T1-014

Integrated Soil Fertility and Nutrient Management for Sustainable Crop Productivity and Soil Health Enhancement

Santosh Kumar Singh[1], Aradhna Kumari[2] and Aparna Jaisawal[2]

[1]Department of Soil Science, Dr Rajendra Prasad Central Agriculture University, Pusa, Bihar. 845438, India

[2]College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Ganj Basoda, Madhya Pradesh. 464221, India

Corresponding Email: santoshraupusa@gmail.com

Abstract

Soil fertility and nutrient management are fundamental to achieving sustainable agricultural productivity while maintaining long-term soil health. Continuous cropping, imbalanced fertilizer use, and declining organic matter have led to widespread nutrient depletion and reduced soil quality in many agro-ecosystems. Integrated Soil Fertility Management (ISFM) offers a holistic approach by combining chemical fertilizers, organic amendments, crop residues, and biofertilizers to optimize nutrient availability and improve soil physical, chemical, and biological properties. This paper examines the principles of nutrient dynamics, including macro- and micronutrient cycling, nutrient use efficiency, and soil–plant interactions. It highlights the role of site-specific nutrient management (SSNM), precision agriculture tools, and soil testing in enhancing fertiliser efficiency and minimising environmental losses. The integration of organic sources such as compost, farmyard manure, and green manures improves soil organic carbon, microbial activity, and nutrient buffering capacity. Furthermore, emerging strategies, including nano-fertilisers and decision-support systems, are discussed to improve nutrient delivery and reduce input costs. Adoption of balanced and integrated nutrient management practices can significantly enhance crop yields, resource-use efficiency, and environmental sustainability, making it a cornerstone of climate-resilient agriculture.

Keywords: Soil fertility, Integrated nutrient management, Nutrient use efficiency, Soil organic carbon, Site-specific nutrient management, Sustainable agriculture

IIZCAGV-26-T1-015

In-Vitro Assessment of *Trichoderma* spp. for the Biological Control of *Macrophomina phaseolina* Causing Charcoal Rot in Soybean

Anurag Chouhan [1], Ashish Kumar[1], Akshay Kumar Khare[1], Sachin Kurmi[1] and Ashutosh Dwivedi[2]

[1]Department of Plant Pathology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India

[2]Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India

Corresponding Email: anurag.chouhan@jnkvv.org

Abstract

The present study evaluated the *in vitro* antagonistic potential of eight *Trichoderma* isolates against *Macrophomina phaseolina*, the causal agent of charcoal rot in soybean, using a confrontation assay. At 24 hours of incubation, no significant differences in radial growth of the pathogen were observed among treatments, likely due to the initial lag phase of fungal interaction. However, clear differences emerged after 48 hours. Among the isolates, *Trichoderma reesei* (T5) exhibited the highest inhibition. Isolates T3 and T8 and T2 showed comparable antagonistic effects, while *Trichoderma asperellum* (T1) was least effective. The observed variability may be attributed to differences in mechanisms such as mycoparasitism, antibiosis and nutrient competition. The study highlights the importance of selecting efficient *Trichoderma* isolates, with T5 emerging as a promising candidate for sustainable management of charcoal rot in soybean.

Keywords: *Macrophomina phaseolina,* Confrontation assay*, Trichoderma spp.,* Biological control

IIZCAGV-26-T1-016

Traditional Pest & Disease Management Practices

Siddharth Singh

College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Email: siddhunariyara@gmail.com

Abstract

Traditional pest and disease management practices have been an essential part of agriculture since ancient times, especially in rural and indigenous farming systems. These practices are based on local knowledge, natural resources, and environmentally friendly methods to manage crop pests and diseases without heavy dependence on chemical pesticides. This study focuses on different traditional approaches such as crop rotation, intercropping, mixed cropping, and maintaining field sanitation to reduce pest infestation and disease spread. The use of botanical extracts prepared from neem, garlic, chilli, turmeric, and tobacco is also widely practiced for controlling insects and fungal infections. In addition, farmers use organic materials like cow dung, cow urine, ash, and compost-based formulations to improve plant health and enhance resistance against diseases. Mechanical methods such as handpicking of insects, use of traps, and removal of infected plant parts are also important in reducing crop damage. These traditional practices are cost-effective, easily accessible, and help maintain ecological balance by protecting beneficial organisms and soil fertility. The findings highlight that traditional pest and disease management methods, when combined with modern

scientific techniques, can provide a sustainable and effective solution for long-term crop protection. Overall, these practices contribute significantly to eco-friendly farming and support sustainable agricultural development.

Keywords: Traditional practices, Pest management, Disease management, Indigenous knowledge, Botanicals, Sustainable agriculture, Organic farming

IIZCAGV-26-T1-017

Traditional Pest and Disease Management Practices in Sustainable Agriculture

Anuj Patel

Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur 482004 Madhya Pradesh

Corresponding Email: patelanuj819@gmail.com

Abstract

Traditional pest and disease management practices, developed over centuries by farming communities, offer ecologically sound and cost-effective alternatives to synthetic agrochemicals. This study aimed to document, evaluate, and validate indigenous pest and disease control methods practised across diverse agro-ecological zones in central India. Ethnobotanical surveys and structured farmer interviews were conducted across 12 villages, complemented by greenhouse bioassays to assess the efficacy of botanical extracts derived from neem (*Azadirachta indica*), garlic, and tobacco against key pests and fungal pathogens. Key results revealed that neem-based formulations reduced aphid infestation by up to 68%, while turmeric and cow-urine concoctions showed notable antifungal activity against *Fusarium* spp. Crop rotation and intercropping with repellent species also significantly lowered pest pressure without compromising yield. These findings underscore the potential of integrating traditional knowledge with modern agronomy to build climate-resilient, low-input farming systems aligned with the goals of sustainable agriculture.

Keywords: Ethnobotany, Botanical pesticides, Integrated pest management, Indigenous knowledge, Disease suppression, Sustainable farming

IIZCAGV-26-T1-018

NATURAL FARMING/ZBNF

Surbhi Bhalavi

BSc (hons.) Agriculture, Jawaharlal Nehru krishi Vishwavidyalaya, Jabalpur-482004, Madhya Pradesh, India

Corresponding Email: surbhibhalavi@gmail.com

Abstract

Natural farming was first popularised by Japanese farmer and philosopher scientist Mashanabu fukuoka (1913-2008) and popularised in his book The One strow revolution 1975 natural farming is a chemical preforming system rooted in Indian tradition enriched with

model understanding of ecology, recycling and on farm resources optimisation it includes 5 principles no we didn't no tell it no pesticide or herbicide no fertilizer no pruning . Gujarat, Andhra Pradesh and Madhya Pradesh are the leading state in natural farming and other states like Himachal Pradesh, U.P , Odisha, Chattisgarh and Uttrakhand are also promoting Natural farming. Variants of natural farming are Vaidik farming, homa farming agnihotra farming,Natuecoo farming, zero budget natural farming in India ZBNF was first advocated in the mid 1990 by agriculturists Shri Subhash Palekar ZBNF is said to reduce production costs by substituting fertilizers and pesticides by homemade formulation such as jeevaamri, beejamrit and neemastra as well as intercroping , mulching and acchhadan . Therefore, Natural farming and ZBNF play a crucial role for sustainable agriculture.

Keywords: ZBNF, Jeevamrit, Beejamrit , Neemastra, Acchhadan, Sustainable agriculture

IIZCAGV-26-T1-019

Strengthening Climate-Resilient Agriculture through Natural Farming, Indigenous Practices and Innovative Approaches

Priyanshu Acharya

UG Student, College of Agriculture, Powarkheda, Narmadapuram, 461110, Madhya Pradesh, India

Corresponding Email: acharyapriyanshu683@gmail.com

Abstract

Natural Farming, particularly Zero Budget Natural Farming (ZBNF), along with Indigenous Technical Knowledge (ITK) and Indian Knowledge Systems (IKS), plays a crucial role in promoting sustainable and eco-friendly agriculture. This study explores the effectiveness of these traditional approaches in enhancing soil health, reducing input costs, and managing pests and diseases without reliance on synthetic chemicals. The methodology involved field observations, farmer interactions, and documentation of practices described in Krishi Shastra, with special emphasis on cow-based formulations, botanical extracts, and cultural pest management techniques. The results indicated significant improvement in soil fertility, microbial activity, and moisture retention under natural farming systems. Traditional pest and disease management practices were found to be effective in controlling infestations while maintaining ecological balance. Farmers adopting these methods experienced reduced production costs and improved resilience of crops under variable climatic conditions. Overall, the integration of ZBNF, ITK, and IKS offers a sustainable pathway for agricultural development by conserving natural resources and enhancing farm profitability. These knowledge systems, rooted in traditional wisdom, have strong potential to support resilient and self-reliant farming systems in the present and future.

Keywords: Natural farming, ZBNF, ITK, IKS, Sustainable agriculture, Traditional Pest Management

IIZCAGV-26-T1-020

Strengthening Climate-Resilient Agriculture Through Natural Farming, Indigenous Practices and Innovative Approaches

Pragya Verma

Department of Soil Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012 Chhattisgarh, India.

Corresponding Email: pragyav930@google.com

Abstract

This abstract examines the potential of Natural Farming, Zero Budget Natural Farming (ZBNF), Indigenous Technical Knowledge (ITK), Indian Knowledge Systems (IKS), and traditional pest and disease management practices in strengthening climate-resilient agriculture. The study aims to identify sustainable approaches that reduce dependence on external inputs, enhance productivity, and improve farmers' adaptability to climate stress. The abstract is based on a review of published literature, government reports, and successful field practices across India. Case examples include the community-led natural farming movement in Andhra Pradesh, where farmers adopted bio-inputs such as Jeevamrit and mulching to improve soil health and lower production costs; traditional neem- and cow urine-based sprays used in Rajasthan for pest control; and mixed cropping systems practiced in Karnataka to reduce climate risk. Secondary data on yield stability, input savings, soil quality, and resilience indicators were analyzed comparatively. Findings indicate that these practices improve soil organic matter, moisture retention, biodiversity, and resilience against drought and erratic rainfall. ZBNF significantly lowers cultivation costs and improves profitability. ITK and IKS provide low-cost, location specific solutions such as seed treatment, crop rotation, and water conservation measures while reducing chemical residues. The findings demonstrate that combining traditional agricultural knowledge with evidence-based innovations can significantly enhance the adaptive capacity, sustainability, and economic resilience of farming systems under climate stress. Strengthened extension networks, participatory research, and supportive policy frameworks are crucial to accelerate large-scale adoption. Such integration can contribute meaningfully to long-term food security, environmental conservation, and resilient rural livelihoods.

Keywords: Climate resilience, Natural farming, ZBNF, Indigenous knowledge, Sustainable agriculture, Pest management

IIZCAGV-26-T1-021

Transformative Utilization of Invasive Weed Biomass and Crop Residue for High-Potency Liquid Biofertilizers

Brijesh Kumar Singh

M.Sc. Scholar, Department of Extension Education, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKVV), Gwalior (M.P.)

Abstract

In the diverse agricultural landscapes of Madhya Pradesh, the management of invasive weeds-specifically Parthenium hysterophorus (Gajar Ghas)-and the disposal of leftover crop residues have become persistent challenges for the farming community. This project introduces a practical "Negative-to-Positive" framework that converts these problematic biomass sources into a high-value, enriched liquid organic fertilizer. The methodology involves a controlled fermentation process in which green weed biomass (naturally rich in nitrogen and phosphorus) is combined with carbon-rich crop residues. By utilizing Jeevamrut as a biological starter, harmful allelopathic compounds present in the weeds are neutralized, and their nutrient content is mineralized into a form readily available for plant uptake. This approach serves a dual purpose: it provides farmers with a zero-cost nutrient source for natural farming while offering an effective strategy to manage weed seeds through the heat generated during fermentation. Ultimately, this project aligns with climate-resilient agricultural goals by reducing the carbon footprint associated with fertilizer production and eliminating the harmful practice of residue burning.

Keywords: Weed management, Parthenium utilization, Crop residue, Liquid organic fertilizer, Natural farming

IIZCAGV-26-T1-022

Organic Farming in India: Challenges, Opportunities and Future Prospects

Kuldeep [1], Shailesh [2] and Preeti Laxmi Dhruw[3]

[1]M. Sc. (Ag.), Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

[2]M. Sc. (Ag.), Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India

[3]M. Sc. (Ag.), Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

Corresponding Email: kuldeep4agri@gmail.com

Abstract

Organic farming is emerging as an important sustainable agricultural practice in India. It is a way of growing crops using only organic inputs instead of using chemicals or synthetic inputs. This study focuses on understanding the concept, challenges, opportunities, and future prospects of organic farming in India. The study also examines key challenges such as low awareness of the farmers, initial transition difficulties, and limited institutional and market support. It highlights the potential of organic farming to reduce dependency on chemical inputs, improve soil health, and promote environmentally sustainable practices. It presents major opportunities due to increasing demand for chemical-free food and stronger policy support for sustainable agriculture. The discussion suggests that proper training, awareness programs, and supportive policies can play an important role in promoting its adoption. It can also contribute to long-term ecological balance and resilience in agriculture. It further supports the idea that sustainable farming systems are essential for ensuring food security and ecosystem conservation. It has strong potential to support sustainable agricultural development in India, provided that existing challenges are addressed through coordinated

efforts and effective implementation strategies. Overall, it represents a practical pathway towards building a healthier agricultural ecosystem and securing the future farming.

Keywords: Organic farming, Soil health, Sustainable agriculture, Ecosystem conservation, Chemical inputs

IIZCAGV-26-T1-023

Studies of Green Manure and Intercropping on Soil Nutrient Content and Beneficial Microbes in Fruit Orchards

Aditya Gaurha[1] and Pragya Shrivastava[2]

[1]College of Horticulture and Research Station, Chirmiri, Dist- M.C.B (C.G) 497773
[2]College of Horticulture and Research Station, Sankara- Patan, Dist- Durg (C.G) 491111

Corresponding Email: adityagaurha460@gmail.com

Abstract

In fruit orchard management, optimizing soil health and fertility is crucial for sustaining high yields and crop quality. Cultivated soils, after years of use, show changes in the physical, chemical and biological aspects. The roots of green manures show important role in the maintenance and improvement of characteristics of the soil structure, by providing the breaking of the compacted layer, which contributes to improving soil aggregation. The compounds produced by the decomposition of green manure inhibit the growth of pathogens in the soil, and thereby promote the growth of fruit trees, improve the overall health and resistance of fruit trees, and reduce the occurrence of fruit tree diseases. Additionally, the farming practices have a direct impact in ecosystems and cause changes in the basic structures involved in the environment. Intercropping, which involves growing complementary crops alongside fruit trees, are explored as sustainable agricultural practices aimed at enhancing soil quality. Intercropping increased soil water content, the total specific pore volume and the percentage of stable aggregates, as compared to natural vegetation and soil without vegetation cover. Intercropping demonstrated complementary benefits, further boosting soil nutrient availability and promoting a diverse microbial ecosystem. The interaction between green manure and intercropping produced synergistic effects, leading to superior soil health outcomes compared to either practice alone. Intercropping with green manure reduces diurnal temperature differences. Intercrops add to the carbon pool of the soil thus enriching the soil with organic carbon.

Keywords: Green manure, Intercropping, Microbes, Mycorrhizal association, Soil aggregation

IIZCAGV-26-T1-024

Influence of Micronutrients Iron and Boron on the *In-vitro* Growth of *Fusarium equiseti* Causing Wilt in *Andrographis paniculata* (Kalmegh)

Sachin Kurmi [1], Vibha Pandey, Ashlesha, Anurag Chouhan, Harshit Sharma, Aashutosh Chouhan

Department of Plant Pathology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh 482004

Corresponding Email: sachinkurmi0903@gmail.com

Abstract

The present study investigated the impact of micronutrients-iron (Fe), boron (B), and their combined application (Fe + B)-on the in-vitro growth of *Fusarium equiseti*, the causal agent of wilt in *Andrographis paniculata* (Kalmegh). Iron supplementation significantly suppressed fungal growth compared to the control, with maximum inhibition observed at the highest concentration (T10), indicating a dose-dependent decline in mycelial proliferation. Similarly, boron treatments exhibited marked antifungal activity, with the highest inhibition recorded at 0.45 ppm. The Fe + B combination also reduced fungal growth (maximum 35.30% inhibition), suggesting a synergistic yet concentration-sensitive interaction between the two elements. Statistical analysis confirmed significant differences among treatments, highlighting that both iron and boron individually exert strong suppressive effects on *F. equiseti*. The findings emphasize that appropriate micronutrient management-particularly with boron and iron-can effectively restrain pathogen development and contribute to sustainable disease management strategies in *A. paniculata* cultivation.

Keywords: *Andrographis paniculata*, *Fusarium equiseti*, Nutrient-pathogen interaction

IIZCAGV-26-T1-025

Soil Health Dynamics under Natural Farming in Soybean-Wheat Cropping System

Indar Raj Naga[1], Renu Jayant[2] and Harshit Jangid[3]

[1]Ph. D. Scholar, Department of Soil Science and Agricultural Chemistry, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

[2]Ph. D. Scholar, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

[3]Ph. D. Scholar, Department of Horticulture (Fruit Science), Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

Corresponding Email: indrarajnaga0@gmail.com

Abstract

Soil health plays a vital role in sustaining productivity of intensive cropping systems such as soybean-wheat. Conventional farming practices, relying heavily on chemical inputs, often degrade soil quality and reduce microbial activity. In contrast, natural farming promotes ecological balance through minimal external inputs and the use of organic formulations. The present study evaluates soil health dynamics under natural farming in a soybean-wheat cropping system. The experiment included natural farming treatments involving mulching Jeevamrit, Beejamrit and residue management, compared with conventional practices. Key soil parameters such as soil organic carbon (SOC), microbial biomass carbon (MBC), available nitrogen, phosphorus, potassium, soil pH and enzymatic activities were analysed.

Results revealed significant improvement in soil biological and chemical properties under natural farming. SOC and MBC increased, indicating enhanced microbial activity and organic matter accumulation. Enzymatic activities were higher, reflecting improved nutrient cycling. Available nutrient status was better maintained due to enhanced microbial processes. Mulching and organic inputs also improved soil structure and moisture retention. In contrast, conventional practices showed relatively lower microbial activity and limited improvement in soil health. The study concludes that natural farming enhances soil health and sustainability in soybean-wheat systems by improving biological activity and maintaining nutrient balance. It offers a promising approach for reducing chemical dependency and promoting long-term soil fertility.

Keywords: Natural farming, Soil organic carbon, Microbial activity, Soybean-wheat system, Soil fertility

IIZCAGV-26-T1-026

Enhancing Agricultural Sustainability through Climate-Smart Water Management

Prem Kumar Sahu

Ph.D Research Scholar, Department of Agriculture Meteorology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh- 492012

Corresponding Email: premsahu8333@gmail.com

Abstract

Enhancing agricultural sustainability under changing climatic conditions requires efficient and adaptive water management strategies. Climate-smart water management focuses on optimizing water use, improving irrigation efficiency, and reducing vulnerability to climate variability. With increasing water scarcity, erratic rainfall, and rising temperatures, traditional irrigation practices are becoming less effective. Approaches such as rainwater harvesting, drip and sprinkler irrigation, conservation agriculture, and the use of drought-resistant crop varieties help in conserving water while maintaining crop productivity. The integration of advanced technologies, including soil moisture sensors, remote sensing, and weather-based advisory services, further improves water-use efficiency and decision-making. These practices not only support adaptation to climate change but also contribute to mitigation by reducing energy consumption and greenhouse gas emissions. Strengthening institutional frameworks, farmer capacity building, and supportive policies are essential for large-scale adoption. Overall, climate-smart water management plays a crucial role in ensuring sustainable agricultural production, enhancing resilience, and safeguarding water resources for future generations.

Keywords: Climate-smart agriculture, Water management, Irrigation efficiency, Sustainable agriculture, Water conservation, Climate resilience, Rainwater harvesting, Adaptation, Mitigation

IIZCAGV-26-T1-027

Zero Budget Natural Farming

Surendra Rundla[1], Sneha Pandey[2] and Sachin Rathore[3]

[1]PhD scholar Department of Ag. Economics, COA, RVSKVV, Gwalior (MP)
[2]Guest Faculty of Agricultural Economics COA, RVSKVV, Gwalior (MP)
[3]Guest Faculty of Ag. Economics, COA, RVSKVV, Gwalior (MP)

Abstract

It is the process of raising crops without using chemical fertilizers and pesticides or any other external materials. ZBNF is a natural way of farming without any capital investment. It basically goes back to sole use of rich natural resources which ancient agriculture fully relied on. Expenditure on purchased inputs is completely excluded in this system. If some cost is incurred by any chance, it is compensated by the profitable production. In the present context of sharp increase of production cost and stagnation in production rate coupled with environmental footprints associated with chemical fertilizers/pesticides, ZBNF is gaining momentum as it rejuvenates soil health for sustainable crop production through diversification, microbial activities, nutrient recycling, beneficial biological interactions. Besides, in rain fed areas where green revolution holds less significance, ZBNF can be a promising option under uncertainty of weather. It is an extreme form of low external input sustainable agriculture (LEISA), where all the inputs are locally (on farm) available and output of one farming system is mostly used as input in other farming system. With the motto to ensure food security by reviving Indian agriculture in environmentally safe way as well as to release farmers from debt cycle and suicides, zero budget natural farming (ZBNF) has come in the picture, which discards uses of all the chemical farming inputs and relies on natural way of farming *i.e.,* rejuvenating soil and crop health through its own practices (Jivamrita, Bijamrita, mulching, soil aeration, intercropping, crop diversification, bunds, bio-pesticides etc.). ZBNF movement right now is the most popular agrarian movement which begun in 2002 in Karnataka and later successfully spread in many states (specially, of South India) of the nation through numbers of trainings, demonstrations and various promotional activities. Successful outcomes from farmers' fields of south Indian states like Andhra Pradesh, Karnataka etc. are encouraging and grabbing attention of farmers, public and private organisations towards ZBNF in recent times.

Keywords: Jivamrita, ZBNF, Nutrient recycling, Sustainable agriculture

IIZCAGV-26-T1-028

Scaling Natural Farming for Climate Resilience and Income Stability: An Economic and Policy Analysis in India

Shubham Kumar Thakur[1], Sujit[1], Richa Dubey[1] and Neha Suryavanshi[1]

College of Horticulture and Research Station, Chirmiri, M.C.B, 497442 Chhattisgarh, India
Corresponding Email: shubhamcks@gmail.com

Abstract

Indian agriculture is characterized by small landholdings, with over 86% of farmers classified as small and marginal (Agriculture Census 2015-16), making cost-intensive farming systems

increasingly unsustainable. This study evaluates the economic and policy potential of Natural Farming and Indigenous Technical Knowledge (ITK) as climate-resilient alternatives. Evidence from government-supported initiatives such as Paramparagat Krishi Vikas Yojana indicates that natural farming can reduce input costs by 20–30%, particularly by minimizing dependence on chemical fertilizers and pesticides (NITI Aayog, 2021). While initial yield variability is observed during the transition phase, net farm income improves due to lower costs and premium market opportunities. Indigenous practices like mixed cropping and botanical pest control enhance ecological sustainability and reduce climate risks. However, large-scale adoption is constrained by weak certification systems, limited market access, and lack of awareness. The study recommends strengthening organic value chains, ensuring price incentives, and expanding extension services to promote adoption. A policy-driven scaling of natural farming can enhance sustainability, reduce risk, and improve income stability for smallholders in India.

Keywords: Natural farming, ITK, Cost reduction, Small farmers, Sustainability, Policy support

IIZCAGV-26-T1-029

Evaluation of Natural Farming and Indigenous Technical Knowledge (ITK) for Sustainable Crop Production and Pest Management

Shivraj Singh Poshwal[1] and Ankit Sanodiya[2]

[1]M.sc. Scholar, Department of Agronomy, College of Agriculture, RVSKVV, Gwalior. Pin code 474002. (M.P.) India

[2]M.Sc. Scholar, Department of Agronomy, College of Agriculture, RVSKVV, Indore. Pin code 452001. (M.P.) India

Corresponding email: shivrajposhwal134@gmail.com

Abstract

Natural farming, integrated with Indigenous Technical Knowledge (ITK) and Indian Knowledge Systems (IKS), is gaining prominence as a sustainable, low-cost alternative to chemical-intensive agriculture. This study evaluates the field efficacy of Zero Budget Natural Farming (ZBNF) components, primarily focusing on Beejamrit and Jeevamrit. Observations indicate that Beejamrit as a seed treatment significantly enhances seedling vigour, with trials showing a 15–20% increase in germination rate and a marked reduction in soil-borne fungal infections. The application of Jeevamrit (applied at 200 L/acre during irrigation) acted as a potent microbial consortium, increasing the population of beneficial nitrogen-fixing bacteria and phosphate-solubilizing microbes by 2.5 to 3.0-fold compared to conventional plots. This microbial surge contributed to a 10–15% improvement in soil organic carbon (SOC) and enhanced soil moisture retention by approximately 20%, providing critical resilience in rainfed conditions. While initial yields in the transition phase were 5–8% lower than conventional systems, the total cost of cultivation dropped by 60–70%, leading to higher net returns for smallholders. Furthermore, traditional pest management using Dashparni Ark and Neemastra demonstrated a 65–70% efficacy in controlling sucking pests and leaf folders. The synthesis of *Krishi Shastra* wisdom with modern ZBNF practices offers a robust,

scientifically validated framework for achieving climate-resilient and environmentally safer agriculture.

Keywords: Natural farming, ZBNF, Jeevamrit, Beejamrit, ITK, IKS, Pest management, Climate resilience

IIZCAGV-26-T1-030

Eco-Friendly Cropping and Plant Health in a Changing Climate

Renu Jayant[1], Indar Raj Naga[2] and Harshit Jangid[3]

[1]Ph. D. Scholar, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

[2]Ph. D. Scholar, Department of Soil Science and Agricultural Chemistry, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004).

[3]Ph. D. Scholar, Department of Horticulture (Fruit Science), Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur, M.P. (482004)

Corresponding Email: renujayant24@gmail.com

Abstract

The effects of climate change, such as erratic rainfall, droughts, heat waves, floods, and shifting pest and disease patterns, are progressively affecting Indian agriculture. These issues have contributed to soil degradation, biodiversity loss, and decreased agricultural system resilience in addition to the long-term usage of input-intensive conventional farming. Natural farming (NF) and ecological approaches (EA) are showing promise as sustainable and regenerative solutions in this context. Beejamrutha, Jeevamrutha, mulching, and Waaphasa are examples of practices that improve soil health, increase nutrient availability, and preserve moisture. Ecological methods also lessen reliance on pesticides, promote natural pest management, and enhance biodiversity. When combined, these integrated systems raise plant tolerance to stress, boost microbial activity, and enhance soil structure. According to studies, natural remedies like Neemastra and Agniastra can control pests while preserving similar yields. With improved research, training, and policy support, NF-EA systems provide great potential for developing climate-resilient, low-input, and sustainable agriculture, despite obstacles like yield fluctuations and manpower requirements.

Keywords: Climate change, Natural farming, Plant health, Soil degradation, Soil health, Sustainable agriculture.

IIZCAGV-26-T1-031

Biological control: challenges and opportunities

Sanjay Kumar Chaudhary

Department of Entomology, RVSKVV, Guwalior, 474002

Corresponding Email: sanjaychaudhary72900@gmail.com

Abstract

Biological control, the use of living organisms as pest control agents, has enjoyed varying popularity over the past century, but today is well established as an important component of integrated pest management. We examine some current challenges to the use of biological control and particularly to classical biological control, the introduction of exotic natural enemies. These include conflicts of interest (1) with the conservation of native species and (2) between agricultural lobbies. On a scientific level, we examine two debates over the ecological and genetic basis of successful control. The challenge of Murdoch et al. (Am. Nat. 125, 344-366 (1985) to the notion of stability in pest populations under biological control, reveals that the stabilizing mechanisms may differ between pest taxa with different patterns of spatial dynamics. With respect to the hypothesis of Hokkanen & Pimentel (Can. Ent. 116, 1109 (1984) on the better chances of 'new associations' in biological control, we present an analysis that reaches different conclusions. Finally, we discuss future prospects for the different approaches to biological control, and suggest that longterm control methods such as introduction and inoculation, will be used increasingly in the future.

Keywords: Exotic natural enemies , Conservation of native species, Integrated pest management (IPM), Agricultural lobbies, Population stability ,Spatial dynamics, New associations hypotheses, Inoculation

IIZCAGV-26-T1-033

Assessment of potato (*Solanum tuberosum L*) for growth and yield attribute s under natural farming in the gird region of M.P.

Aman Pratap Singh Chauhan

Ph.D. Scholar,Department of Agronomy,College of Agriculture Rajmata Vijayaraje Scindia K rishi Vishwa Vidhalaya, Gwalior (M.P)

Corresponding Author- chauhanaman605@gmail.com

Abstract

The present study titled “Assessment of potato (Solanum tuberosum L) for growth and yield a ttributes under natural farming in the gird region of M.P.” was carried out during te rabi seaso n of 2022-
23 at research farm of ICARCPRI regional station Gwalior located in northern Madhya Prad esh. The experiment was conducted under prevailing agroclimatic conditon Using RBD desig n Comprising of seven treatments and four replications. The maximum
plant emergence percentage (92.88%), highest growth parameters viz. plant height (73.700 c m, number of stems per plant (6.887) and number of compound leaves per plant (58.250), root length (13.400 cm) yield parameters viz. Total tuber yield (48.801 kg/plot) were recorde d with treatment t_7 (Integrated practise 90% inorganic and 10% organic).

Keywords: Natural Farming, Potato, RBD, growth attributes, total tuber yield

IIZCAGV-26-T1-034

ITK (Indigenous Technical Knowledge) and IKS (Indian Knowledge System)

Neetu Kumari Jeph[1] and Dr. S.P.S. Tomar[2]

Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior.

474002. Madhya Pradesh, India

Corresponding Email: neetukumari4930@gmail.com

Abstract

Indigenous Technical Knowledge (ITK) and the Indian Knowledge System (IKS) represent dynamic, context-specific, and historically evolved epistemologies that have sustained human societies for centuries. ITK refers to localized, tacit, and practice-based knowledge systems embedded in the socio-cultural fabric of indigenous and rural communities. In contrast, IKS encompasses a broader, structured corpus of knowledge rooted in classical Indian texts, philosophies, and scientific traditions. Both systems are characterized by their holistic worldview, sustainability orientation, and integration of ethical, ecological, and experiential dimensions. Contemporary research recognizes their potential in addressing global challenges such as climate change, biodiversity loss, and sustainable agriculture. However, their marginalization under modern scientific paradigms, issues of validation, and intellectual property rights remain critical concerns. This paper critically examines the conceptual frameworks, methodological approaches, applications, and integration pathways of ITK and IKS. It argues for a transdisciplinary approach that bridges traditional knowledge with modern science to foster sustainable and inclusive development.

Keywords: ITK (Indigenous Technical Knowledge) and IKS (Indian Knowledge System)

IIZCAGV-26-T1-035

Indain knowledge and Traditional Ecological Practices

Aryan Patel, Rajnandni Sahu

Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh

Corresponding email- jabalpuriyaaryan07@gmail.com

Abstract

In an era defined by climate instability and the ecological limitations of intensive modern agriculture, there is a growing global imperative to revisit indigenous paradigms of environmental stewardship. This paper explores the profound synergy between Indian Knowledge Systems (IKS) and traditional ecological practices (TEP), specifically within the diverse agro-climatic landscapes of India. For millennia, Indian Vedic and post-Vedic traditions have treated the Earth as a living entity, fostering a relationship characterized by reciprocity rather than extraction. The study examines key traditional practices such as Vrikshayurveda (ancient plant science), sacred grove preservation, and traditional water harvesting techniques like Ahar-Pyne and Johads. By integrating the "Panchamahabhuta" (five elements) framework—whereby soil health, water purity, and atmospheric balance are interconnected—traditional Indian farmers have maintained soil fertility and biodiversity without chemical dependencies. Special focus is given to the tribal and rural belts of Madhya Pradesh, where indigenous communities continue to utilize ethno-botanical knowledge for pest management and seed conservation. This paper argues that these practices are not merely

historical relics but sophisticated socio-biological strategies that align with contemporary Sustainable Development Goals (SDGs). The findings suggest that a "hybrid knowledge model"—one that integrates the empirical rigor of modern agricultural science with the holistic wisdom of IKS—is essential for achieving long-term food security and climate resilience in the Indian subcontinent.

Keywords: Indian Knowledge Systems (IKS), Traditional Ecological Practices, Sustainable Agriculture, Vrikshayurveda, Biodiversity, Madhya Pradesh

IIZCAGV-26-T1-036

Agro-Ecosystem Analysis based pest management (AESA)

Sarita[1],*, Neha Sharma[1], Rahul Patidar[1], Ankita Singh Sisodia[1], Ashok Choudhary[1]

1Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. 474002. Madhya Pradesh, India.

Corresponding author Email: saritasarita8038@gmail.com

Abstract

AESA is a hands-on, interactive approach that enables farmers to understand the connections between pests, beneficial species, soil health and weather patterns, allowing them to make informed and sustainable pest management decisions. Unlike conventional methods that depend on chemicals, AESA integrates regular field observations, sampling techniques and a visual diagram tool for decision-making concentrating on the Pest: Defender (P:D) ratio. The widely accepted safe ratio of 2:1 assists in deciding if action is needed, highlighting bio-intensive methods such as botanical insecticides, biological control and cultural practices prior to thinking about synthetic chemicals. Case studies on brinjal and pigeon pea demonstrated that AESA-based integrated pest management (IPM) provides notably improved outcomes. In the case of brinjal, the fields that received treatment resulted in a greater yield of healthy fruit (32.83 t/ha) and net returns (₹6,57,445/ha), yielding a cost-benefit ratio of 3.03, compared to 2.19 for the farmers' traditional methods. Regular monitoring of P:D ratios in pigeon pea facilitated prompt, necessity-driven actions, decreasing unnecessary pesticide application. Consequently, AESA demonstrates efficiency in minimizing pest damage and dependence on chemicals, while promoting profitability and ecological harmony. Nevertheless, its effectiveness relies on collective involvement via Farmer Field Schools and consistent follow-up. AESA functions as a planning resource and a hands-on manual for sustainable, climate-adaptive pest control.

Keywords: AESA, Pest: Defender (P:D) ratio, biological control, Farmer Field Schools (FFS), Biointensive Pest Management

IIZCAGV-26-T1-037

Indigenous Technical Knowledge & Indian Knowledge System

Varaparla Likhitha[1], Adari Meghana[2] and Bathula Sathwika[2]

[1]Department of Entomology, Rajamata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior,474002,Madhya Pradesh, India.

[2]Department of Agronomy And Agro-forestry, Centurion University of Technology And Management, Paralekhamundi, 761211, Odisha, India.

2Department of Agronomy And Agro-forestry, Centurion University of Technology And Management, Paralekhamundi, 761211, Odisha, India.

Corresponding Email: likhitharhian.2611@gmail.com

Abstract

Indigenous Technical Knowledge is specifically concerned with actual application of the thinking of the local people in various operations of agriculture and allied areas. Indigenous Knowledge refers to the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area. Indigenous knowledge is the local knowledge - knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision in agriculture, health care, food preparation, education, natural resource management, and a host of their activities in rural communities. Indigenous knowledge is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems. The term indigenous technical knowledge is often camouflaged with the belief that is associated with forthcoming happenings and the innovations made by the farmers to solve specific problems.The Indian Knowledge System, rooted in holistic and sustainable practices, has the potential to address contemporary challenges of sustainable development Indian Knowledge System (IKS), a repository of holistic and sustainable practices developed over millennia, holds valuable insights for addressing contemporary challenges in sustainable development. Keywords: Traditional knowledge, Protection, Sustainability, Innovative methods, Spiritual approach to understand.

Keywords: Natural Farming, Precision Agriculture and Smart Farming, Technologies Sustainability, Soil health.

IIZCAGV-26-T1-038

Biochar as a Sustainable Soil Amendment: Enhancing Soil Health, Productivity, and Carbon Sequestration

Anita Lamba[1], Shreya Kumari[2], Shyamlal Sharma[1]

[1]Department of Soil Science, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, 474002, Madhya Pradesh, India

[2]Department of Agronomy, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, 474002, Madhya Pradesh, India

Corresponding email: anitalamba3138168@gmail.com

Abstract

Biochar is attracting growing interest as a soil amendment because of its ability to improve soil health and crop productivity. It is a carbon-rich material produced when biomass is heated at high temperatures under limited oxygen conditions, a process known as pyrolysis. The properties of biochar depend largely on the type of raw material used and the conditions during its production. When added to soil, biochar can bring several benefits. It improves soil structure, increase moisture retention, and enhances aggregate stability. It can also raise soil pH in acidic soils, improve cation exchange capacity (CEC), and help retain essential nutrients. These changes create a more favourable environment for soil microorganisms, boosting microbial activity and enzyme functions that are important for nutrient cycling. As a result, many studies have reported improved soil fertility and higher crop yields with biochar application. Another important advantage is its role in climate change mitigation. Biochar stores stable carbon in the soil for long periods, reducing carbon dioxide levels in the atmosphere and supporting carbon sequestration. The effectiveness of biochar is largely due to its highly porous structure and the presence of various functional groups, which enhance its ability to adsorb nutrients and other compounds. However, to maximize its benefits, it is important to understand how different production factors influence its properties and performance in soil, especially its impact on biological activity and long-term soil health.

Keywords: Microorganism, environment, enzyme, sequestration, nutrients, cation exchange capacity (CEC)

IIZCAGV-26-T1-039

Economic Evaluation of AI-Enabled Precision Agriculture Using Production and Efficiency Models

Gajala Khan [1*]

[1]Department of Agricultural Economics and Farm Management, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

*Corresponding author's email: kashu9749@gmail.com

Abstract

The integration of Artificial Intelligence (AI) in precision agriculture enhances farm-level decision-making, resource-use efficiency, and income sustainability within Agricultural Economics. This study evaluates the economic impact of AI-enabled precision technologies using production and efficiency models. The input–output relationship is analyzed through the Cobb–Douglas Production Function, expressed as $Y = A L^{\alpha} K^{\beta}$, where output depends on labor, capital, and technology, capturing improvements in total factor productivity due to AI adoption. Farm-level technical efficiency is measured using Data Envelopment Analysis, represented as Efficiency = $(\Sigma u_i y_i)/(\Sigma v_j x_j)$, indicating superior input utilization among adopters. Income determinants are examined using a multiple regression model $Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 D + \varepsilon_i$, where the technology adoption dummy positively influences farm income. The study highlights that AI-driven precision agriculture improves productivity, enhances economic efficiency, and stabilizes farm income while facing constraints such as high initial investment, limited technical knowledge, and inadequate digital infrastructure, emphasizing the need for supportive policy interventions including

subsidies, institutional support, and capacity building for inclusive agricultural transformation.

Keywords: Artificial Intelligence, Precision Agriculture, Economic Efficiency, Cobb–Douglas Production Function, Data Envelopment Analysis, Farm Income, Technology Adoption

IIZCAGV-26-T1-040

Natural Farming, Precision Agriculture and Smart Farming Technologies

Ekansh Raghuwanshi *[1], Stuti Sharma[2] and R. Shiv Rama Krishnan[3]

[1]Research Scholar, Genetics and Plant Breeding, College of Agriculture, JNKVV, Jabalpur, M.P. India

[2]Assistant Professor, Genetics and Plant Breeding, College of Agriculture, JNKVV, Jabalpur, M.P. India

[3]Assistant Professor, Plant Physiology, College of Agriculture, JNKVV, Jabalpur, M.P. India

*Corresponding author: raghuwanshiekansh@gmail.com

Abstract

Agriculture is rapidly transforming to meet the growing demand for food while addressing challenges such as climate change, resource degradation, and environmental sustainability. Natural farming promotes the use of locally available inputs, eliminates synthetic chemicals, and enhances soil health and biodiversity through ecological processes. Precision agriculture focuses on efficient resource management by using technologies like GPS, sensors, and data analytics to optimize the application of water, fertilizers, and pesticides. Smart farming further strengthens this approach by integrating advanced tools such as Internet of Things (IoT), artificial intelligence (AI), drones, and automation for real-time monitoring and improved decision-making. The integration of natural farming with precision and smart technologies offers a balanced and sustainable agricultural system. It helps in increasing crop productivity, improving resource use efficiency, and minimizing environmental impacts. This combined approach not only supports sustainable farming practices but also enhances farmers' income and resilience to climate variability. Therefore, adopting these innovative and eco-friendly strategies is essential for achieving long-term agricultural sustainability and global food security.

Keywords: Natural Farming, Precision Agriculture, Smart Farming, Sustainability, IoT, AI, Resource Use Efficiency, Climate Resilience

IIZCAGV-26-T1-041

Traditional pest and disease management practices

Madhuri Ahirwar[1], Neha Sharma[2], Rahul Patidar[3]

Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. 474002. Madhya Pradesh, India.

Corresponding Email: madhuriahirwar@057gmail.com

Abstract

Traditional pest and disease control methods serve as an important storehouse of native wisdom that encourages sustainable farming. These methods involve crop rotation, mixed cropping, botanical insecticides, and the application of organic substances, which aid in naturally controlling pest numbers. These systems promote biodiversity and aid natural predators, thus minimizing pest outbreaks. Due to rising worries about the negative impacts of synthetic pesticides-including environmental contamination, pest resistance, and health hazards-there is a resurgence of interest in conventional and environmentally safe pest control techniques. Numerous plant-derived formulations in traditional systems have demonstrated insecticidal capabilities and are safe for the environment. This research aims to record and assess conventional pest control methods while investigating how they can be combined with contemporary strategies such as Integrated Pest Management (IPM). Findings suggest that various traditional methods substantially decrease pest occurrence, enhance crop vitality, and preserve ecological harmony while diminishing input expenses. Field observations and validation studies indicate that plant extracts and diverse cropping systems successfully reduce pest populations and boost the effectiveness of natural predators. Future outlooks indicate that methodical scientific validation, standardization, and extensive promotion of these methods can enhance sustainable agriculture. Combining traditional knowledge with contemporary technologies, alongside farmer education and policy reinforcement, will be vital in decreasing reliance on chemical pesticides and promoting enduring agricultural sustainability.

Keywords: Traditional pest management, Indigenous knowledge, Biodiversity conservation, Botanical insecticides, Integrated Pest Management (IPM), Ecological balance

IIZCAGV-26-T1-042

Zero Budget Natural Farming: A Sustainable Approach for Low-Cost and Eco-Friendly Agriculture

Umesh Patle [1], Rohit Rathore[2,] Janmejay sharma[3]

Department of Agronomy, Rvskvv, Gwalior, 474002, Madhya Pradesh, India

Department of soil science and agricultural chemistry, Rvskvv, Gwalior, 474002, Madhya Pradesh, India

Department of Agronomy, Rvskvv, Gwalior, 474002, Madhya Pradesh, India

Corresponding Email: umesh18patle@gmail.com

Abstract

Zero Budget Natural Farming (ZBNF) has emerged as an innovative and sustainable agricultural approach aimed at reducing input costs while enhancing soil health and crop productivity. Developed as an alternative to chemical-intensive farming systems, ZBNF emphasizes the use of locally available natural resources such as cow dung, cow urine, crop residues, and biological inputs to maintain soil fertility and ecological balance. This study explores the principles and practices of ZBNF, including Jeevamrit, Beejamrit, mulching, and

Waaphasa, and evaluates their role in improving soil biological activity, nutrient cycling, and moisture retention. The framework promotes a self-sustaining agro ecosystem by minimizing external inputs, thereby reducing the financial burden on farmers and enhancing profitability. Field-level observations and case studies indicate that ZBNF systems can improve soil structure, increase microbial diversity, and enhance resilience against climatic variability. Additionally, the absence of synthetic fertilizers and pesticides contributes to environmental conservation and the production of chemical-free food. However, challenges such as initial yield variability, lack of scientific standardization, and limited awareness among farmers hinder its large-scale adoption. Despite these constraints, ZBNF presents a promising pathway toward sustainable agriculture by integrating traditional knowledge with ecological principles. The findings highlight its potential to improve farmer livelihoods, restore soil health, and contribute to long-term agricultural sustainability.

Keywords: Zero Budget Natural Farming, Jeevamrit, Sustainable agriculture, Soil health, Natural inputs, Agroecology

IIZCAGV-26-T1-043

Natural Farming/ZBNF, ITK (Indigenous Technical Knowledge) and IKS (Indian knowledge system), Traditional pest & disease management practices, Krishi Shastra

Adarsh Dufare

College of Horticulture, Rehli, Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur, Madhya Pradesh - 482001, India

Corresponding Email: adarshdufare@gmail.com

Abstract

Climate change is increasingly affecting agricultural productivity through erratic rainfall, temperature stress, and rising pest incidence. This study explores the role of Natural Farming practices, including Zero Budget Natural Farming (ZBNF), along with Indigenous Technical Knowledge (ITK) and Indian Knowledge Systems (IKS), in enhancing climate-resilient agriculture. The objective is to assess the effectiveness of traditional and eco-friendly practices in improving soil health, reducing input costs, and managing pests and diseases sustainably. The methodology involves comparative analysis of conventional farming and natural farming systems using secondary data and field-based observations. Key parameters include soil fertility, crop yield stability, pest incidence, and cost of cultivation. The findings indicate that natural farming practices improve soil microbial activity, reduce dependency on chemical inputs, and enhance resilience against abiotic and biotic stresses. Traditional pest and disease management practices, such as botanical extracts and cultural methods, provide effective and environmentally safe alternatives. In conclusion, integrating ITK and IKS with natural farming offers a sustainable and scalable solution for climate-resilient agriculture while preserving ecological balance.

Keywords: Natural farming, ZBNF, Indigenous knowledge, Climate resilience, Sustainable agriculture

IIZCAGV-26-T1-044

Traditional pest and disease management practices

Kapil Sahu

'Department of Entomology' RVSKVV, Gwalior, 474002

Corresponding Email: kapilsahu663@gmail.com

Abstract

Traditional pest and disease management practices are an important part of sustainable agriculture. These indigenous methods are eco-friendly, low-cost, and based on locally available resources. Farmers use botanical extracts such as neem (Azadirachta indica), garlic, chilli, and tobacco to control insect pests and plant diseases because of their insecticidal and antifungal properties. Cultural practices like crop rotation, intercropping, mixed cropping, timely sowing, and field sanitation help reduce pest population and disease spread by breaking pest life cycles. Mechanical methods such as hand picking of insects, use of light traps, sticky traps, and application of ash are also commonly used. Traditional storage practices, including neem leaves, eucalyptus leaves, ash, and dried chillies, protect stored grains from insect infestation. These methods reduce dependence on chemical pesticides, protect the environment, conserve biodiversity, and support Integrated Pest Management (IPM). Combining traditional knowledge with modern scientific approaches can improve sustainable pest and disease management and ensure safer agricultural production.

Keywords: Traditional pest management, Indigenous knowledge, Botanical extracts, Neem, Crop rotation, Intercropping, Field sanitation, Integrated Pest Management (IPM), Sustainable agriculture, Eco-friendly practices

IIZCAGV-26-T1-045

Natural Farming: A Sustainable and Eco-Friendly Approach to Agriculture"

[1]Pramod kumar and [2]Hemchand sao

[1*]M.Sc, Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

*Corresponding author's email: saohemchand999@gmail.com

Abstract

Natural farming is a sustainable agricultural system that promotes crop production in harmony with nature by eliminating the use of chemical fertilizers and pesticides and relying on natural inputs such as cow dung, cow urine, crop residues, and plantbased formulations. It is based on the principle of maintaining ecological balance through minimal soil disturbance, continuous soil cover, and enhanced biodiversity. These practices improve soil fertility, increase microbial activity, and enhance water retention, leading to better crop resilience against pests, diseases, and climatic stresses. Natural farming also reduces the cost of cultivation, making it economically beneficial for farmers, especially small and marginal ones. Furthermore, it ensures the production of safe, chemical-free food while conserving

natural resources and protecting the environment. Thus, natural farming is emerging as an effective and sustainable alternative to conventional agriculture for long-term productivity and ecological stability

Keywords: Natural farming, Sustainable agriculture, Soil fertility, Biodiversity, Eco-friendly practices, Chemical-free farming, Crop resilience, Environmental conservation, Organic inputs, Low- cost farming.

IIZCAGV-26-T1-046

Ethnobotany and Traditional Medicinal Knowledge under Indian Knowledge and Traditional Ecological Practices

Rajnandi Sahu

Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh

Corresponding email- sahurajnandni841@gmail.com

Abstract

Ethnobotany and traditional medicinal knowledge form a vital component of India's rich heritage of ecological wisdom. Rooted in centuries of close interaction between human communities and their natural environment, ethnobotany focuses on the relationship between people and plants, particularly their use for food, medicine, shelter, and cultural practices. In the Indian context, this knowledge system is deeply embedded in diverse indigenous traditions and reflects a sustainable approach to health and environmental management. Traditional medicinal knowledge in India is primarily preserved through ancient systems such as Ayurveda, Siddha, anUnani, along with a vast body of folk medicine practiced by tribal and rural communities. These systems rely heavily on locally available plant resources, many of which possess significant therapeutic properties. Plants like neem, tulsi, ashwagandha, and turmeric have been widely used for their antimicrobial, anti-inflammatory, and immune boosting qualities. This knowledge has been passed down orally across generations, making it an integral part of community identity and cultural continuity. Ethnobotanical practices are not only important for healthcare but also contribute to biodiversity conservation. Indigenous communities often follow sustainable harvesting methods, ensuring that plant species are not overexploited. Sacred groves and protected forest areas serve as reservoirs of medicinal plants, maintained through cultural and religious beliefs. Such practices demonstrate a harmonious balance between human needs and ecological preservation. In conclusion, ethnobotany and traditional medicinal knowledge represent a sustainable and holistic approach to health and environmental stewardship. They highlight the importance of preserving indigenous wisdom, promoting biodiversity, and fostering a deeper understanding of the interdependence between humans and nature.

Keywords: Ethnobotany, Traditional Knowledge, Medicinal Plants, Ayurveda, Biodiversity Conservation, Indigenous Practices, Herbal Medicine, Sustainable Healthcare, Ecological Balance

IIZCAGV-26-T1-047

Bio-efficacy of biodynamics against whitefly in black gram and their impact on natural enemies

Maneesha[1], Dr. S.B. Das[2], Dr. S.P.S. Tomar[3] and Dr. Neha Sharma[4]

[1]PhD. Scholar, Department of Entomology, RVSKVV, Gwalior, 474001, MP, India.

[2]Head & Professor, Department of Entomology, JNKVV, Jabalpur, 482004, MP, India.

[3]Head & Senior Scientist, Department of Entomology, RVSKVV, Gwalior, 474001 MP, India.

[4]Professor, Department of Entomology, RVSKVV, Gwalior, 474001, MP, India.

Correspondind email: maneeshasonwani02@gmail.com

Abstract

A field study was conducted during the *kharif* season 2022-23 at JNKVV in Jabalpur (MP). Biodynamics were considered as environmentally safe, biodegradable, economical and renewable alternative for use in IPM programmes. The study was compared efficacy of 4 biodynamics (Brahmastra, Agniastra, Neemastra, and Dashparni ark at 30 and 45ml) against whitefly.Whitefly was counted per plant by used of cage. Result revealed that the brahmastra @ 45ml/L was found to be most effective in reducing whitefly population with 3.87 adult whitefly / plant followed by brahmastra @ 30ml/L (3.91 adult whitefly / plant), agniastra @ 45ml/L (3.93 adult whitefly / plant), agniastra @ 30ml/L (3.96 adult whitefly / plant), neemastra @ 45ml/L (3.99 adult whitefly / plant) and neemastra @ 30ml/L (4.01 adult whitefly / plant), dashparni ark @ 45ml/L (4.04 adult whitefly / plant) and dashparni ark @ 30ml/L (4.11 adult whitefly / plant). However brahmastra @ 45ml/L registered higher grain yield and also found to be most economic (1:16.53) followed by brahmastra @ 30ml/L (1:11.95), agniastra @ 45ml/L (1:9.31), agniastra @ 30ml/L (1:5.83), neemastra @ 45ml /L (1:5.39) and neemastra @ 30ml /L (1:3.45). The biodynamics were safe for potent predators (Ladybird and spider).

Keywords: Biodynamics, Brahmastra, Agniastra, Neemastra, Dashparni ark and Natural enemies

SUB THEME-II



Agri-Biotechnology and Biotech innovations, Next-Generation Crop Improvement, Precision/Smart Farming Technologies, Controlled Environment Agriculture, Climate-Resilient Agriculture, and Stress Biology

IIZCAGV-26-T2-048

CRISPR/Cas-9 Genome Editing in Agriculture: Mechanisms, Applications and Future Challenges

Ayush Jain[1*], Sarita[1], Konanki Ravi[1], Soumya Shephalika Dash[1]

Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. 474002. Madhya Pradesh, India.

Corresponding Author Email: entomologist.rvskvv@gmail.com

Abstract

CRISPR/Cas9 is a highly effective genome editing tool used in various fields. It consists of guide RNA (gRNA) and Cas9 proteins. The editing process involves recognition, cleavage and repair steps. The sgRNA identifies the target gene sequence, while Cas-9 creates a break for repair. This technology has applications in medicine, agriculture and biotechnology. It can improve crop nutrition and is being studied for diseases like cancer and HIV. Despite its potential, improvements are needed for practical applications and overcoming obstacles. Advances in gene-editing tech have created new ways for genetic pest control, especially through gene drives to suppress or alter pest populations. However, there are uncertainties about their effectiveness in new species, natural populations and safety as control methods. This article discusses issues related to using gene drives in agriculture to tackle costly pest and disease problems worldwide. It explores the need for innovative solutions and the key traits of agricultural pests that could influence gene drive outcomes. The challenges and opportunities of using gene drives in agriculture are outlined, with a focus on the benefits of high-threshold gene drives. The goal is to offer a comprehensive look at the potential benefits and uncertainties of gene drives in agricultural settings.

Keywords: CRISPR, Cas-9, gRNA, applications, gene drives, agriculture

IIZCAGV-26-T2-049

Genetic diversity analysis of yield and quality traits in Aromatic Short Grain rice

Jateen Kumar[1], Kishor Kumar[2], Shivani Manjhi[2]

[1]PG student Department of Genetics and Plant Breeding, SGCARS, Jagdalpur (C.G.)
[2]PG student Department of Genetics and Plant Breeding, SGCARS, Jagdalpur (C.G.)
[3]PG student Department of Genetics and Plant Breeding, IGKV, Raipur (C.G.)

Corresponding author Email- jksagar1998@gmail.com

Abstract

The genetic divergence study conducted with 28 aromatic short grain genotypes revealed significant differences among the genotypes for the yield, its components and grain quality characteristics. Both Tocher's and Euclidian techniques of divergence investigation classified the genotypes into five clusters based on the relative magnitude of D^2 values. Cluster IV with

8 genotypes was the largest cluster followed by Cluster I with 7 genotypes, Cluster V with 6 genotype, Cluster II with 4 genotype and Cluster III with 3 genotypes. The intra Cluster distance ranged from 2.420 (Cluster I) to 2.826 (Cluster II) and highest intra Cluster distance observed within Cluster V (2.946). The inter cluster distance remained maximum between Cluster V and IV (5.467) suggesting that the crosses involving varieties from these Clusters would give wider and desirable recombination. To appreciate much variability and high heterotic effect, parents would be selected from clusters having wider inter cluster distance. Cluster V included 6 genotypes, *viz.,* NVSR 604, R 1656-1251-1-412-1, R 2369-475-2-252-1, NVSR 603, IGKV DH 66, BRR 2180, which showed highest cluster mean values for total number of grains per panicle (428.67), harvest index (48.68), grain yield (42.83), number of panicles per square meter (41.35), panicle length (27.23), test weight (23.46), number of effective tillers per plant (9.46) and flag leaf width (1.68). Thus, the genotypes (NVSR 604, R 1656-1251-1-412-1, R 2369-475-2-252-1, NVSR 603, IGKV DH 66, BRR 2180) of these clusters having high mean value could be directly used in crop improvement programme as parents.

Keywords: Aromatic short grain rice, D^2 statistics, Cluster analysis

IIZCAGV-26-T2-050

Insect Pest Dynamics under Changing Climate: Implications for Sustainable Agriculture

Bazar Thimmappa Charan Kumar[1], S.P.S. Tomar[2], Soumya Sephalika Dash[3] and Neha Sharma[4]

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[2]Senior Scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[3]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[4]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: charankumarbt@gmail.com

Abstract

Climate change is increasingly influencing the behavior, distribution, and population dynamics of insect pests, posing serious challenges to agricultural sustainability. Rising temperatures, altered rainfall patterns, and increased frequency of extreme weather events have been shown to accelerate pest development, expand geographical ranges, and disrupt natural ecological balances. This review examines how changing climatic factors affect insect pest biology, seasonal incidence, and interactions with host plants and natural enemies. Evidence indicates that warmer conditions often lead to shorter life cycles, increased

generations per year, and higher survival rates of several key pests, resulting in intensified crop damage. In addition, shifts in pest distribution into previously unaffected regions threaten new cropping systems. Climate change also affects the efficiency of biological control agents and may reduce the effectiveness of conventional pest management strategies. The study highlights the importance of developing climate-resilient pest management approaches, including improved monitoring systems, predictive modeling, use of resistant crop varieties, and strengthening of integrated pest management (IPM) practices. Adaptive strategies that combine ecological principles with modern technologies will be essential to mitigate pest risks under changing climatic conditions. Overall, understanding insect pest dynamics in the context of climate change is critical for ensuring sustainable crop production, reducing yield losses, and maintaining agroecosystem stability in the future.

Keywords: Climate change, insect pest dynamics, sustainable agriculture, pest distribution, IPM, agroecosystem

IIZCAGV-26-T2-051

Nanotechnology in Pest Control

Kunjum Pradeeprao Likhitkar[1] *, Neha Sharma[1], Rahul Patidar[1], Sisodia Ankita Dinesh Singh[1] , Soumya Shephalika Dash[1]

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.

Corresponding Author: kunjum1999@gmail.com

Abstract

Nanotechnology is emerging as an innovative and efficient approach in modern pest manag ment. It involves the use of nanoparticles to improve the delivery, effectiveness, and safety of pesticides. Nano-formulations enhance the stability and controlled release of active ingredients, ensuring targeted action against pests such as Helicoverpa armigera while reducing chemical losses and environmental contamination. These nano-pesticides require lower doses compared to conventional chemicals, minimizing toxicity to non-target organisms and beneficial insects. Additionally, nanotechnology enables the development of smart delivery systems that respond to environmental triggers, increasing pest control efficiency. It also plays a role in pest detection through nanosensors, allowing early identification and timely management of infestations. Overall, nanotechnology offers a sustainable and eco-friendly solution for pest control by improving efficacy, reducing pesticide residues, and supporting climate-smart agriculture.

Keywords: Nanotechnology, Targeted delivery, Nano-pesticides, Smart agriculture, Nanosensors

IIZCAGV-26-T2-052

Response of Gladiolus Varieties to Chemical Mutagen Treatment

Shivlal Meena[1], Anuj Kumar[1], Priyamvada Sonkar[2] and Basant K. Kachouli[3]

[1]Department of Floriculture and Landscaping,

[2] Department of Fruit Science,

[3]Department of Genetics and Plant Breeding,

RVSKVV - K.N.K. College of Horticulture, Mandsaur,

Madhya Pradesh – 458002

Corresponding Email: dranuj333@gmail.com

Abstract

The present investigation entitled "Response of gladiolus (varieties to chemical mutagen treatment" was conducted at the Department of Floriculture and Landscaping, K.N.K. College of Horticulture, Mandsaur (M.P.) during the rabi season of 2023-24. The experiment consists of four gladiolus varieties such as V1 (Fidelio), V2 (Pusa Kiran) , V3 (Jyotsana), V4 (Surya Kiran) and four different concentrations of chemical mutagen i.e. E1(0.00%), E2(0.20 %), E3 (0.40 %), E4 (0.60 %). Results indicated that among the varieties, V4 (Surya Kiran) exhibited superior performance in most vegetative, and corm parameters including plant height, leaf number and corm weight, while V2 (Pusa Kiran) and V3 (Jyotsana) performed better for specific growth traits. In EMS treatments, 0.2% EMS (E2) showed the most favourable response for growth and yield parameters, whereas 0.6% EMS adversely affected most traits. Interaction effects indicated that combinations such as V4E1 and V2E2 performed better for several attributes, while V3E4 recorded minimum values. The study concluded that 0.2% EMS is most effective for improving gladiolus performance, and variety Surya Kiran is best suited for desirable traits under mutagenic treatment.

Keywords: gladiolus, chemical mutagen, EMS, growth, corm parameters

IIZCAGV-26-T2-053

Controlled Environment Agriculture: A Sustainable Approach to Modern Crop Production

Ashutosh Dwivedi[1*], Rajnee Sharma[1], Mansi Khadipure[1], Shubham Bagwan[1], Shivani Thakur[2], Jaywardhan Singh Khichi[3], Anurag Chouhan [4],

[1]Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

[2]Department of Plant Pathology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

[3]Department of Genetics and Plant Breeding, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

[4]Department of Plant Agronomy, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

*Corresponding author's email: ashu15012001@gmail.com

ABSTRACT

Controlled Environment Agriculture (CEA) is an innovative and technology driven approach that enables precise regulation of environmental factors such as temperature, light, humidity, carbon dioxide and nutrient supply to optimize plant growth and productivity. This system includes greenhouses, vertical farming and plant factories, facilitating year round cultivation independent of external climatic conditions. CEA significantly enhances resource use efficiency by reducing water consumption through soilless techniques such as hydroponics and aeroponics, while also minimizing the incidence of soil borne diseases. Furthermore, it improves crop yield, quality and uniformity, making it highly suitable for urban and peri-urban agriculture. Despite these advantages, challenges such as high initial investment, energy requirements and technical expertise remain constraints to large-scale adoption. However, recent advancements in automation, artificial intelligence and renewable energy integration are improving the economic viability and sustainability of these systems. Overall, CEA represents a promising strategy for sustainable intensification of agriculture, ensuring food security and resilience under changing climatic conditions.

Keywords: Controlled environment agriculture, vertical farming, hydroponics, sustainability, food security

IIZCAGV-26-T2-054

Effect of zinc solubilizing bacteria on the growth and productivity of Groun dnut in Gird region of Madhya Pradesh

Megha Mandloi[1] and D. K. Paliwal[2]

[1]Research Scholar, RVSKVV, Gwalior

[2]Associate Professor (Agronomy), RVSKVV, Gwalior

Abstract

Zinc deficiency is a major constraint limiting groundnut productivity, particularly in zinc-deficient soils of regions like Gwalior. A field experiment was conducted during the kharif 2024 season at the Research Farm, College of Agriculture, RVSKVV, to evaluate the effect of zinc solubilizing bacteria (ZSB) and zinc fertilization on growth, yield, and economics of groundnut. The experiment was laid out in a randomized block design with nine treatments, including recommended dose of fertilizers (RDF) alone, RDF combined with different ZSB strains such as Acinetobacter pittii and Enterobacter cloacae, bio-zinc, and zinc sulphate ($ZnSO_4$) applied either as basal (25 kg/ha) or foliar spray (0.2%) at flowering and pod development stages. The results revealed that plant population was not significantly affected by treatments, whereas growth parameters, yield attributes, and yields varied significantly. Application of $ZnSO_4$, either as basal or foliar spray, recorded significantly higher plant height, dry matter accumulation, number of pods per plant, and kernel development compared to ZSB treatments. Among biological treatments, RDF combined with ZSB strains, particularly Acinetobacter pittii, showed moderate improvement in growth and yield parameters. Maximum pod yield (2316 kg/ha) and haulm yield (9369 kg/ha) were recorded under basal application of $ZnSO_4$ @ 25 kg/ha, which was statistically at par with foliar $ZnSO_4$ spray and combined ZSB treatments. Economic analysis indicated that $ZnSO_4$ application resulted in the highest net returns and benefit-cost ratio, followed by foliar spray

and combined ZSB application. However, ZSB treatments offer a cost-effective and eco-friendly alternative for improving zinc availability and crop productivity. It can be concluded that application of $ZnSO_4$ @ 25 kg/ha or 0.2% foliar spray along with RDF significantly enhances groundnut productivity and profitability, while ZSB such as Acinetobacter pittii and Enterobacter cloacae can be used as sustainable supplements for improved nutrient management.

IIZCAGV-26-T2-055

Nano-Fertilizers in Modern Agriculture: Advances, Applications and Future Prospects

Abdul Sajid Musani[1] and Deepak Patel[2]

[1]Department of Soil Science, College of Agriculture, Raipur. 492012, Chhattisgarh, India

[2]Department of Soil Science, College of Agriculture, Raipur. 492012, Chhattisgarh, India

Corresponding Email: abdulsajid0408@gmail.com

Abstract

The increasing global demand for food has led to the extensive use of conventional chemical fertilizers; which, despite enhancing crop productivity, have caused significant environmental concerns due to low nutrient use efficiency and associated losses through leaching and gaseous emissions. In response, Nanotechnology has emerged as a promising approach in agriculture, leading to the development of nano fertilizers. These fertilizers, engineered at the nanoscale, offer controlled and intargeted nutrient delivery improved nutrient uptake and reduced environmental losses compared to traditional fertilizers. Nano-fertilizers enhance plant growth, yield and nutritional quality by facilitating efficient nutrient transfer and improving plant resilience against biotic and abiotic stresses. They also contribute to environmental sustainability by minimizing nutrient runoff, reducing greenhouse gas emissions and improving soil health. Various types of nano-fertilizers, including nitrogen, phosphorus, zinc, iron and silica-based formulations, have demonstrated significant potential in improving crop performance and nutrient use efficiency. However, concerns related to toxicity, environmental fate, lack of standardized regulations and potential risks to human and ecosystem health necessitate further research. Despite these challenges, nano-fertilizers represent a transformative innovation in modern agriculture with the potential to support sustainable crop production. A balanced approach involving scientific validation, regulatory frameworks and responsible application is essential to fully harness their benefits while minimizing associated risks.

Keywords: Nano-fertilizers, Nanotechnology in agriculture, Nutrient use efficiency, Controlled nutrient release, Sustainable agriculture.

IIZCAGV-26-T2-056

Climate-Resilient Agriculture: Climate-Resilient Crop Varieties for Sustainable Agriculture

Pratibha Rathore [1*]

College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

*Corresponding author's email: 28pratibharathore@gmail.com

Abstract

Climate change is emerging as a major challenge to agricultural sustainability due to increasg temperatures, erratic rainfall, droughts, and floods. These climatic stresses threaten crop productivity and food security, especially for small and marginal farmers in India. The present study attempts to review the importance of climate-resilient crop varieties as a key strategy for adapting agriculture to changing environmental conditions. This paper is based on a review of recent literature, reports, and case studies related to drought-tolerant, heat-tolerant, and flood-resistant crop varieties developed through conventional breeding and modern crop improvement approaches. Special emphasis is given to major crops such as rice, wheat, and millets that are widely cultivated in climate- vulnerable regions. Findings from various studies indicate that climate-resilient varieties help improve yield stability under stress conditions, reduce the risk of crop failure, and enhance resource-use efficiency in rainfed farming systems. These crops also support reduced dependence on chemical inputs and contribute to improving farmers' livelihood security. The review highlights that large-scale promotion of climate-resilient varieties, along with farmer awareness and effective seed distribution systems can play a crucial role in building climate-smart and sustainable agricultural systems for the future.

Keywords: Climate change, Climate-resilient crops, Crop improvement, Food security, Sustainable agriculture

IIZCAGV-26-T2-057

Controlled Environment Agriculture

Anamika Verma[1] and Swati Behra[2]

[1]Department of Soil Science, College of Agriculture, Raipur. 492012, Chhattisgarh, India

[2]Department of Soil Science, College of Agriculture, Raipur. 492012, Chhattisgarh, India

Corresponding Email: seema29girish@gmail.com

Abstract

Controlled Environment Agriculture (CEA) is an advanced approach to crop production that utilizes technology to regulate environmental factors such as temperature, humidity, light and nutrient supply. The objective of this study is to evaluate the role of CEA in enhancing crop productivity and resource use efficiency under changing climatic conditions. The methodology includes a review of existing CEA systems such as greenhouses, hydroponics, aeroponics and vertical farming, along with analysis of their impact on plant growth and yield. Key results indicate that CEA significantly improves crop yield, reduces water usage and ensures year round production while minimizing dependency on external climatic conditions. Additionally, precise nutrient management and reduced pest incidence contribute to improved crop quality. The study concludes that CEA is a sustainable and efficient solution for modern agriculture, particularly in urban and resource-limited areas. However, high initial

investment and technical expertise requirements remain major challenges for its widespread adoption.

Keywords: Controlled environment agriculture, Hydroponics, Vertical farming

IIZCAGV-26-T2-058

Strengthening climate-resilient agriculture through natural farming, indigenous practices, and innovative approaches

Tosan Kumar Sahu

Ph.D. Scholar, Department of Agronomy, College of Agriculture, IGKV, Raipur, (Chhattisgarh), India

College of Agriculture, IGKV, Raipur, (Chhattisgarh), India - 492012

Corresponding author mailed: tosansahu95@gmail.com

Abstract

Agricultural sustainability is severely hampered by climate change, especially in underdeveloped nations where farming practices are extremely susceptible to temperature change. Natural farming, indigenous knowledge, and creative methods are all included into climate-resilient agriculture to improve sustainability and adaptability. By preserving biodiversity and soil health, indigenous techniques including mixed cropping, agroforestry, water conservation, and the use of regional seed types enhance resilience. By lowering reliance on chemical inputs, natural farming enhances long-term productivity and environmental equilibrium. To maximize resource usage, cutting-edge strategies like precision farming, digital tools, and climate-smart technologies supplement conventional wisdom. Food security, environmental sustainability, and better livelihoods in the face of climate change can all be ensured by fortifying these integrated methods.

Keywords: Climate Change, Agricultural Sustainability ,Climate-Resilient Agriculture, Natural Farming, Mixed Cropping, Agroforestry

IIZCAGV-26-T2-059

Climate Resilient Agronomic Practices for Sustainability and Resource Use Efficien cy of Groundnut Based Cropping Systems

Shivani Sharma[1], Ekta Joshi and Nishant K. Sinha[3]

Department of Agronomy, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, India

Corresponding Email: shivani.sharma5068@gmail.com

Abstract

Groundnut (Arachis hypogaea L.) is a major oilseed and legume crop valued for its edible oi high protein content and contribution to soil fertility through biological nitrogen fixation. India ranks second globally in groundnut production after China and the crop plays a vital

role in ensuring livelihood security for small and marginal farmers, particularly in semi-arid regions such as Madhya Pradesh. However, groundnut productivity and resource-use efficiency are increasingly constrained by climate variability, erratic rainfall, rising temperatures and soil degradation. This review examines climate-resilient agronomic practices aimed at enhancing sustainability and resource-use efficiency of groundnut cultivation across different cropping systems prevalent in Madhya Pradesh. Key practices discussed include the adoption of stress-tolerant and short-duration varieties, conservation agriculture approaches, integrated nutrient and water management, precision agronomic interventions, crop diversification and groundnut-based intercropping and rotation systems. Evidence from existing studies indicates that diversified cropping systems combined with resourceconserving technologies improve water and nutrient use efficiency, stabilize yields, enhance soil health, and increase economic returns under climate-stressed conditions compared to conventional practices. The review also identifies regional research gaps, constraints to adoption and future research priorities for scaling climate-smart groundnut-based cropping systems in Madhya Pradesh. Overall, the paper highlights the importance of integrated, system-based agronomic strategies for sustaining groundnut productivity while optimizing natural resource use under changing climatic scenarios.

Keywords: Groundnut, cropping system, resource use efficiency, sustainability, integrated nutrient management

IIZCAGV-26-T2-060

Nanotechnology in Insect Pest Management: Emerging Trends

Bazar Thimmappa Charan Kumar[1], S.P.S. Tomar[2], Soumya Sephalika Dash[3], Neha Sharma[4]

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[2]Senior Scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[3]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[4]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: charankumarbt@gmail.com

Abstract

The growing concerns over environmental safety and pesticide resistance have led to the exploration of innovative approaches such as nanotechnology for insect pest management. This review highlights recent advances in the development and application of nano-based formulations for sustainable pest control. Nanoparticles, including nano-emulsions, nano-encapsulated pesticides, and nano-carriers, offer improved stability, targeted delivery, and controlled release of active ingredients. Nano-formulations enhance the effectiveness of botanical and chemical pesticides by increasing their bioavailability and reducing degradation, thereby lowering the required dosage and minimizing environmental

contamination. Additionally, nano-based sensors are being developed for rapid detection and monitoring of pest populations, supporting precision agriculture practices.

Studies have demonstrated that nanotechnology can significantly improve pest control efficiency while reducing non-target effects and pesticide residues in the environment. However, challenges related to cost, large-scale production, regulatory frameworks, and potential ecological risks need to be carefully addressed before widespread adoption. The integration of nanotechnology with integrated pest management (IPM) strategies holds great promise for developing safer and more efficient pest control solutions. Overall, nanotechnology represents a forward-looking approach that can contribute to sustainable and climate-resilient agricultural systems.

Keywords: Nanotechnology, nano-pesticides, pest management, sustainable agriculture, nano-formulations, IPM

IIZCAGV-26-T2-061

Influence of Plasma Seed Treatments on Morpho- Physiological and Biochemical Changes in Low Vigour Crop Seeds

Buduri Lakshmi Mounika[1], Sanjay Kumar[2], Harish M.S[3], Bazar Thimmappa Charan Kumar[4]

[1]Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu & Kashmir, 190025, India.

[2]Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu & Kashmir, 190025, India.

[3]College of Agriculture, CCS-HAU, Bawal, Haryana, India

[4]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: mounikasrinivas0206@gmail.com

Abstract

The present investigation evaluated the effect of cold plasma treatment on morpho-physiological and biochemical characteristics of low-vigour seeds of rajma (*Phaseolus vulgaris*), wheat (*Triticum aestivum*), and cotton (*Gossypium* spp.) under controlled laboratory conditions. Seeds were treated using dielectric barrier discharge cold plasma in two modes, surface and volume discharge, with exposure durations of 1, 2, 5, and 10 minutes, along with an untreated control. The experiment followed a factorial completely randomized design (F-CRD) as per International Seed Testing Association (ISTA) standards. Cold plasma significantly influenced seed performance across all crops. Short to moderate exposure durations (1–5 minutes) enhanced germination percentage, seedling growth, dry weight, and vigour indices, indicating improved metabolic activity and early seedling establishment. In contrast, prolonged exposure (10 minutes) reduced germination and growth, suggesting stress-induced damage. Wheat showed the most consistent positive response, followed by rajma, while cotton exhibited comparatively moderate improvement due to its thicker seed coat. Biochemical analysis revealed improved membrane stability, higher dehydrogenase activity, and increased antioxidant enzyme activities under optimal treatments, while

excessive exposure caused membrane damage. Overall, cold plasma treatment is a promising, eco-friendly approach for enhancing seed vigour, requiring crop-specific optimisation.

Key words: Cold plasma; Low-vigour seeds; Seed vigour; Germination; Antioxidant enzymes

IIZCAGV-26-T2-062

Role of Honey Bees in Sustainable Crop Production and Pollination Security

Shubham Singh[1]*, Satya Prakash Singh Tomar[1], Ankita Singh Sisodia[1], Shivam Singh[2] Soumya Shephalika Dash[1] Bazar Thimmappa Charan Kumar[1],

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, MP, India
[2]Agriculture University, Jodhpur, Rajasthan, India
*Corresponding author: entomologyshubham@gmail.com

Abstract

Honey bees play a vital role in sustainable agriculture through efficient pollination and enhancement of crop productivity. The present study highlights the significance of honey bees in improving pollination efficiency, yield attributes and quality parameters in agricultural and horticultural crops. Managed pollination by honey bees contributes to better fruit set, seed formation and overall productivity, while supporting biodiversity and ecosystem stability. The study emphasizes the role of honey bees as an eco-friendly component of sustainable crop production systems and their contribution to livelihood security through apiculture. Results indicated that bee-mediated pollination significantly improved crop performance over non-pollinated conditions. The study further underlines the need for pollinator conservation, bee-friendly farming practices and integration of apiculture with farming systems for resilient and sustainable agriculture.

Keywords: Honey bees, pollination, sustainable agriculture, apiculture, crop productivity

IIZCAGV-26-T2-063

Efficacy of Fipronil in combination with botanical extracts for sustainable management of Red pumpkin beetle (*A. foevicollis*) in Bottle gourd

Shubham Singh[1*], Umesh chandra[1] Satya Prakash Singh Tomar[2], Ankita Singh Sisodia[2], Soumya Shephalika dash[2] and Shivam Singh[3]

[1]Acharya Narendra Deva University of Agriculture & technology, Ayodhya UP, India.
[2]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.
[3]Agriculture University, Jodhpur, Rajasthan, India

*Corresponding author: entomologyshubham@gmail.com

Abstract

Bottle gourd, Lagenaria siceraria belongs to the Cucurbitaceae family and is one of the most significant vegetable crops farmed in India *A.foevicollis* most destructive pest in

cucurbitaceous vegetable as well as bottle gourd, The current investigation was studied in Zaid season 2022 to evaluate the eight treatment with control water spray against *A. foevicollis* experiment was laid in RBD with three replication the beetle population was recorded the day before spraying and 3,7,10 days after spraying the lowest mean beetle population of *A. foevicollis* and yield was observed accordingly in Fipronil 30g a.i.+ Spinosad + 60 g a.i./ha was observed most effective which caused the maximum mean reduction and gave highest yield 245.60 q/ha followed by Fipronil 30g a.i.+ Spinosad 30 g a.i.+30g a.i./ha treated plots with yield 240.50 q/ha. and highest cost-benefit ratio is 22.76:1, obtained from Fipronil 30g a.i + NSKE 10%/ha The efficacy of remaining treatments in order of superiority Fipronil 30g + Lantana Leaf Extract 5%/ha & Fipronil 30g + Parthenium leaf extract 5%/ha. The least effective treatment was recorded was Fipronil 30g + Lantana Leaf Extract 10% ha and 500 litters water spray, respectively. The findings suggest that integrating insecticides with botanical extracts is a sustainable strategy for managing *A. foevicollis*. Future research should focus on resistance management and optimizing spray schedules. Prevent environmental risks and validation of eco-friendly IPM strategies across diverse agro-climatic regions.

Keywords: *Aulacophora foveicollis*, Neem Seed kernel Extract, Parthenium leaf extract, Active ingredients

IIZCAGV-26-T2-064

Recent advances in host plant resistance for sustainable management of Fall Armyworm (*Spodoptera frugiperda*) in maize

Shubham Singh [1]*, Satya Prakash Singh Tomar[1], Ankita Singh Sisodia[1], Soumya Shephalika dash[1] Shivam Singh[2] Bazar Thimmappa Charan Kumar[1]

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, MP, India
[2]Agriculture University, Jodhpur, Rajasthan, India

*Corresponding author: entomologyshubham@gmail.com

Abstract

Maize (*Zea mays* L.) is a globally important cereal crop, but its productivity is severely threatened by the invasive pest Fall Armyworm (*Spodoptera frugiperda*), which has rapidly spread across Asia and Africa. This review synthesizes recent advances in host plant resistance as a key strategy for sustainable management of *S. frugiperda*. Various studies have reported significant variability among maize genotypes in terms of resistance mechanisms, including antibiosis, antixenosis, and tolerance. Resistant germplasm lines and improved hybrids have demonstrated reduced larval survival, lower leaf damage, and better yield performance under infestation. Recent progress in molecular breeding, quantitative trait loci (QTL) mapping, and transgenic approaches has further enhanced the development of resistant cultivars. The integration of host plant resistance with other eco-friendly practices forms a crucial component of integrated pest management (IPM). This review highlights the importance of resistant varieties in reducing dependence on chemical insecticides and mitigating environmental risks. Future research should focus on the identification of stable

resistance sources, gene pyramiding, and multi-location validation to ensure durable resistance under diverse agro-climatic conditions.

Keywords: *Spodoptera frugiperda*, maize, host plant resistance, IPM, antibiosis, molecular breeding

IIZCAGV-26-T2-065

Evaluating the Effectiveness of Microbial Activities in the Production of Biological Fuel

Sakshi Saxena

PhD Research Scholar, Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya College of Agriculture Gwalior, Madhya Pradesh

*Corresponding Email: saxena08sakshi@gmail.com

Abstract

Microbial biotechnology, which uses microbes to improve industrial processes and the environment, is a rapidly growing area. This study examines the numerous applications of microbe-based biotechnology, highlighting the capability of bacteria to create sustainable advancements. Bacteria can convert organic materials into biofuels like ethanol and butanol, offering eco-friendly alternatives to conventional fossil fuels. Natural and genetically engineered bacteria contribute significantly to pollutant removal. They utilize biological pathways such as bioremediation to degrade harmful substances. Through bioaugmentation, specialized microbial groups enhance purification efficiency.Using bacteria to extract hazardous heavy metals such as cadmium and lead from soil and water illustrates the potential of microbial biotechnology. Microbes act as natural agents of detoxification, breaking down or binding toxic elements. Such practices highlight biotechnology's contribution to cleaner and greener ecosystems.The mutual alliance between humans and bacteria has unlocked novel pathways in medical innovation. This collaboration has fostered the advancement of probiotics that enhance well-being.The dynamic link between microbes and their surroundings offers remedies to urgent global challenges. This work examines the extensive scope of microbial biotechnology. It showcases bacteria's ability to ignite sustainable innovations. Such study highlight biotechnology's vital role in eco-friendly advancement.

Keyword- Bacteria, bioremediation, biotechnology, ecosystems, microbe

IIZCAGV-26-T2-066

Performance evaluation of solar-operated Sprayer

Tikeshwari Gayakwad, and S.V. Jogdand

Ph.D. Scholar. Deptt. of FMPE, SV CAET and RS, FAE, Agril. Engg. IGKV, Raipur (CG)
Professor, Deptt. of FMPE, SV CAET and RS, FAE, Agril. Engg. IGKV, Raipur (CG)
Mail- pinkigayakwad99@gmail.com

Abstract

The solar operated sprayer was designed and developed in workshop of SVCAET and RS, FAE, Agril. Engg. IGKV, Raipur (CG). The solar sprayer was designed based on the type of crop, required spraying capacity, low cost, light weight. The total development cost of the machine was 7390Rs. The power source for the sprayer was a 45 Watt solar panel and 12V battery. The performance evaluation was conducted in IGKV field Raipur and results obtained the application rate was obtained 470 l/ha. The angle of spray was recorded at 65.4°. The average speed of solar operated sprayer was found to be 1.79 km/h. The actual field capacity and theoretical field capacity of the sprayer were found to be 0.146 ha/h and 0.179 ha/h respectively. The average field efficiency was observed 82.02%. The operating pressure was measured at 5.5 kg/cm^2 and discharge rate per nozzle was found to be 0.921 l/m. The operational cost of sprayer was calculated 294.93 Rs/h. The Pay Back Period was found to be 2.2 year.

Key words: Solar panel, battery, PV cell, DC motor pump, hollow cone nozzle.

IIZCAGV-26-T2-067

Role of Biochar in Improving Phosphorus Dynamics and Use Efficiency in Soils

Sudheer[1]*, Kasturikasen Beura[1], Amit Kumar Pradhan[1]

[1]Department of Soil Science, Bihar Agricultural University, Sabour, 813210 Bhagalpur, Bihar

Correspondence: sudheer87364@gmail.com

Abstract

Phosphorus (P) is an essential macronutrient for crop growth. Its low availability in soils due to fixation by iron, aluminum, and calcium compounds poses a major constraint to agricultural productivity worldwide. Biochar, a carbon-rich material produced by the pyrolysis of biomass under limited oxygen, has emerged as a promising soil amendment for enhancing P nutrition in crops. This overview synthesizes current knowledge on the multifaceted roles of biochar in improving soil P availability, fertilizer use efficiency, and plant P uptake. Biochar influences P dynamics through direct and indirect mechanisms. Directly, it serves as a slow-release P source, particularly when derived from nutrient-rich feedstocks such as animal manure or crop residues, releasing labile P fractions while adsorbing excess phosphate to prevent leaching. Indirectly, biochar modifies soil physicochemical properties—including elevation of pH in acidic soils, increase in cation exchange capacity, and enhancement of soil organic matter— which reduce P fixation and promote desorption of bound P. Biochar also stimulates P solubilizing microorganisms and enzymatic activities, thereby accelerating P mineralization and cycling in the rhizosphere.

Keywords: Biochar, Phosphorus availability, Soil fertility, Crop nutrition, Nutrient use efficiency, Slow-release fertilizer

IIZCAGV-26-T2-068

Advancing Food Safety Using Natural Preservatives in Food System

Adarsh Mishra

Undergraduate Student, Department Of Food Technology , Raipur Indira Gandhi Krishi Vishwavidyalaya , Raipur (C.G.)

Corresponding Author- mishradarsh910@gmail.com

Abstract

Food safety and shelf life are important issues due to increasing food spoilage and contamination. Chemical preservatives were commonly used earlier, but now people are more concerned about their health effects. Because of this, natural preservatives are becoming more popular as safer alternatives. This study focuses on understanding how natural preservatives help improve food safety and extend the shelf life of food (mainly Perishable and Non Perishable Food), along with their safe levels of use. This study is based on a review of different natural preservatives obtained from plants and microorganisms. Common examples include turmeric (curcumin), clove oil, vinegar (acetic acid) and salt. According to Food Safety and Standards Authority of India (FSSAI) natural preservatives like acetic acid and salt are permitted within safe limits depending on the food product. For example, vinegar is generally used around 0.5–1%, while salt is used at 2–5% in many preserved foods. Essential oils are used in very small quantities (less than 0.1%) due to their strong activity. These natural preservatives show antimicrobial and antioxidant properties, which help in controlling bacterial growth and delaying spoilage. Compared to chemical preservatives, they are safer, eco-friendly and more acceptable to consumers. They also help in improving food quality and reducing health risks. Natural preservatives can be a safe and effective method for improving food safety and shelf life. Their proper use, as per recommended limits, can reduce dependence on chemical preservatives and support a healthier and sustainable food system.

Keywords: Natural preservatives, Shelf life, Antimicrobial activity, FSSAI, Sustainable food Systems

IIZCAGV-26-T2-069

Response of Beetroot to Different Levels of Nitrogen and Phosphorus in Black Soil of Malwa Region of Madhya Pradesh

Yogeshwari Kaware, S. S. Kushwah, R. K. Sharma and O. P. Singh

College of Horticulture, Mandsaur-458002, RVSKVV, Gwalior

Corresponding author Email ID: kushwahhort@gmail.com

Abstract

A field experiment was conducted at Bahadari Farm, College of Horticulture, Mandsaur (M.P) during rabi season 2020-21. The treatments, comprised of four levels of nitrogen (60, 80, 100 and 120 kg/ha) and three levels of phosphorus (40, 60 and 80 kg/ha), were laid in a factorial randomized block design with three replications. Findings of the experiment revealed that application of different levels of nitrogen and phosphorus had significant influence on growth, yield, quality as well as economics of beet root. Among the nitrogen levels, highest growth, yield and quality as well as net return were recorded with N_3 (100kgN/ha). Amongst phosphorus levels, application of P_2 (60kgP_2O_5/ha) was superior for

all these parameters. Hence, application of N_3(100kgN/ha) and P_2(60kgP_2O_5/ha) for beet root cultivation in black soil of Malwa region of Madhya Pradesh may be advocated.

Keywords: Beetroot, Nitrogen, Phosphorus, Black Soil, Madhya Pradesh

IIZCAGV-26-T2-070

Assessment of yield related parameters in finger millet germplasm

Bhavna Sinha[1], Kishor Kumar[2] and Jateen Kumar[3]

P.G. Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
M.Sc. (Ag.) Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
P.G. Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)

Corresponding email: bhavnasinha642@gmail.com

Abstract

The experiment was carried out in finger millet (*Eleusine coracana* L.) was selected for the current study on yield assessment, was excecuted at the section of Genetics and Plant Breeding at S. G. College of Agriculture and Research Station, Jagdalpur, Baster, IGKV, Raipur (C.G.)., during *Kharif* 2023 with an augmented complete block design as experimental framework. The characterize and evaluate the variability, character association among 100 finger millet germplasm, observations were documented for 3 qualitative and 13 quantitative traits at different plant growth stages as per the guidelines for the test of conduct of DUS on finger millet by PPV and FRA. The highest GCV (21.82%) values were recorded for the trait grain yield and PCV (35.02%) values were recorded for the traits number of productive tillers per plant. whereas the lowest GCV (0.85%) and PCV (3.14%) values were recorded found for the trait test weight. The genetic parameters demonstrated moderate GCV coupled with moderate PCV for the characters, fodder yield (11.59 and 12.66), biological yield (13.40 and 14.22), finger length (14.95 and 17.00). High heritability in broad sense (>60%) was performed by days to 50% flowering (80.63%) followed by days to maturity (92.69%), fodder yield (83.87%), biological yield (88.83%), finger length (77.39%), harvest index (74.36%) and grain yield (73.48%). Moderate heritability (30-60%) was performed by the traits like number of finger (59.89%), flag leaf width (58.29%), plant height (56.60%), flag leaf length (49.03%) and low heritability (<30%) was shown by traits like number of productive tiller (4.05%) and test weight (7.37%). The highest estimates for genetic advance as a percentage of mean observed in grain yield (38.53%), number of finger (27.78%), finger length (27.10%), biological yield (26.02%)fodder yield (21.87%), harvest index (16.44%), flag leaf width (10.25%) were these genotypes estimated to be moderate and days to 50% flowering (8.56%), days to maturity (8.46%), plant height (5.85%), flag leaf length (7.81%), number of productive tiller (2.92%) and test weight (0.48%) were they genotype estimated to be low genetic advance.

Keywords: Finger millet, *Eleusine coracana,* GCV, PCV, Heritability, Genetic advanc.

IIZCAGV-26-T2-071

Strengthening Climate-Resilient Agriculture through Sustainable Value Chains and Economic Innovations

Shubham Kumar Thakur[1], Sujit[1], Aditya Gaurha[1], Richa Dubey[1] and Neha Suryavanshi[1]

[1]College of Horticulture and Research Station, Chirmiri, M.C.B, 497442 Chhattisgarh, India

Corresponding Email: shubhamcks@gmail.com

Abstract

India's agriculture sector contributes nearly 16% to GDP while supporting about 45% of the population, underscoring its central role in livelihoods and economic stability (*Ministry of Agriculture & Farmers Welfare, 2025*). Despite achieving record food grain production of 357.73 million tonnes and agricultural exports exceeding USD 51 billion in 2024–25 (*Press Information Bureau, 2025*), farm income growth remains uneven, particularly among small and marginal farmers. This study examines the role of sustainable value chains and economic innovations in enhancing climate-resilient agriculture. Using secondary data and field-level insights, it evaluates diversification, value addition, and institutional mechanisms such as Farmer Producer Organizations (FPOs). The findings indicate that integration of high-value horticulture, digital marketing platforms, and improved market access significantly enhances income and reduces climate vulnerability. Additionally, climate-smart interventions can increase adaptive capacity and reduce production risks (*Organization for Economic Co-operation and Development, 2025*). The study concludes that strengthening agri-value chains through policy support and innovation is essential for achieving sustainable and inclusive agricultural growth under climate variability.

Keywords: Climate resilience, Value chains, Agricultural economics, Farmer income, Sustainable agriculture, FPOs

IIZCAGV-26-T2-072

Biopesticides as Sustainable Alternatives to Synthetic Pesticides: Current Status and Future Prospects

Bazar Thimmappa Charan Kumar[1], S.P.S. Tomar[2], Buduri Lakshmi Mounika[3] and Shubham Singh[4]

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[2]Senior scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[3]M.Sc. scholar, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Jammu & Kashmir, 190025, India

[4]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: charankumarbt@gmail.com

Abstract

The extensive use of synthetic pesticides has contributed significantly to agricultural productivity; however, their indiscriminate application has led to serious environmental, ecological, and human health concerns, including pesticide resistance, residue accumulation, non-target toxicity, and biodiversity loss. These challenges have accelerated the search for safer and more sustainable pest management alternatives. Biopesticides, derived from natural sources such as microorganisms, plants, animals, and minerals, have emerged as promising eco-friendly substitutes due to their target specificity, biodegradability, and compatibility with integrated pest management (IPM) and organic farming systems. This review presents a comprehensive overview of biopesticides, including their definition, historical development, classification, modes of action, and role in sustainable agriculture. Major categories such as microbial, botanical, biochemical, plant-incorporated protectants are discussed with emphasis on their mechanisms of pest suppression and practical applications. The advantages of biopesticides, including reduced environmental persistence, lower risk to non-target organisms, and minimized resistance development, are critically evaluated alongside existing limitations such as inconsistent field performance, slower pest suppression, limited shelf life, and adoption constraints. The review also outlines future research priorities and policy interventions required to promote the large-scale adoption of biopesticides for sustainable and climate-resilient agricultural systems.

Keywords: Biopesticides, Sustainable agriculture, Integrated Pest Management (IPM), Microbial pesticides, Botanical pesticides

IIZCAGV-26-T2-073

Study and analysis of variation arise in M_3 generation

Kishor Kumar[1], Bhavna Sinha[2] and Jateen Kumar[3]

P.G. Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
M.Sc. (Ag.) Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
P.G. Student, Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)

Corresponding email: kishorkurre0425@gmail.com

Abstract

Kodomillet (*Paspalum scrobiculatum* L.) was selected for the present study on induced mutation, which was counducted at the Research cum Instructional Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.). 500 advanced generation in kodo millet in Augmented Randomized Block design (ARBD) with 10 blocks and three checks. Study and analysis of variation arise in M_3 generation of kodomillet compared with check varieties indira kodo-1. It was found that the phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for every trait. The highest PCV and GCV was recorded for number of grains per panicle i.e. (494.44% and 258.67%) values respectively, followed by number of productive tillers (94.00 % and 31.02%). The moderate PCV and GCV was recorded for grain weight per panicle (17.26% and 11.73 %) respectively and low PCV and GCV was recorded for test weight (13.95 % and 3.67 %) respectively, followed by plant height (6.57 % and 3.37 %) respectively, length of raceme (4.15 % and 1.15 %) and flag leaf length (3.13 % and 1.34 %) respectively. The least value of PCV (0.65) and GCV (0.30) were recorded for flag leaf width out the trait classified based on PCV and GCV respectively. Only one trait grain weight per panicle (46.20%), was recorded for moderate heritability in narrow sense (30- 60%). Number of grain per panicle (27.76%), plant height (26.23%), flag leaf width (21.37%), productive tillers (10.89%), length of raceme (7.68%) and test weight (6.92%) respectively, was recorded for lowest heritability (30-60%). The current study's mean genetic advance value for various traits is shown in only one trait the number of grain per panicle (278.77%) for high genetic advance (>20%). Productive tillers (21.08 %), grain weight per panicle (16.43 %) plant height (3.55%), test weight (1.99 %), flag leaf length (1.19 %), length of raceme (0.66 %) and flag leaf width (0.28%).

Keywords: kodomillet, *Paspalum scrobiculatum,* GCV, PCV, Heritability, Genetic advance.

IIZCAGV-26-T2-074

Climate Resilient Crop Production and Stress Biology

Preeti Singh

UG Student, JNKVV College of Agriculture, Rewa, 486001, Madhya Pradesh, India.

Corresponding author: preetisingh6679@gmail.com

Abstract

As climate change intensifies the frequency of vulnerability of environment is increasing that threats our global food security. While modern chemicals are common but there is an urgent need for the Adoption Of sustainable practises of farming Such as Climate resilient crop production and stress biology. In this year the focus has shifted It play significant role because of it ensures the low cost sustainability, climate resilience towards the Climate resilient crop production that helps in building a resilient farming system with key strategies and techniques of genetic and varietal intervention (Drought -Flood tolerant varieties), Water management Climate(smart irrigation ,Rain water harvesting), Agronomic practises(no till ,INM), Resources conservation technologies (Direct seeded rice, precision farming) , And structural & ecological strategies (agroforestry ,protected cultivation). Stress biology provides the tools to mitigate the impact of changing climate for ensuring food security. The

objective is to move beyond simple survival of extreme weather toward an adaptive agricultural system that remains productive and economically viable despite increasing climatic shocks.

Keywords: Precision farming, food security, economic viability, INM, sustainable practices.

IIZCAGV-26-T2-075

Effect of Drip Irrigation Regimes and Mulching on Growth, Yield and Quality of Late Cauliflower (*Brassica oleracea* L. var. botrytis)

Simran Choudhary, S.S. Kushwah, R.K. Sharma, O.P. Singh and G.P.S. Rathore

College of Horticulture, Mandsaur-458002, RVSKVV, Gwalior

Corresponding author Email ID: kushwahhort@gmail.com

Abstract

A field experiment was conducted at research farm, College of Horticulture, Mandsaur during rabi season 2020-21. Sixteen treatment combinations comprising of four irrigation levels (I_1- IW/CPE = 0.6, I_2- IW/CPE = 0.8, I_3- IW/CPE = 1.0 and I_4 IW/CPE =1.2) and four mulches (M_1 = no mulch, M_2 = neem leaves, M_3 = transparent polyethylene, M_4 = black polyethylene) were laid out in split plot design with three replications. The findings obtained from the study revealed that among the irrigation levels highest growth and yield attributes, yield and quality parameters were recorded with I_4 (1.2 IW/CPE) which was at par to I_3. Amongst mulching, application of M_4 was superior but at par to M_3. Interactive effect of irrigation regimes and mulching registered highest growth and yield with I_4M_4 which was at par to I_3M_4. Thus, it could be concluded that under lesser water availability application of I_3M_4 may be advocated for late cauliflower cultivation.

Keywords: Drip Irrigation Regimes, Mulching, Late Cauliflower

IIZCAGV-26-T2-076

Role of microorganisms in food spoilage

Animesh Tiwari

Undergraduate Student, B. Tech (Food Technology) Department Of Food Technology, Raipur Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

Corresponding Author – animeshtiwari7569@gmail.com

Abstract

Food spoilage is a common problem that reduces the quality, safety and shelf life of food. It mainly happens due to the growth of microorganisms like bacteria, yeast and moulds, which cause changes in taste, smell, texture and appearance of food. Factors such as temperature, moisture, pH and storage conditions affect how fast food gets spoiled. Microorganisms like Aspergillus and Pseudomonas are commonly involved in this process. The main objective of this study is to understand how microorganisms cause food spoilage and how different storage conditions influence their growth. In this study, perishable food samples like bread

were observed under different conditions such as room temperature and refrigeration for a few days. Changes in colour, smell and visible microbial growth were noted daily to understand the spoilage pattern. The results showed that food kept at room temperature spoiled faster due to rapid microbial growth, while refrigeration slowed down the process. This indicates that controlling environmental conditions is an effective way to reduce spoilage. Compared to chemical preservatives, methods like refrigeration are safer, cheaper and do not affect food quality.

Keywords: Food spoilage, Microorganisms, Yeast, Shelf life, Food safety, Perishable food

IIZCAGV-26-T2-077

Genetic variability in yellow-seeded linseed (*Linum usitatissimum* L.)

Mahe Nigar Hussain

Ph.D. Scholar Department of Genetics and Plant Breeding College of Agriculture, IGKV, Raipur, C.G.

Author Gmail: mahenigar099@gmail.com

Abstracts

The experiment entitled “Genetic variability in yellow seeded linseed (Linum usitatissimum L.) ” was undertaken during rabi 2022-23 at the Research cum Instructional farm, Department of Genetics and Plant Breeding, College of Agriculture, IGKV, Raipur, C.G. Materials used in the experiment consisted of thirty yellow seeded genotype including three check (RLC-133, RLC-148 and SURBHI) released from AICRP on linseed IGKV, Raipur C.G. Observation on qualitative & quantitative traits had been noted on five plant which were chosen randomly from each genotype per replications. The observations were recorded for characters viz., days to 50% flowering, days to maturity, plant height (cm), leaf length (cm), plant height(cm), stem thickness(mm), number of primary branches/plant, number of secondary branches/plant, number of capsules/plant, capsule width(cm), capsule length (cm), number of seeds/capsule, 1000 seed weight(g) and seed yield / plant(g). Analysis of variance disclosed that significant differences exist for all the traits taken under study from yellow seeded linseed genotypes. It indicates that there is presence of sufficient amount of variation among the yellow seeded linseed genotype for seed yield and its contributing traits. The highest seed yield per plant(g) was found in YLS-20(11%). The highest genotypic coefficient of variation observed was recorded in number of secondary branches / plant (21.8%) and seed yield /plant (20.77%), number of primary branches/plants (18.8%). However, highest value phenotypic coefficient of variation observed for number of secondary branches per plant (23.48%) and seed yield \plant (22.27), number of primary branches\plant (20.86). The magnitude of PCV was higher than GCV indicated the impact of environment on genotype. The highest heritability was observed for the trait seed yield/plant(87.02), number of secondary branches/plant(85.97), number of primary branches\plant(80.97) whereas, The genetic advance as percent of mean was found to be highest number of secondary branches per plant (41.58%), seed yield \plant(39.92),number of primary branches\plant(34.80) This shows that certain traits are influenced by additive gene action and selection will be rewarded for the improving such traits. Highest positive and significant correlation was seen for plant

height and negative and significant correlation was seen in days to 50% flowering at both genotypic and phenotypic level with seed yield /plant. In path coefficient analysis using yield as dependent character revealed that number of secondary branches per plant showed the highest positive direct effect followed by days to 50% flowering, 1000 seed weight (g), plant height (cm), number of seeds per capsule and capsule length (cm). Keywords:Heritability,Genetic advance, GCV, PCV.

IIZCAGV-26-T2-078

Climate Smart Agronomic Practices for Sustainable Crop Production

Shailesh [1*], Kuldeep [2]

[1]M.Sc. (Ag.) Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India

[2]M.Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

*Corresponding Author Email: janghelshailesh1999@gmail.com

Abstract

The phenomenon of climate change is posing considerable risk for the entire globe in terms of agricultural activities since there is an increase in drought, heat stresses, and erratic precipitation, which impacts negatively the yield of crops. The practice of climate smart agronomy is a sustainable strategy for addressing the issue in question while improving crop productivity. This article critically examines the major climate-smart agronomic strategies including conservation tillage, integrated nutrient management, adoption of drought-resistant varieties, efficient water management using drip irrigation and mulching, and precision agriculture practices. Such measures allow for more efficient use of resources, maintenance of soil health, and minimization of carbon emissions. There is evidence showing that a combination of organic and inorganic nutrient sources increases soil fertility levels and promotes microbial activities. In addition, the adoption of water-saving practices allows for efficient water usage under drought conditions. Finally, precision agriculture practices ensure that decisions are based on timely information, promoting more efficient use of inputs. Overall, climate smart agronomic strategies offer an all-round strategy for implementing sustainable crop production practices in the modern era.

Keywords: Climate smart agriculture, Sustainable farming, Resource use efficiency, Soil health, Precision agriculture, Water management

IIZCAGV-26-T2-079

Genetic Divergence and Trait-Based Classification of Soybean (Glycine max L.) Genotypes using Mahalanobis D² and Principal Component Analysis

Devendra Kumar Payasi[1], Saurav Raj[2]

[1]Senior Scientist & Incharge, ICAR-AICRP on Soybean, Department of Genetics and Plant Breeding, R.A.K. College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, sehore – 466001, Madhya Pradesh, India
[2]Department of Genetics and Plant Breeding, R.A.K. College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Sehore – 466001, Madhya Pradesh, India

Corresponding Email: dpayasi@gmail.com

Abstract

The present investigation was conducted to assess genetic divergence and trait-based classification among 61 soybean genotypes excluding 4 checks evaluated during Kharif 2025 under a Randomized Complete Block Design (RCBD). Observations on seventeen quantitative traits were analyzed using Mahalanobis D^2 statistics and principal component analysis (PCA). The D^2 analysis grouped the genotypes into six distinct clusters, indicating the presence of considerable genetic diversity. Cluster IV exhibited the highest mean seed yield and showed maximum divergence from other clusters, suggesting its potential use in hybridization programmes. Inter-cluster distances were higher than intra-cluster distances, confirming the genetic distinctness among clusters. Among the traits, pod length, days to maturity, chlorophyll content at 75 DAS, and flowering traits contributed most to total genetic divergence. Principal component analysis revealed that the first five components explained 73.98% of the total variation. The first principal component was mainly associated with yield and its component traits, while subsequent components represented maturity and plant architecture traits. The clustering pattern was consistent with PCA grouping, indicating reliability of the diversity analysis. The study highlights that selection of genetically diverse and high-performing genotypes can be effectively utilized for developing superior soybean varieties.

Keywords: Soybean, Genetic divergence, D^2 statistics, PCA, Cluster analysis, Breeding

IIZCAGV-26-T2-080

Climate-Smart Integrated Nutrient Management Using Micronutrients and Microbial Consortia for Enhancing Soybean Productivity and Sustainability under Changing Climate

Ankita Ray Saral*[1], G. S. Gathiye[1], S.C. Gupta[2] and R.S. Dangi[1]

1Department of Agronomy, R. A. K. College of Agriculture Sehore-4666001(M. P.), India
2Department of Soil Science R. A. K. College of Agriculture Sehore-4666001(M. P.), India

Corresponding Email: raiankitasaral@gmail.com

Abstract

A field experiment was conducted during the Kharif season using a RBD with multiple nutrient treatments to evaluate INM with nutrient fortification and microbial management strategies for improving soybean, productivity, and resilience under changing climatic conditions. Comprising varying RDF levels of NPKS along with micronutrients interventions (Mo, Zn, Fe, and B), seed treatment, microbial consortia consisting of Rhizobium and high phosphorus-solubilizing beneficial strains. Results indicated that precision nutrient combined Along with 100% RDF and Mo seed treatment (3 g kg^{-1} seed) Soil application on T5 +Zn (25

kg ha^{-1}) and Fe (50 kg ha^{-1}) at 45 DAS, and Foliar application on T6 Zn(0.5%) +Fe (1%) at 45 DAS were found particularly promising in improving productivity, reducing nutrient losses, and sustaining soil microbial activity under changing climatic conditions. Application micronutrient at critical crop stages further supported reproductive growth significantly improved plant height (49.5/48.73), nodulation (77/75.9), nitrogen uptake (8.5/8.4 kg/ha), seed yield (1392/1356 kg ha-1), and soil biological health over sole RDF application. Follow Integrating T9 100% RDF + treated microbial consortia showed superior performance due to enhanced available nitrogen (210.85 kg ha-1), nodulation (72.56), production is significantly high (1226.6 kg ha-1) then control, nutrient mobilization, and stress tolerance. Correlation analysis revealed strong positive relationships between nodulation, nutrient uptake, and final seed yield, highlighting the importance of integrated nutrient stewardship. Keyword: Smart precision, Correlation analysis, Nutrient fortification, Micronutrients interventions

IIZCAGV-26-T2-081

Real-Time Nitrogen Management in Precision Farming: Enhancing Crop Productivity and Resource Efficiency through SPAD and LCC

Riya Upadhayay[1], Dr. Vinay Bachkaiya[1]

[1]Department of Soil Science, Indira Gandhi Krishi Vishwavidhalaya, Raipur 492012, Chhattisgarh, India

*Corresponding author Email: riyaupadhyay01@gmail.com, 7987147124

Abstract

Climate change and rising input costs demand climate-resilient and resource-efficient nutrient management strategies. Real-time nitrogen (N) management using portable diagnostic tools offers a promising precision-farming approach aligned with natural and climate-smart agriculture. The present study aimed to evaluate the effectiveness of SPAD (Soil Plant Analysis Development) meter and Leaf Colour Chart (LCC)-based N management in improving nitrogen use efficiency (NUE), crop productivity, and environmental sustainability in rice-based systems. Field experiments were conducted under varying nitrogen schedules, comparing fixed recommended doses with real-time need-based applications guided by SPAD and LCC thresholds. Results indicated that real-time N management significantly enhanced grain yield, agronomic efficiency, and partial factor productivity while reducing total N input without yield penalty. Improved synchronization between crop N demand and fertilizer application minimized losses and supported climate-resilient production. The study demonstrates that integrating simple sensor-based diagnostics into precision farming can strengthen sustainable intensification, reduce environmental footprints, and support next-generation climate-resilient agriculture.

Keywords: Precision farming, SPAD, Leaf Colour Chart, Nitrogen use efficiency, Climate-resilient agriculture

IIZCAGV-26-T2-082

An Innovative Idea of Vertical Farming in India

Kunika Khodiyar

B.Sc. (Ag.) student, College of Agriculture, Indira Gandhi Krishi Vishwavidhyalaya, Raipur (C.G.)

Abstract

Vertical farming is an innovative agricultural technique that involves growing crops in vertically stacked layers, often in controlled indoor environments. This practice allows for large- scale crop production within areas or location where traditional farming is limited due to space, climate or soil conditions. Vertical farming relies on various technologies and is of different types like Hydroponics, Aeroponics, Aquaponics and Soil based using soil in stacked containers. **Hydroponics**- In this method, plants grow without soil, using a nutrient-rich water solution that directly feeds their roots. This system often involves trays or tubes where water flows over or through the root. **Aeroponics**- Plants are grown with roots suspended in the air, misted with a nutrient solution. This allows more oxygen to reach the roots, which can speed growth. **Aquaponics**- A combination of hydroponics and aquaculture (raising fish), where nutrient- rich water from fish tanks is used to feed plants. In turn, plants filter the water, which is then recirculated back to the fish. **Soil-Based Vertical Farming** - Uses soil as the growing medium in stacked layers, often with lighting and irrigation. These systems aim to replicate natural growth in a controlled environment. **Hybrid Systems** - Combines elements of two or more systems (e.g., aquaponics and hydroponics) to take advantage of multiple benefits. Benefits of Vertical Farming is Space-efficient for urban area Uses 90% less water than traditional farming, Allows for year-round production, Cuts down on transport costs and emissions, Reduces or eliminates the use of pesticide, Yields higher, faster crop growth, Energy-efficient with advanced tech, Resilient to climate changes. It aims to address challenges faced by farmers in the region, such as land scarcity, traditional farming limitations, and environmental issues. By adopting vertical farming, it helps to improve crop yield, conserve water, and reduce dependency on large plots of land. They initiative is part of a broader movement to modernize agriculture in the region, making farming more sustainable and economically viable.

IIZCAGV-26-T2-083

Role of microorganisms in food spoilage

Animesh Tiwari

Undergraduate Student, Department of Food Technology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding author: animeshtiwari7569@gmail.com

Abstract

Food spoilage is a common problem that reduces the quality, safety and shelf life of food. It mainly happens due to the growth of microorganisms like bacteria, yeast and moulds, which cause changes in taste, smell, texture and appearance of food. Factors such as temperature, moisture, pH and storage conditions affect how fast food gets spoiled. Microorganisms like Aspergillus and Pseudomonas are commonly involved in this process. The main objective of this study is to understand how microorganisms cause food spoilage and how different storage conditions influence their growth. In this study, perishable food samples like bread were observed under different conditions such as room temperature and refrigeration for a few days. Changes in colour, smell and visible microbial growth were noted daily to understand the spoilage pattern. The results showed that food kept at room temperature

spoiled faster due to rapid microbial growth, while refrigeration slowed down the process. This indicates that controlling environmental conditions is an effective way to reduce spoilage. Compared to chemical preservatives, methods like refrigeration are safer, cheaper and do not affect food quality.

Keywords: Food spoilage, Microorganisms, Yeast, Shelf life, Food safety, Perishable food

IIZCAGV-26-T2-084

Advancing Food Safety Using Natural Preservatives in Food System

Adarsh Mishra

Undergraduate Student, Department Of Food Technology , Raipur Indira Gandhi Krishi Vishwavidyalaya , Raipur (C.G.)

Corresponding Author- mishradarsh910@gmail.com

Abstract

Food safety and shelf life are important issues due to increasing food spoilage and contamination. Chemical preservatives were commonly used earlier, but now people are more concerned about their health effects. Because of this, natural preservatives are becoming more popular as safer alternatives. This study focuses on understanding how natural preservatives help improve food safety and extend the shelf life of food (mainly Perishable and Non Perishable Food), along with their safe levels of use. This study is based on a review of different natural preservatives obtained from plants and microorganisms. Common examples include turmeric (curcumin), clove oil, vinegar (acetic acid) and salt. According to Food Safety and Standards Authority of India (FSSAI) natural preservatives like acetic acid and salt are permitted within safe limits depending on the food product. For example, vinegar is generally used around 0.5–1%, while salt is used at 2–5% in many preserved foods. Essential oils are used in very small quantities (less than 0.1%) due to their strong activity. These natural preservatives show antimicrobial and antioxidant properties, which help in controlling bacterial growth and delaying spoilage. Compared to chemical preservatives, they are safer, eco-friendly and more acceptable to consumers. They also help in improving food quality and reducing health risks. Natural preservatives can be a safe and effective method for improving food safety and shelf life. Their proper use, as per recommended limits, can reduce dependence on chemical preservatives and support a healthier and sustainable food system.

Keywords: Natural preservatives, Shelf life, Antimicrobial activity, FSSAI, Sustainable food systems.

IIZCAGV-26-T2-085

Nano-Encapsulated Fortified Snack for Enhanced Iron and Vitamin D Delivery to Combat Hidden Hunger

Kavya Pandwar

Undergraduate Student, Department Of Food Technology, Raipur Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

Corresponding Author - kavyapandwar@gmail.com

Abstract

Nanotechnology represents a revolutionary path for technological development that concerns the management of material at the nanometer scale (one billion times smaller than a meter). Nanotechnology factually means any technology on the nanoscale that has numerous applications in the real world. Micronutrient deficiencies of iron and copper are global challenges that significantly undermine public health, particularly among vulnerable populations. Recent advancements in nanotechnology have paved the way for nano micronutrient formulations that offer improved nutrient delivery over conventional supplements. This study proposes an innovative fortified snack solution aimed at addressing widespread iron and vitamin D deficiencies. Using nano-encapsulation technology, we enhance the bioavailability of these critical nutrients in a delicious, allergen-free snack bar. The product targets individuals with dietary restrictions, plant-based eaters and populations at risk for micronutrient gaps. Through precise nutrient delivery and scalable production, this approach offers a safe, effective and sustainable solution to support everyday nutrition and improve long term health outcomes. This study underscores the importance of combining nutritional science with technological innovation to address hidden hunger and promote sustainable health outcomes.

Keywords: Nanotechnology, Micronutrient deficiencies; Nano-encapsulation; Bioavailability, Fortified snack; Sustainable nutrition.

IIZCAGV-26-T2-086

Evaluation of Wood Vinegar as a Sustainable Bio-based Alternative to Synthetic Agrochemicals

K. Uday Shree

Department of Food Technology Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh

Corresponding Author: udayshree.2711@gmail.com

Abstract

Wood vinegar (pyroligneous acid), a by-product of biomass pyrolysis, has emerged as a promising sustainable and bio-based alternative to conventional synthetic agrochemicals. This study evaluates its potential in enhancing crop productivity, controlling microbial growth, improving post-harvest shelf life, and promoting environmentally friendly waste utilization. Wood vinegar contains a diverse range of organic acids, phenolic compounds, and other bioactive constituents that contribute to its multifunctional properties. A comprehensive review of experimental findings indicates that, when applied at appropriate dilutions, wood vinegar can significantly enhance seed germination, stimulate plant growth, and improve overall crop yield. Its antimicrobial and antifungal activities effectively suppress pathogenic microorganisms, thereby reducing reliance on chemical pesticides. Furthermore, its application has shown potential in extending the shelf life of agricultural produce by inhibiting spoilage-causing microbes. In addition to its agricultural benefits, the use of wood vinegar supports sustainable waste management by converting biomass residues into value-added products. However, its effectiveness is influenced by factors such as concentration, application methods, and crop type, and excessive use may result in phytotoxic effects due to

its acidic nature. Overall, wood vinegar demonstrates considerable potential as an eco-friendly agrochemical alternative, although further standardization and large-scale field validation are necessary for widespread adoption.

Keywords: Wood vinegar; Pyroligneous acid; Sustainable agriculture; Bio-based agrochemicals; Crop productivity; Antimicrobial activity

IIZCAGV-26-T2-087

Enhancing Climate Resilience in Cereal Crops through CRISPR/Cas9-Mediated Genetic Engineering

Kumud Pawar

B.Sc. (Hons.) Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, 482001, Madhya Pradesh, India

Corresponding Email: kumudpawar958@gmail.com

Abstract

The increasing challenges caused by global climate change, particularly increasing abiotic stresses like drought and salinity, demands the development of high-yielding, climate-resilient crop varieties. This study aims to evaluate the efficacy of CRISPR/Cas9-mediated genome editing in enhancing the stress tolerance of major cereal crops. The methodology involved the identification of specific negative regulators of stress response genes and their subsequent targeted mutagenesis using CRISPR/Cas9 constructs. Protoplast assays and greenhouse trials were conducted to validate the phenotypic improvements. Key results demonstrated a 25% increase in water-use efficiency and improved biomass retention under induced drought conditions compared to wild-type controls. Furthermore, the edited lines maintained stable yields without significant trade-offs in nutritional quality. It is concluded that biotechnological innovations such as precision genome editing offer a robust and scalable framework for next-generation crop improvement. These findings underscore the potential of integrating biotechnology into smart farming systems to ensure global food security amidst a changing climate.

Keywords: Agri-Biotechnology, CRISPR/Cas9, Climate-Resilient Agriculture, Crop Improvement, Abiotic Stress, Genome Editing

IIZCAGV-26-T2-088

Precision and Climate-Resilient Agriculture for Reducing Environmental Footprint in India

Vaibhav Laxmi Tiwari[1]

[1]ICAR-National Institute of Biotic Stress Management, Raipur, 493225 Chhattisgarh, India

Corresponding Email: vibhatiwari131998@gmail.com

Abstract

Indian agriculture exerts significant pressure on natural resources, with overuse of water, fertilizers, and energy contributing to environmental degradation. More than 50% of cultivated land is rained**,** making it highly vulnerable to climate variability. This study assesses the environmental benefits of climate-resilient and precision agriculture technologies in improving resource-use efficiency. Technologies such as micro-irrigation, remote sensing and precision nutrient management significantly reduce water wastage and fertilizer overuse, thereby lowering greenhouse gas emissions and soil contamination. Government initiatives like Pradhan Mantri Krishi Sinchai Yojana promote efficient water management and conservation. Evidence suggests that unsustainable agricultural expansion has increased ecological pressure, with a 1% rise in agricultural output linked to a 1.2% increase in ecological footprint. Precision agriculture can reverse this trend by optimizing inputs and minimizing environmental damage. Policy support through green subsidies, digital tools, and capacity building is essential for large-scale adoption and sustainable intensification of agriculture in India.

Keywords: Precision agriculture, climate resilience, ecological footprint, water efficiency, sustainability

IIZCAGV-26-T2-089

Development of Genic-SSR Markers linked to Abiotic Stresses of potato (*Solanum tuberosum* L.)

Deepali Singh, Sushma Tiwari* Avi Raizada, Kriti Tiwari, Yash Tale and Rahul Prajapati

Department of Molecular Biology and Biotechnology, RVSKVV, Gwalior

*Corresponding Author mail ID: sushma2540@gmail.com

Abstract

Potato is ranked as the 4th most important food crop across the globe (FAOSTAT). It is known for its nutrient-rich tubers, high productivity, and adaptability to diverse climatic conditions. However, abiotic stresses such as drought, heat, cold, and salinity pose a major threat to potato production, significantly reducing yield and quality. Development of tolerant genotypes through the use of targeted genic-molecular markers for breeding purposes will accelerate the same with accuracy. Simple Sequence Repeat (SSR) markers, being highly polymorphic, co-dominant, and reproducible, represent one of the most effective tools for molecular breeding. In the present study, cellular-molecular factors (such as transcription factors, receptors etc) reported to be associated with several abiotic stresses were selected from published studies in potato. The gene sequences of 30 factors were retrieved from the National Center for Biotechnology Information (NCBI) database. All sequences were scanned for underlying microsatellites using WebSat online tool. Out of 30 gene sequences, SSR were identified in 10 sequences followed by primer designing with the same tool. The screening of these 10 primer-pairs were done in 19 different potato genotypes that differed in tolerance to abiotic stresses. The studied 19 different potato genotypes are Kufri Surya, Kufri Chipsona-1, Kufri Himalini, Lady Rosetta, Kufri Chipsona-3, Kufri Bahar, Kufri Uday, Kufri Jyoti, Kufri Thar 2, Kufri Neelkanth, KFS, Kufri Frysona, FC-11, Kufri Fryom, Kufri Khyati, Kufri Thar 1, FLP, Kufri Pukhraj, and Kufri Mohan. This study demonstrates an efficient and

systematic in silico approach for the development of novel genic-SSR markers targeting abiotic stress genes in potato, which can further be utilized in molecular breeding programs aimed at improving stress tolerance in this important crop.

Keywords: SSR Markers, Abiotic Stress, Potato, NCBI, WebSat, Molecular Breeding, Transcription Factors.

IIZCAGV-26-T2-090

Comparative assessment for Morpho-physiological traits of *In vitro* potato plants grown under Aeroponics and Net house and their genetic fidelity testing using ISSR markers

Yash Tale[1], Sushma Tiwari[1,2], Avi Raizada[2], Madhurjit Singh Rathore[2], Deepali Singh[1] and Krati Tiwari[2]

[1]Department of Molecular Biology and Biotechnology, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior

[2]Biotechnology Centre, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior

Abstract

Potato (*Solanum tuberosum* L.) is a tetraploid (2n = 4x = 48) tuber-bearing crop belonging to the family Solanaceae and is one of the most important food crops worldwide. Seed production in potato is constrained by a low multiplication rate, disease incidence, and variability in tuber quality under conventional systems. Plant tissue culture serves as an important biotechnological tool for in vitro micropropagation and the production of virus-free, true-to-type planting material, thereby ensuring improved productivity. In the present study, eight cultivars (K. Uday, K. Bahar, K. Neelkanth, K. Pukhraj, K. Chipsona-1, K. Frysona, K. Thar-2, and K. Surya) were raised through in vitro techniques and assessed for genetic fidelity using Inter Simple Sequence Repeat (ISSR) markers to detect somaclonal variation. The analysis revealed monomorphic banding patterns with no detectable polymorphism, confirming a high level of genetic uniformity among the regenerated plants and their true-to-type nature. These genetically stable plants were subsequently used for minituber production under aeroponic and net house systems at similar plant densities, and a comparative assessment was carried out based on morphophysiological traits. The results demonstrated that plants grown under the aeroponic system produced a significantly higher number of minitubers per plant (20–30 tubers per plant) compared to the net house system (5–8 tubers per plant). However, the average tuber weight was lower in aeroponics (3–5 g per tuber), whereas tubers produced in the net house were comparatively larger (20–30 g per tuber). Thus, the net house system produced fewer minitubers but a higher proportion of medium to large-sized tubers suitable for seed purposes. Aeroponics produced a higher number of uniform, smaller minitubers with better plant growth and higher multiplication rates, primarily due to improved root aeration and controlled environmental conditions. In contrast, net house cultivation yielded fewer but larger tubers and is more economical and easier to manage, although plants are more exposed to pests and diseases. Overall, aeroponics

proved more efficient for rapid and healthy seed production, while net house remains a practical low-cost alternative.

Keywords: Aeroponics, Potato, Plant tissue culture, Genetic fidelity, Inter-simple sequence repeat

IIZCAGV-26-T2-091

Development of Genic-SSR Markers linked to Abiotic Stresses of potato (*Solanum tuberosum* L.)

Deepali Singh, Sushma Tiwari* Avi Raizada, Kriti Tiwari, Yash Tale and Rahul Prajapati

Department of Molecular Biology and Biotechnology, RVSKVV, Gwalior

*Corresponding Author mail ID: sushma2540@gmail.com

Abstract

Potato is ranked as the 4th most important food crop across the globe (FAOSTAT). It is known for its nutrient-rich tubers, high productivity, and adaptability to diverse climatic conditions. However, abiotic stresses such as drought, heat, cold, and salinity pose a major threat to potato production, significantly reducing yield and quality. Development of tolerant genotypes through the use of targeted genic-molecular markers for breeding purposes will accelerate the same with accuracy. Simple Sequence Repeat (SSR) markers, being highly polymorphic, co-dominant, and reproducible, represent one of the most effective tools for molecular breeding. In the present study, cellular-molecular factors (such as transcription factors, receptors etc) reported to be associated with several abiotic stresses were selected from published studies in potato. The gene sequences of 30 factors were retrieved from the National Center for Biotechnology Information (NCBI) database. All sequences were scanned for underlying microsatellites using WebSat online tool. Out of 30 gene sequences, SSR were identified in 10 sequences followed by primer designing with the same tool. The screening of these 10 primer-pairs were done in 19 different potato genotypes that differed in tolerance to abiotic stresses. The studied 19 different potato genotypes are Kufri Surya, Kufri Chipsona-1, Kufri Himalini, Lady Rosetta, Kufri Chipsona-3, Kufri Bahar, Kufri Uday, Kufri Jyoti, Kufri Thar 2, Kufri Neelkanth, KFS, Kufri Frysona, FC-11, Kufri Fryom, Kufri Khyati, Kufri Thar 1, FLP, Kufri Pukhraj, and Kufri Mohan. This study demonstrates an efficient and systematic in silico approach for the development of novel genic-SSR markers targeting abiotic stress genes in potato, which can further be utilized in molecular breeding programs aimed at improving stress tolerance in this important crop.

Keywords: SSR Markers, Abiotic Stress, Potato, NCBI, WebSat, Molecular Breeding, Transcription Factors.

IIZCAGV-26-T2-092

Assessment of Genetic Diversity and Character Association in Advanced Breeding Lines of Soybean (Glycine max [L.] Merrill)

Pooja Verma, D.K. Payasi, M. Yasin, and Lekharam

Department of Genetics and Plant Breeding, R.A.K. College of Agriculture, Sehore. 466114. Madhya Pradesh, India.

Corresponding Email: pooja.verma01042002@gmail.com

Abstract

The present investigation was conducted to assess genetic diversity and character association in 45 advanced soybean breeding lines obtained from AICRP on Soybean at R.A.K. College of Agriculture, Sehore (M.P.), during Kharif season under a Randomized Block Design with three replications. Analysis of variance revealed significant differences among genotypes for all traits, indicating substantial genetic variability. High heritability coupled with high genetic advance as percentage of mean was observed for clusters per plant (GCV: 33.68%, h^2: 90.74%, GA%: 66.09%) and pods per plant, suggesting predominance of additive gene action and effectiveness of selection. Correlation analysis revealed that seed yield per plant exhibited strong positive association with harvest index (0.9071**), seeds per plant (0.8112**), and pods per plant (0.7428**). Path coefficient analysis further indicated that harvest index (0.8519) and seeds per plant (0.7029) had high direct effects on seed yield. Mahalanobis D^2 analysis grouped the genotypes into eight distinct clusters, indicating considerable genetic divergence. The maximum inter-cluster distance was observed between clusters II and IV (D^2 = 21.52), suggesting their suitability for hybridization. Chlorophyll content at 45 DAS and days to maturity contributed most to total genetic divergence. Genotypes G4, G10, G3, G8, G19, G20, and G26 were identified as promising parents for future breeding programmes.

Keywords: Soybean, Genetic diversity, Character association, Path analysis, D^2 analysis, Heritability

IIZCAGV-26-T2-093

Sustainable Agricultural Products Production and Marketing

Shashank Sharma

KDC College of Agriculture & Research Station, Indira Gandhi Krishi Vishwavidyalaya, Saja (Bemetara) 491993 Chhattisgarh, India

Corresponding Email: shashanknsagri@gmail.com

Abstract

This study examines sustainable agricultural production and marketing with the objective of promoting environmental sustainability, improving farmer income and ensuring efficient market access. The research aims to analyze sustainable farming practices and evaluate marketing systems that enhance value realization. The methodology is based on secondary data analysis, including government reports, research articles and case studies related to organic farming, agroforestry and sustainable value chains. Comparative analysis is used to assess the effectiveness of different production and marketing approaches. Key results indicate that sustainable practices such as organic farming and integrated pest management improve soil health, reduce input costs and enhance long-term productivity. In marketing, certification, eco-labeling and direct selling channels significantly improve price realization and reduce intermediary exploitation. However, challenges like high certification costs, limited awareness and weak infrastructure persist. The study concludes that integrating sustainable production with efficient marketing systems, supported by strong policy frameworks and technological interventions, can ensure environmental conservation and economic viability for farmers.

Keywords: Sustainable agriculture, Organic farming, Agroforestry, Value chain, Eco-labeling, Market access, Farmer income and Food security

IIZCAGV-26-T2-094

Enhancing Agricultural Sustainability through Climate-Smart Water Management

Prem Kumar Sahu

Ph.D. Research Scholar, Department of Agriculture Meteorology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh- 492012

*Corresponding Author- premsahu8333@gmail.com

Abstract

Enhancing agricultural sustainability under changing climatic conditions requires efficient and adaptive water management strategies. Climate-smart water management focuses on optimizing water use, improving irrigation efficiency, and reducing vulnerability to climate variability. With increasing water scarcity, erratic rainfall, and rising temperatures, traditional irrigation practices are becoming less effective. Approaches such as rainwater harvesting, drip and sprinkler irrigation, conservation agriculture, and the use of drought-resistant crop varieties help in conserving water while maintaining crop productivity. The integration of advanced technologies, including soil moisture sensors, remote sensing, and weather-based advisory services, further improves water-use efficiency and decision-making. These practices not only support adaptation to climate change but also contribute to mitigation by reducing energy consumption and greenhouse gas emissions. Strengthening institutional frameworks, farmer capacity building, and supportive policies are essential for large-scale adoption. Overall, climate-smart water management plays a crucial role in ensuring sustainable agricultural production, enhancing resilience, and safeguarding water resources for future generations.

Keywords: Climate-smart agriculture, Water management, Irrigation efficiency, Sustainable agriculture, Water conservation, Climate resilience, Rainwater harvesting, Adaptation, Mitigation

IIZCAGV-26-T2-095

Studies of modern and advance techniques on quality fruit production

Jitendra Chandravanshi, Jeet Kumar Kurre, Sevan Das Khunte and Hemant Kumar

Department of Fruit Science, College of Horticulture & Research Station, Sakra-Patan, Durg (C.G.) 491001, India

Abstract

In current time India has second rank in overall world in fruit production, data are 117.65 million Tonnes (2024-25). In present time many advance techniques are adopted and innovate in the field of quality fruit production like soilless culture (Hydroponics), mechanization and

artificial intelligence, micro propagation, meadow orcharding, nano technology, Fertigation, transgenic varieties modern training pruning. Soilless culture is possible with hydroponics; this technique reduces labour for production of fruit like strawberry and raspberry. Artificial intelligence is a miracle in quality fruit production this technique totally based on the concept that a technology which think and perform complicated work similar to the performance of human brain this provide accurate information before any event like attack of insect pest and weather forecast and many culture practices done with in less time with high efficiently. Meadow orcharding is old technique but major role in much and quality fruit production, in this technique accommodated a greater number of plants in per unit area compare to normal density, including better utilization of resources. Training and pruning are important culture practices in fruit production, proper air circulation and light penetration in all direction of fruit canopy is possible by this technique. Fertigation technique is applied for application of macro and micro-nutrient in actual amount at required time for quality fruit production. Micro in-vitro propagation technique is a modern technique for production of disease free and healthy sapling of fruit. Transgenic breeding is an advance approach of breeding for develop biotic and abiotic resistance/tolerant with highly keeping quality varieties of fruit. Modern techniques like use of drones, automatic robotic system information technology for carrying out different operations of fruit production technology could help the growers by reducing time and labour requirement and thus intended towards increasing yield by achieving the goals of sustainability.

Keywords: Artificial intelligence, fertigation, meadow orcharding, micropropagation, nano techniques, soilless culture, transgenic varieties and training, pruning.

IIZCAGV-26-T2-096

Bioassay of Botanical Formulations Against Anthracnose Disease of Chilli Caused by Colletotrichum capsica

Pratham kumar Singh*, Dr. Shyam Kishor Patel, Dr. Rajni Singh Sasode, Dr. Rajbabbar Jatav, Dr. Sucharita Mohapatra, Neelam Soni, Anita Kumari Pandey

SCHOOL OF AGRICULTURE, ITM UNIVERSITY GWALIOR, GWALIOR(M.P.)

Corresponding author: **prathamksingh.pk@gmail.com**

Abstract

Chilli (Capsicum annuum L. 2n=24) is one of the most important vegetable as well as spice and cash crop of India, and belongs to the family Solanaceae. In all chilli –growing regions around the world, anthracnose of chilli caused by Colletotrichum capsici is a significant economic disease. An in vitro study was conducted to evaluate the efficacy of eight botanicals against anthracnose of chilli caused by Colletotrichum capsici. The treatments included Neem, Garlic, Ginger, Turmeric, Tulsi, Mahogoni, Mehendi, and Onion at 10%, 15%, and 20% concentrations. Radial mycelial growth was recorded seven days after inoculation and compared with the untreated control. All botanicals significantly inhibited fungal growth compared to the control. At 10% concentration, Onion (49.00 mm) and Turmeric (52.66 mm) showed relatively lower mycelial growth, while Neem recorded comparatively higher growth (72.33 mm). Increasing concentration enhanced antifungal

efficacy across treatments. At 15%, Ginger (41.33 mm), Turmeric (43.67 mm), and Tulsi (43.67 mm) exhibited notable suppression. At 20%, Ginger demonstrated the highest inhibition with minimum radial growth (22.33 mm), followed by Turmeric (32.33 mm) and Mahogoni (36.67 mm). Percent inhibition increased proportionally with concentration. At 20%, maximum inhibition was observed in Ginger (75.19%), followed by Turmeric (64.08%), Mahogoni (59.26%), Onion (56.67%), and Mehendi (53.70%). Neem showed comparatively moderate inhibition (41.11%) at the highest concentration. Statistical analysis (CD at 5%) indicated significant differences among treatments. The results indicate that Ginger and Turmeric extracts were most effective in suppressing C. capsici under in vitro conditions, suggesting their potential as eco-friendly alternatives for managing chilli anthracnose.

Keywords: Anthracnose of chilli, Colletotrichum capsici, Botanicals, Plant extracts, In vitro evaluation

IIZCAGV-26-T2-097

Studies on Physical and Chemical Crop Regulation and Their Effects on the Physiology and Development of Fruit Crops

Jeet Kumar Kurre, Jitendra Chandravanshi and Hemant Kumar

Department of Fruit Science, College of Horticulture and Research Station, Sankara -Patan, Durg (C.G.) 491001 India

Abstract

Crop regulation the practice is to force the tree for rest and produce profuse blossoms and fruits throughout any one of the two or three flushes. Through the use of different treatments and techniques, such as withholding irrigation, root pruning, root exposure, shoot pruning, defoliation, flower thinning and chemical spraying like urea, 2.4 D, PBZ and KNO3, it is necessary to decrease fruit set during the rainy season And then increase it during the winter season. This regulation methods physical and chemical highly suitable for depends on climatic factors, cropping pattern, extend of the damage by the disease and pests, market, industrial demand and cultivars etc. Crop regulation is planning method to obtain good quality fruit and yield with good income generation to regulate the crop for their suitable bending time for improving flowering, yield and quality of guava. Bending in the month of October resulted in maximum C: N ratio of leaf with maximum flowering shoot lets in a branch and yield. So, time of bending may be standardized in the month of October or June for higher profit.

Keywords: Bending, Crop regulation, Nutrient, PGRs, Fruit Quality and Yield

IIZCAGV-26-T2-098

Integrated Nutrient Management Strategies for Enhancing Soil Fertility and Sustainable Crop Productivity

Divya Sahu

Ph.D. Scholar, Department of Soil Science, Indira Gandhi Krishi Vishwavidyalaya, College of Agriculture, Raipur (CG)- 492012

Email id: divyasahu1713@gmail.com

Abstract

The Soil fertility decline due to intensive agriculture, imbalanced fertilizer use, and climate variability poses a major threat to global food security. Effective nutrient management is essential for maintaining soil health, optimizing crop yields, and minimizing environmental impacts such as nutrient leaching and greenhouse gas emissions. The main objective of this title to importance and effectiveness of Integrated Nutrient Management (INM) strategies in enhancing soil fertility, improving nutrient use efficiency, and achieving sustainable crop productivity while minimizing environmental impacts. Soil fertility and nutrient management are essential for sustaining crop productivity and ensuring long-term agricultural sustainability. Soil fertility refers to the capacity of soil to supply essential nutrients in adequate amounts
and balanced proportions, while nutrient management involves the efficient use of organic and inorganic inputs to optimize plant growth and minimize environmental impacts. The excessive and imbalanced use of chemical fertilizers has improved crop yields but has also led to soil degradation, nutrient imbalances, and reduced biological activity. Integrated Nutrient Management (INM) has emerged as a sustainable approach that combines chemical fertilizers with organic amendments and biofertilizers to enhance soil health and nutrient use efficiency. Organic inputs improve soil structure, water-holding capacity, and microbial activity, while inorganic fertilizers provide readily available nutrients. Soil enzymes such as urease and phosphatase play a key role in nutrient cycling and are sensitive indicators of soil fertility. Their activity is significantly influenced by nutrient management practices. Efficient nutrient management also depends on factors such as soil type, climate, and crop management practices, including seed rate and plant density. In soils like Vertisols, balanced fertilization is critical due to specific nutrient limitations. Moreover, improper nutrient use can result in environmental issues such as nutrient leaching and greenhouse gas emissions. Therefore, adopting integrated and site-specific nutrient management strategies, along with conservation practices, is essential for improving soil health, enhancing crop productivity, and ensuring sustainable agricultural systems.

IIZCAGV-26-T2-099

Impact of Different Crop Establishment Techniques on Rice Productivity and Resource Use Efficiency

Ramnivas Patidar, Sachin Anchal and Lavesh Malviya

College of Agriculture Rewa, (M.P) 486001

Email - rampatel74770@gmail.com

Abstract

Rice in India is predominantly cultivated through the transplanting method, despite it being laborintensive and cumbersome. Increasing scarcity of irrigation water and rising labour costs during peak agricultural operations often cause delays in transplanting. To address these challenges, farmers are gradually shifting toward direct seeding methods under puddled conditions. Wet seeding, which involves sowing pre germinated seeds in puddled soil, significantly reduces labour requirements and allows the crop to mature 810 days earlier compared to transplanting. This method eliminates the need for nursery preparation, seedling care, uprooting, bundling, transportation, and transplanting operations. However, both

transplanting and direct seeding methods demand higher irrigation water and seed rates, highlighting the need for alternative crop establishment techniques such as the System of Rice Intensification (SRI), which aims to conserve water. With efficient water and weed management, SRI and wet seeding methods can produce yields comparable to transplanted rice. This paper attempts to review the impact of different crop establishment methods on rice yield.

Keywords: Rice, Direct Seeding, Transplanting, SRI, Water Use Efficiency, Yield.

IIZCAGV-26-T2-100

Effect of pre- harvest spray of plant growth regulators and mineral nutrients on post- harvest behavior of Nagpur mandarin (*Citrus reticulata* Blanco)

Subham Gupta[1], R.N. Kanpure[2], S.K. Dwivedi[3], Priyamvada Sonkar[4], P.K.S. Gurjar[5] and B.K. Kachouli[6]

[1, 2, 4&5] Department of Fruit Science, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Horticulture Mandsaur-458001 (M.P), India

[3]Department of Post Harvest Management, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Horticulture Mandsaur-458001 (M.P), India

[6]Department of Plant Breeding and Genetics, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Horticulture Mandsaur-458001 (M.P), India

Corresponding Email: dr.rnkanpure@gmail.com

Abstract

An experiment was carried out at Department of Fruit Science College of Horticulture Mandsaur (M.P.) during 2020-21. The experiment was laid out in randomized block design (RBD) with three replications. The treatments were imposed on Nagpur mandarin by pre-harvest spray of growth regulators i.e., GA_3 @ 10, 15 & 20ppm and NAA @ 15, 20 & 25 ppm and mineral nutrients i.e., calcium nitrate @ 1.0, 1.5 & 2% and zinc sulphate @ 0.2, 0.4 & 0.6%. Spray was done before harvesting. The fifteen fresh, good looking, fully mature and uniform fruits of Nagpur mandarin were taken for each treatment in each replication. Result revealed that the minimum physiological loss in weight (0.00, 0.00, 9.55 and 22.73) acidity (0.00, 0.00, 9.55 and 22.73) and maximum marketable fruit (100, 100, 90.45, and 76.39%) , juice (42.86, 40.38, 38.21 and 36.36%) , TSS (8.03, 8.07, 8.94, and 11.77 °Brix), vitamin C (27.84, 26.63, 25.56 and 23.95 mg/100g juice), reducing (6.26, 6.29, 6.32 and 6.87%), total sugars (9.43, 9.47, 10.41 and 11.54%) and overall acceptability (9.00, 8.78, 7.81 and 5.78) of Nagpur mandarin were recorded in T_9 (calcium nitrate 2%) from 0, 5th 10th and 15th days of storage.

Keywords: Nagpur mandarin, pre-harvest sprays, growth regulators, mineral nutrients and post- harvest behavior

IIZCAGV-26-T2-101

Protected Cultivation, Hydroponics and Controlled Environment Agriculture

Aditya Raj

B. Tech Student, Swami Vivekanand college of Agricultural Engineering and Technology and Research Station, Indira Gandhi Krishi Vishwavidyalaya,Raipur (C.G)

Corresponding Author: adityaraj4ut2021@gmail.com

Abstract

Protected cultivation, hydroponics, and controlled environment agriculture (CEA) are innovative approaches that enhance crop production by minimizing the influence of adverse climatic conditions and optimizing resource use. Protected cultivation involves growing crops in structures such as greenhouses, polyhouses, and shade nets, which provide a controlled microclimate to improve yield, quality, and off-season production while protecting crops from pests, diseases, and extreme weather. Hydroponics is a soil-less cultivation technique in which plants are grown in nutrient-rich water solutions. This method ensures precise delivery of essential nutrients directly to plant roots, resulting in faster growth, higher productivity, and efficient water usage compared to conventional soil-based farming. It is particularly suitable for urban agriculture and areas with poor soil quality. Controlled environment agriculture integrates advanced technologies such as sensors, automation, climate control systems, and artificial lighting to regulate temperature, humidity, light, and carbon dioxide levels. By creating optimal growing conditions, CEA enables year-round production, improved crop consistency, and reduced dependency on natural environmental factors. Together, these approaches represent a modern, sustainable solution for increasing agricultural productivity, conserving resources, and ensuring food security in the face of climate change and growing population demands.

Keywords: Protected Cultivation, Greenhouse, Polyhouse, Hydroponics, Soilless Farming, Nutrient Solution, Controlled Environment Agriculture (CEA), Climate Control, Automation, Sensors, Artificial Lighting, Water Efficiency, Urban Farming, Sustainable Agriculture

IIZCAGV-26-T2-102

Effect of graded levels of nitrogen and boron on growth, yield and quality of radish

Pankaj Kumar[1], Pankaj Maida[2], Roshan Gallani*[3], and R.K. Sharma[4]
Post Graduate Student[1], Assistant Professor[2], Assistant Professor[3], Assistant Professor[4]
RVSKVV College of Horticulture, Mandsaur-458001, Madhya Pradesh, India

*Corresponding author e-mail: dr.roshangallani@gmail.com

Abstract

The present field experiment was conducted at the field of Department of Vegetable Science, College of Horticulture, R.V.S.K.V.V. Mandsaur (M.P.) during the year 2024-2025. Twelve treatment combinations comprising of four graded nitrogen levels (N1-30 kg N/ha, N2- 60 kg N/ha, N3-90 kg N/ha, N4-120 kg N/ha) and three graded boron levels (B1-00 kg B/ha, B2- 1kg B/ha, B3- 2 kg B/ha) were tested in factorial randomized block design with three replications. The findings revealed that among the nitrogen levels, application of nitrogen

level N4 (120 kg N/ha) showed maximum growth, yield and quality parameters of radish. Among the boron levels, application of boron level B3 (2 kg B/ha) showed maximum growth attributes, yield attributes, and quality attributes. Similarly, treatments N4 (120 kg N/ha) and B3 (2 kg B/ha) were recorded maximum gross return, net income and B:C ratio. However, the interaction impact of nitrogen and boron levels was found non-significant with respect to all the parameters of radish.

Keywords: Nitrogen, Boron, Radish, Growth and yield attributes and economics.

IIZCAGV-26-T2-103

Screening of cluster bean genotypes against collar rot disease as a core strategy in advanced integrated disease management technologies

Yogesh Kumar, Rajni Singh Sasode, Manish Leel, Rajbabbar Jatav, Sucharita Mohapatra, Neelam Soni, Anita Kumari Pandey

Department of Plant Pathology, RVSKVV, Gwalior, Madhya Pradesh, India

yogeshjakhar1000@gmail.com

Abstract

Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.), is regarded as an important commercial crop in arid and semi-arid areas. Cluster bean production faces various biotic stresses specially collar rot, caused by *Sclerotium rolfsii* Sacc., being a significant factor that can substantially reduce crop yield. An experiment was conducted during *Kharif* 2023, for evaluate the better reaction showing genotypes against collar rot that is a key component of integrated disease management. Thirty-four cluster bean genotypes in two replications were evaluated for their resistance against collar rot disease under natural conditions. Result was observed that none of the genotypes were found to be free from disease, ten genotypes showed highly resistance reactions to collar rot disease with 0.1-5% of their infected plant, nine genotypes were found to be resistance reactions with 5.1-10 % of their infected plants, thirteen genotypes were found to be moderately resistance reactions with 10.1-20 % of their infected plants, two genotypes were found to be susceptible reactions, with 20.1-50 % of their infected plants and none were found with highly susceptible reactions. The selection and utilization of highly resistant and resistant genotypes can serve as an effective strategy for the management of collar rot in cluster bean.

Keywords: Integrated disease management, Collar rot, Cluster bean, Genotypes, Resistance.

IIZCAGV-26-T2-104

Compatibility Effects of Herbicide Application and Nitrogen Sources on Weed Suppression and Wheat Yield

Shivani Thakur[1], Ashutosh Dwivedi[1], Anurag Chouhan[1], Akshat Tamrakar[1], Dr V.K Choudhary[2] Dr Amit Kumar Jha[3]

[1]Research scholar, Department of Agronomy, JNKVV Jabalpur M.P

[1]Senior Scientist at ICAR- Directorate of Weed Research, Jabalpur M.P

[1]Assistant professor, Department of Agronomy, JNKVV Jabalpur M.P

Abstract

Weed infestation and nitrogen management are two major factors limiting wheat productivity, making their effective control essential for achieving higher yields. Since herbicide application often coincides with nitrogen fertilization, integrating both practices can enhance crop performance. Studies evaluating the compatibility of herbicides with different nitrogen sources have shown that post-emergence application of clodinafop + metsulfuron (60 + 4 g ha^{-1}) effectively suppresses a wide range of weeds and improves crop growth by minimizing competition. This effect is further enhanced when combined with nano urea, leading to lower weed density and better weed control. Similarly, metsulfuron (4 g ha^{-1}) proved effective when used along with nano urea or prilled urea, improving nutrient utilization and reducing weed pressure. The herbicide combination mesosulfuron + iodosulfuron (12 + 2.4 g ha^{-1}) also provided satisfactory weed control, although it initially caused some phytotoxicity, which was mitigated by the application of nano urea. In subsequent years, carfentrazone + metsulfuron (20 + 4 g ha^{-1}) was introduced to overcome phytotoxicity issues and successfully controlled weeds without damaging the crop. However, its combination with nano urea or prilled urea was less effective in weed suppression, resulting in reduced grain and straw yield due to increased competition. On the other hand, integrating suitable herbicides with nano urea significantly improved weed management and crop productivity. The highest yield was recorded with the application of clodinafop + metsulfuron (60 + 4 g ha^{-1}) along with nano urea, which can be attributed to effective weed control, enhanced nutrient uptake, and improved photosynthetic activity. Overall, the integration of selective post-emergence herbicides with nano urea emerges as a promising approach for improving weed control, nutrient use efficiency, and wheat yield under field conditions. Towards mitigating both these aspects, resistance and nitrogen use judiciously. Mixture of nano urea, prilled urea and herbicide could be a boon to the farmers for enhancing wheat productivity and also controlling weeds. Therefore the attempt was made to study the compatibility of herbicides with nitrogen sources.

Keywords: Weed density, Weed control efficiency (WCE), Crop–weed competition, Weed suppression, Post-emergence herbicides, Herbicide compatibility

IIZCAGV-26-T2-105

Biochar as a Climate – Smart Soil Amendment: Opportunities and Challenges

Shivamnath Yogi

Ph.D. Scholar, Department of Agricultural Extension Education, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

Corresponding Author – shvmnyogi@icloud.com

Abstract

Biochar, a carbon-rich material produced through pyrolysis of organic biomass, has emerged as a promising climate-smart soil amendment in sustainable agriculture. This review explores the potential of biochar in enhancing soil fertility, improving water retention, and mitigating

climate change impacts. Biochar application has been reported to increase soil pH, enhance cation exchange capacity, and improve nutrient use efficiency, thereby supporting better crop productivity. Globally, biochar production has reached approximately 350,000 metric tonnes annually, with the market valued at about USD 859 million in 2025 and projected to exceed USD 2.7 billion by 2034. The Indian biochar market was valued at around USD 79.8 million in 2025 and is expected to grow steadily Additionally, biochar contributes to long-term carbon sequestration, reducing greenhouse gas emissions from agricultural soils. Its application on just 10% of global agricultural land could potentially sequester nearly 1 gigaton of CO_2 per year. The country generates over 600 million tonnes of agricultural residue annually, with the potential to produce 15–26 million tonnes of biochar each year. Economic feasibility, lack of standardization, and limited farmer awareness remain key constraints to its widespread adoption. The study emphasizes the need for location-specific research, policy incentives, and extension services to promote biochar use. Overall, biochar represents a viable strategy for achieving sustainable and resilient agricultural systems under changing climatic conditions.

Key Words: - Biochar, Pyrolysis, Organic biomass, Climate-smart, Soil amendment

IIZCAGV-26-T2-106

Understanding Water Use Efficiency: Physiological Strategies for Drought Management

Aradhna Kumari[1], Santosh Kumar Singh[2] and Vinod Kumar Garg[1]

[1]College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Ganj Basoda, Madhya Pradesh, India.

[2]School of Data Science, Global Tech University, Chennai. 534645. Tamil Nadu, India

Corresponding Email: merymitu@gmail.com

Abstract

Water scarcity is a major constraint on agricultural productivity, particularly in the current climate of variability and the increasing frequency of drought events. Improving Water Use Efficiency (WUE) is a critical strategy for sustaining crop yields with limited water resources. WUE is governed by complex physiological processes, including photosynthesis, transpiration, stomatal regulation, and root dynamics. This paper presents a comprehensive overview of the physiological basis of WUE and its practical implications for drought management in crops. Key mechanisms such as stomatal conductance, osmotic adjustment, antioxidant defence, and root system architecture are discussed in relation to drought tolerance. The role of agronomic interventions, including mulching, deficit irrigation, plant growth regulators, and the selection of drought-resilient genotypes, is highlighted as a means of enhancing WUE. Integration of physiological understanding with field-level practices can significantly improve water productivity and ensure sustainable crop production in water-limited environments.

Keywords: Water use efficiency, drought tolerance, stomatal regulation, osmotic adjustment, root architecture, and sustainable agriculture

IIZCAGV-26-T2-107

Effect of pre harvest foliar application of salicylic acid, calcium nitrate and bagging on morphological characteristics of guava fruit (*Psidium guajava* L.) cv. Rewa 72

Satish Raykwar, Priyamvada Sonkar, R. N. Kanpure, B. K. Patidar, P. K. S. Gurjar and Pramod Kumar Fatehpuriya

KNK College of Horticulture, Mandsaur (MP), Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (MP)

Abstract

The present experiment was carried out at at the *Instructional cum Research Fruit Orchard*, Department of Fruit Science, KNK College of Horticulture, Mandsaur to assessed the impact of different pre-harvest foliar spray and bagging relative to the morphological characters of guava fruits cv. Rewa 72. The experiment was replicated thrice using RBD comprised of 15 treatments. The selected fruits were subjected to foliar spray with with salicylic acid (100 ppm), calcium nitrate (2%), and different bagging materials (brown paper, butter paper, yellow and white polyethylene bags) alone and in combinations at 30 days before harvest of fruits. Statistically analysed data revealed that the spraying of calcium nitrate @ 2% and bagging with brown paper is most effective in enhancing the morphological characters (such as fruit length, fruit weight, equatorial diameter, fruit firmness, thickness of pericarp, circumference of endocarp and weight of pericarp) strictly followed by the Salicylic acid @ 100 ppm and bagging with brown paper. Although, the maximum days taken to maturity was observed with calcium chloride @ 2% and bagging with yellow polyethylene bag, specific gravity recorded more than the standard value in fruits bagged with polyethylene bag followed by the white polyethylene bags alone and in combinations.

Keywords: Salicylic acid, calcium nitrate, bagging materials, morphological characters and guava.

IIZCAGV-26-T2-108

Climate Smart Agronomic Practices for Sustainable Crop Production

Shailesh [1*], Kuldeep [2]

[1]M.Sc. (Ag.) Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India

[2]M.Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

*Corresponding Author Email: janghelshailesh1999@gmail.com

Abstract

The phenomenon of climate change is posing considerable risk for the entire globe in terms of agricultural activities since there is an increase in drought, heat stresses, and erratic

precipitation, which impacts negatively the yield of crops. The practice of climate smart agronomy is a sustainable strategy for addressing the issue in question while improving crop productivity. This article critically examines the major climate-smart agronomic strategies including conservation tillage, integrated nutrient management, adoption of drought-resistant varieties, efficient water management using drip irrigation and mulching, and precision agriculture practices. Such measures allow for more efficient use of resources, maintenance of soil health, and minimization of carbon emissions. There is evidence showing that a combination of organic and inorganic nutrient sources increases soil fertility levels and promotes microbial activities. In addition, the adoption of water-saving practices allows for efficient water usage under drought conditions. Finally, precision agriculture practices ensure that decisions are based on timely information, promoting more efficient use of inputs. Overall, climate smart agronomic strategies offer an all-round strategy for implementing sustainable crop production practices in the modern era.

Keywords: Climate smart agriculture, Sustainable farming, Resource use efficiency, Soil health, Precision agriculture, Water management

IIZCAGV-26-T2-109

Marker-Assisted Selection: A Tool for Developing Climate- Resilient Crop Varieties

Rashi Mishra

Department of Genetics and Plant Breeding, College of Agriculture, Jawaharlal Nehru Krishi VishwaVidhyalay, Jabalpur 482004 Madhya Pradesh India.

Corresponding Email: rashipg25@gmail.com

Abstract

Climate change causes a significant hazard to global agriculture by increasing the occurrence of abiotic stresses such as heat, drought and salinity. Conventional breeding approaches for developing stress-tolerant varieties are time consuming and affected by environmental changes. Marker-Assisted Selection (MAS) has appeared as a commanding biotechnological tool that enhances the efficiency and precision of plant breeding by utilizing DNA markers linked to desirable traits. MAS enables early and accurate selection of genotype carrying stress- tolerant genes or quantitative trait loci (QTLs), thereby accelerating the breeding process. Successful applications include the drought and salinity tolerant cultivars in major crops as well as development of submergence- tolerant rice varieties through the incorporation of Sub1gene.MAS significantly improves breeding efficiency by reducing the phenotypic selection under different environmental conditions. Regardless of its advantages, limitations such as high cost and the complexity of polygenic traits are also there. However, integration with advanced genomic tools and high- throughput technologies holds great promises for the future. Thus MAS represents a key approach in developing climate-resilient crops and ensuring global food security under changing climatic conditions.

Keywords: Marker-Assisted Selection, QTLs, Molecular marker, Crop improvement, Drought Tolerance, Sustainable Agriculture

IIZCAGV-26-T2-110

Advancing Millet Breeding through Genomics and Gene Editing for Climate-Resilient Agriculture

Sandeep Patel[1], Stuti Sharma[2] and Yogendra Singh[3]

[1]M.Sc., Department of Genetics and Plant Breeding, JNKVV, Jabalpur, M.P., India, 482004
[2]Assistant Professor, Department of Genetics and Plant Breeding, JNKVV, Jabalpur M.P., India, 482004
[3] Assistant Professor, Department of Genetics and Plant Breeding, JNKVV, Jabalpur M.P., India, 482004

Corresponding Email: sp1212745@gmail.com

Abstract

Millets, a diverse group of small-seeded cereals, are valued for their resilience to harsh agro-climatic conditions, high nutritional content, and contribution to sustainable agriculture. Predominantly cultivated in Asia and Africa, they play a vital role in food and nutritional security in rainfed and semi-arid regions, with renewed global interest following the International Year of Millets (2023). Millet breeding focuses on improving yield, nutritional quality, and tolerance to biotic and abiotic stresses. While conventional methods such as selection and hybridization have produced several improved varieties, they remain limited by long breeding cycles, restricted genetic variability, and environmental influences on phenotypic selection. Modern breeding tools—including marker-assisted selection, QTL mapping, genomic selection, and CRISPR/Cas genome editing—offer precise and accelerated improvement, particularly for complex traits like stress tolerance and micronutrient enrichment. Integrated genomics–phenomics platforms and participatory approaches are emerging to address genotype × environment interactions and climate variability. Strengthening millet breeding through enhanced germplasm utilization, improved seed systems, and global collaboration is essential for developing climate-resilient, nutrient-rich varieties that support sustainable agriculture and food security.

Keywords: Climate resilience, genome editing, nutritional security, QTL mapping, sustainable agriculture

IIZCAGV-26-T2-111

Food Adulteration

Rupam Bisne

Undergraduate Student, B.Tech (Food Technology), Department of Food Technology, Raipur, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G)

Corresponding Author – rupambisne922@gmail.com

Abstract

Food Adulteration Food is not just a basic necessity it is the foundation of our health and well-being. Yet today, what reaches our plate is not always what it appears to be. Foodadulteration, the deliberate mixing of inferior or harmful substances into food products, has become an alarming reality in both developing and developed countries. Driven largely

by greed and the desire for quick profit, traders and manufacturers compromise food quality in ways that are invisible to the naked eye. Chalk powder in flour, water in milk, artificial dyes in spices these are not rare incidents but everyday realities. The consequences fall heavily on ordinary consumers who trust that the food they buy is safe. The health impact is deeply concerning. Regular consumption of adulterated food has been linked to serious conditions including kidney damage, cancer, cardiovascular disease and developmental disorders in children. The most vulnerable children, pregnant women and the elderly suUer the most. Addressing this problem requires more than just laws on paper. It demands public awareness, stronger enforcement and a collective responsibility to protect the food we eat.

Keywords: Food adulteration, food safety, adulterants, public health, food fraud, health risks, food quality, consumer awareness

IIZCAGV-26-T2-112

Advances in Agri-Biotechnology and Smart Farming for Climate-Resilient Crop Improvement

Pratiksha Pandram

M.Sc. Research Scholar, Department of Genetics and Plant Breeding, JNKVV, Jabalpur, Madhya Pradesh, India.

Corresponding Email: pratikshapandram2003@gmail.com

Abstract

Climate change poses significant challenges to global agriculture by affecting crop productivity, quality, and sustainability. Agri-biotechnology offers innovative solutions to enhance crop resilience and ensure food security. This study highlights the role of next-generation crop improvement techniques, including molecular breeding, genetic engineering, and genome editing tools such as CRISPR/Cas systems, in developing climate-resilient crop varieties. Emphasis is given to traits like drought tolerance, heat resistance, pest and disease resistance, and improved nutrient use efficiency. Additionally, precision farming technologies integrated with biotechnology, such as sensor-based monitoring and controlled environment agriculture, are discussed for optimizing resource use and increasing productivity. Advances in stress biology further provide insights into plant responses under abiotic and biotic stresses, enabling targeted interventions. The integration of these approaches not only accelerates breeding programs but also contributes to sustainable agricultural practices. The study concludes that agri-biotechnology, combined with smart farming techniques, plays a crucial role in addressing the challenges of climate variability and ensuring long-term agricultural sustainability.

Keywords: Agri-biotechnology, Climate resilience, Genome editing, Precision farming, Stress biology

IIZCAGV-26-T2-113

Host plant resistance to insects: an eco-friendly approach for pest management and environment conservation.

Sachin Yadav

Department of Entomology, RVSKVV, Guwalior, 474002

Corresponding Email: Sachinyadav1702002@gmail.com

Abstract

Host plant resistance (HPR) to insects is an effective, economical, and environment friendly method of pest control. The most attractive feature of HPR is that farmers virtually do not need any skill in application techniques, and there is no cash investment by the resource poor farmers. Considerable progress has been made in identification and development of crop cultivars with resistance to the major pests in different crops. There is a need to transfer resistance genes into high-yielding cultivars with adaptation to different agroecosystems. Resistance to insects should form one of the criteria to release varieties and hybrids for cultivation by the farmers. Genes from the wild relatives of crops, and novel genes, such as those from Bacillus thuringiensis can also be deployed in different crops to make HPR an effective weapon to minimize the losses due to insect pests. HPR will not only cause a major reduction in pesticide use and slow down the rate of development of resistance to insecticides in insect populations, but also lead to increased activity of beneficial organisms and reduction in pesticide residues in food and food products.

Keywords: Host plant resistance (HPR), Insects, Economical, Environment friendly, Crop cultivars, Resistance genes, High-yielding cultivars, Wild relatives, Bacillus thuringiensis (Bt), Pesticide residues

IIZCAGV-26-T2-114

Climate-Resilient Agriculture: A Sustainable Framework for Adaptive Agro ecosystems

Rohit Rathore[1], Umesh Patle[2]

Department of soil science and agricultural chemistry, Rvskvv, Gwalior, 474002, Madhya Pradesh, India

Department of Agronomy, RVSKVV, Gwalior, 474002, Madhya Pradesh, India

Corresponding email: rr8241343@gmail.com

Abstract

The increasing frequency of climate variability and extreme weather events poses a significant threat to global agricultural productivity and food security. Climate-resilient agriculture (CRA) has emerged as a comprehensive approach aimed at enhancing the adaptive capacity, resilience, and sustainability of agro ecosystems under changing climatic conditions. This study proposes an integrated framework that combines soil health management, climate-smart agricultural practices, and data-driven decision-support systems to improve farm-level resilience. The framework incorporates strategies such as conservation agriculture, crop diversification, precision water management, and the use of stress-tolerant crop varieties. Special emphasis is placed on improving soil organic carbon and nutrient

dynamics to enhance soil buffering capacity against climatic stresses. The proposed model also integrates modern technologies, including remote sensing, geographic information systems (GIS), and real-time weather-based advisory systems, to optimize resource use and minimize risks. Evaluation of the framework across diverse agro ecological conditions indicates improved productivity, resource-use efficiency, and system stability compared to conventional farming approaches. Furthermore, the system demonstrates strong adaptability under uncertain climatic scenarios, ensuring sustained agricultural output. The findings suggest that climate-resilient agriculture can serve as a viable pathway for achieving long-term sustainability, enhancing farmer livelihoods, and ensuring food security in climate-vulnerable regions.

Keywords: Climate-resilient agriculture, Soil health, Climate change adaptation, Precision farming, Agro ecosystem sustainability, Resource-use efficiency

IIZCAGV-26-T2-115

Multivariate Analysis of Genetic Variability and Yield Determinants in Soybean (Glycine max L.) Reveals Superiority of Early Maturing Genotypes for Climate-Resilient Breeding

Saurav Raj[1], Lekharam[2], Devendra Kumar Payasi[3], A.N. Bhanu[4]

[1,2,3,4]Department of Genetics and Plant Breeding, R.A.K. College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Sehore – 466001, Madhya Pradesh, India

Corresponding Email: sauravraj766@gmail.com

Abstract

The present investigation was conducted on sixty elite soybean genotypes evaluated during Kharif 2025 under Randomized Complete Block Design (RCBD). Observations on 17 quantitative traits were assessed for genetic variability, trait association and diversity using ANOVA, heritability estimates, correlation, path coefficient analysis, Mahalanobis D^2 statistics, and PCA. Significant genotypic differences indicated substantial variability. High heritability coupled with high genetic advance for seed yield, seeds per plant, pods per plant, clusters per plant, biological yield, and 100-seed weight, indicated additive gene action. Seed yield exhibited strong positive association with biological yield (rg = 0.707) and harvest index (rg = 0.532), which also exhibited the highest direct effects (0.832 and 0.662, respectively) in path analysis, identifying them as key selection criteria. A significant negative association of days to maturity with yield (rp = −0.192) along with its negative direct effect indicates the advantage of early maturing genotypes. D^2 analysis grouped genotypes into six clusters, cluster IV showed maximum mean yield and divergence. The first five PCA components explained 73.98% of total variation. The study highlights that selection for early maturity coupled with high biomass and efficient partitioning can enhance soybean productivity under climate variability.

Keywords: Soybean, Genetic variability, Path analysis, D^2 statistics, PCA, Climate resilience

IIZCAGV-26-T2-116

Synergistic Approaches in Agri Biotechnology and Smart Farming for Next Generation Crop Improvement

Anshika Gupta

College of Agriculture , Gwalior, 474011, Madhya Pradesh, India.

Corresponding Email ID- guptaanshika7898@gmail.com

Abstract

At present, agriculture is at a pivotal moment due to the combination of an increased global demand for food, as well as a need to repair the environment. The introduction of agricultural biotechnology and the application of modern technology will lead to greater sustainability and improved agricultural practices in the future. In this paper, we will discuss the role of next generation crop improvement technologies, precision and smart farming, and stress biology in developing the future of agriculture. Biotechnology advancements such as improved breeding and genetic techniques will allow for the production of crops with greater yields, improved nutritional value, and greater resistance to pests and diseases. Precision farming technologies enable farmers to be more efficient in their use of resources like water and fertilizers through the use of data-based decision-making systems, automated equipment, and remote sensing devices. Controlled environment agriculture will help support the production of crops in a more consistent manner by providing a stable growing environment and reducing the dependency of crop growth on weather pattern extremes .Climate resilient agriculture is focused on making farming systems flexible so they can handle stresses due to climate change, including droughts, extreme heat, and flooding. Stress biology provides critical insight to understand how plants react and adapt with respect to these stresses and will help develop new crop varieties that are able to tolerate many of these stresses. Ultimately, the effective integration of biological knowledge with digital technologies has the potential to develop an agricultural system that is both productive and environmentally sustainable. In conclusion, the convergence of biotechnology and smart agricultural practices provides a holistic approach to achieving food security, sustainability, and resilience in the face of global challenges.

Keywords: Agri biotechnology, smart farming, crop improvement, climate resilience, stress biology, controlled environment agriculture.

IIZCAGV-26-T2-117

Effect of elevated CO_2, temperature and sources of mineral nitrogen on nitrogen release pattern of wheat crop

Kiranlata Manikpuri[1], Shashi S. Yadav[2] and Aditi Chourasia[3]

[1]Ph.D. Scholar, Department of Soil Science, CoA, RVSKVV, Gwalior (M.P)
[1]Scientist, Department of Soil Science, RVSKVV, Gwalior (M.P.)
[1]Guest Teacher, Department of Soil Science, RVSKVV, Gwalior (M.P.)

latakiran57152@gmail.com

Abstract

A field experiment was conducted during the Rabi season of 2025-26 at RVSKVV, Gwalior (Madhya Pradesh) to evaluate the effect of elevated CO_2, temperature and sources of mineral nitrogen on nitrogen release pattern of wheat crop. The study was laid out in a Factorial Complete Randomized design with 12 treatment and 3 Replications. Treatment includes Factor A (open, Ambient CO_2 + Ambient temperature, Elevated CO_2 500ppm + Elevated temperature 3°C, Elevated temperature 3°C) and Factor B (Conventional Urea (100% RDN), 100%RDN+ Nano-urea 0.4% foliar spray at 45 DAS, 100%RDN+ Prilled-urea 6% foliar spray at 45 DAS), and their combinations. Result revealed that Elevated CO_2 500ppm + Elevated temperature 3°C with RDN + Prilled-urea 6% foliar spray at 45 DAS (T_9) significantly enhanced nitrogen release pattern at 7 days intervals over RDN combinations. However, this treatment was statistically at par with Elevated CO_2 500ppm + Elevated temperature 3°C with RDN + Nano-urea 0.4% foliar spray at 45 DAS (T_8). Considering yield and efficiency, T_8 was found to be a more economical and effective treatment.

Keyword: nano-urea, prilled-urea, wheat, nitrogen release pattern.

IIZCAGV-26-T2-118

Evaluating the Effectiveness of Microbial Activities in the Production of Biological Fuel

Sakshi Saxena

PhD Research Scholar, Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya College of Agriculture Gwalior, Madhya Pradesh

*Corresponding author Email: - saxena08sakshi@gmail.com

Abstract

Microbial biotechnology, which uses microbes to improve industrial processes and the environment, is a rapidly growing area. This study examines the numerous applications of microbe-based biotechnology, highlighting the capability of bacteria to create sustainable advancements. Bacteria can convert organic materials into biofuels like ethanol and butanol, offering eco-friendly alternatives to conventional fossil fuels. Natural and genetically engineered bacteria contribute significantly to pollutant removal. They utilize biological pathways such as bioremediation to degrade harmful substances. Through bioaugmentation, specialized microbial groups enhance purification efficiency.Using bacteria to extract hazardous heavy metals such as cadmium and lead from soil and water illustrates the potential of microbial biotechnology. Microbes act as natural agents of detoxification, breaking down or binding toxic elements. Such practices highlight biotechnology's contribution to cleaner and greener ecosystems.The mutual alliance between humans and bacteria has unlocked novel pathways in medical innovation. This collaboration has fostered the advancement of probiotics that enhance well-being.The dynamic link between microbes and their surroundings offers remedies to urgent global challenges. This work examines the extensive scope of microbial biotechnology. It showcases bacteria's ability to ignite

sustainable innovations. Such study highlight biotechnology's vital role in eco-friendly advancement.

Keyword- Bacteria, bioremediation, biotechnology, ecosystems, microbe

IIZCAGV-26-T2-119

Mango Seed Kernel Butter

Prakhar Sahu

Undergraduate student, Department of Food Technology, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)

Corresponding Author- ps8817911@gmail.com

Abstract

Mangoes belong to the genus Mangifera of the family Anacardiaceae. The genus Mangifera contains several species that bear edible fruit. Most of the fruit trees that are commonly known as mangoes belong to the species Mangifera indica. MSKB is underutilized byproduct of the mango processing industry with significant economic and environmental potential. Mango seed kernel oil can be utilized as a source of edible oil. Mango seed kernel contains a considerable amount of butter (21%). The butter has melting point of 32°C, acidity 0.76 %, peroxide value 2.782 meq/kg and iodine value 55.15, indicates that the characteristics of mango seed kernel buttter (MSKB) are in the normal range of edible oils. It can be extracted by cold-pressing, organic solvents, and supercritical extraction. It has valuable essential fatty acids, vitamins and minerals. At room temperature, it become solid, has smooth creamy color and gives nutty and sweet flavor in its pure form. In addition, mango seed kernel could be used as a potential source for functional food ingredients, antimicrobial compounds and cosmetic due to its high quality of fat and protein as well as high levels of natural antioxidants. Cocoa butter is a key ingredient in many chocolate products but mango seed kernel butter can be its substitute and it has potential to reduce chocolate production costs and improve shelf-life. MSKB are valuable for tropical regions where refrigerated storage may not be available or financially viable. The mango seed could be used as a potential source for natural antioxidants, antimicrobial compounds, cosmetic, activated carbon and, in addition, it could be further processed into therapeutic functional food products. This suggests that the mango seeds should be further utilized rather than just discarded as waste. Despite its promising characteristics, large-scale commercialization faces challenges including extraction efficiency, standardization, and market awareness.

Keywords: Mango Seed Kernel Butter, Mangifera indica, Butter, Chocolate products, Natural antioxidant, Cocoa butter, Cosmetics, Reduce cost, Shelf-life, Tropical regions.

IIZCAGV-26-T2-120

Biochar as a strategy for optimizing soil Phosphorus dynamics and use efficiency

Sudheer[1]*, Kasturikasen Beura[1] and Amit Kumar Pradhan[1]*

[1]Department of Soil Science, Bihar Agricultural University, Sabour, Bhagalpur, Bihar

Correspondence: sudheer87364@gmail.com

Abstract

Phosphorus (P) is a critical macronutrient required for optimal crop growth and development. However, its limited availability in soils—primarily due to fixation by iron, aluminum, and calcium compounds—constitutes a major constraint to global agricultural productivity. Biochar, a carbon-rich material produced through the pyrolysis of biomass under oxygenlimited conditions, has gained attention as an effective soil amendment for improving phosphorus nutrition in crops. This overview consolidates current knowledge on the diverse roles of biochar in enhancing soil P availability, increasing fertilizer use efficiency, and promoting plant P uptake. Biochar affects phosphorus dynamics through both direct and indirect mechanisms. Directly, it functions as a slow-release source of phosphorus, particularly when produced from nutrient-rich feedstocks such as animal manure or crop residues. It releases labile P fractions while simultaneously adsorbing excess phosphate, thereby reducing nutrient leaching. Indirectly, biochar alters soil physicochemical properties, including increasing pH in acidic soils, enhancing cation exchange capacity, and improving soil organic matter content. These changes reduce phosphorus fixation and facilitate the desorption of previously bound P. Additionally, biochar promotes the activity of phosphorussolubilizing microorganisms and associated enzymes, thereby accelerating phosphorus mineralization and cycling within the rhizosphere.

Keywords: Biochar, Phosphorus availability, Soil fertility, Crop nutrition, Nutrient use efficiency, Slow-release fertilizer

IIZCAGV-26-T2-121

Enhancing Climate Resilience in Rice-Based Systems through Direct Seeded Rice (DSR): An Agronomic Perspective

Pragya Pandey

Scientist, Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Mail: pragya.pandey@igkv.ac.in

Abstract

Climate change, less water, and more manpower are all making rice-based production systems in India less stable. Traditional puddled transplanted rice (PTR) uses a lot of resources, which leads to too much water use, soil degradation, and greenhouse gas emissions. In this situation, Direct Seeded Rice (DSR) has become a promising climate-resilient option that fits with farming methods that are environmentally friendly and promote conservation. This abstract highlights how DSR can enhance climate resilience by making better use of resources, leaving a smaller environmental footprint, and being able to adapt under stress conditions. DSR reduces the water use by 15–30%. Meanwhile, DSR has fewer

labour needs than transplanted rice, and it enables the timely sowing of the crop. Sowing in a suitable sowing window is essential when the monsoon patterns are unpredictable. Further, due to the absence of continuous flooding, DSR also mitigates climate change by reducing methane emissions. From an agronomic point of view, DSR success depends on the right varietal selection, precise land levelling, well-controlled weeds, and optimum nutrient management. Adding mechanized sowing to site-specific nutrient management enhances nitrogen use efficiency and crop establishment. Increased nutrient use efficiency leads to better root proliferation and plant growth, which enables the plants to be more resistant to drought and perform under scarcity of water. However, some problems, such as severe weed infestation, optimization of nutrient and water needs to be addressed by technology and management practices. For large-scale adoption, especially in smallholder farming systems, it is very important to have policy support, training, and access to the right tools. Overall, DSR is a viable pathway to achieve climate-resilient techniques while maintaining a balance among productivity, sustainability, and resource conservation. Its integration with natural farming principles and indigenous knowledge systems can further enhance system adaptability and long-term sustainability in rice-based agroecosystems.

IIZCAGV-26-T2-122

Insilico analysis of predicted putative Resistance genes in pearl millet (*Pennisetum glaucum*) for accelerating molecular marker development and gene pyramiding.

Avi Raizada[1], Sushma Tiwari[1], Ravi Yadav[1]

Biotechnology Centre, RVSKVV, Gwalior, M.P

Corresponding author: sushma2540@gmail.com

Abstract

Pearl millet is a staple cereal crop, cultivated in arid regions. Besides being known for its high nutritional qualities, drought-tolerance, adaptive traits, reduction in grain yield due to biotic stresses is reported, thus posing a challenge to sustaining pearl millet production. Biotic stress in pearl millet, primarily caused by fungal pathogens and pests, can slash yields by up to 60%. Management relies on developing resistant hybrids and using integrated pest management (IPM) techniques. For accelerating molecular breeding and gene pyramiding, quick and accurate approaches for the prediction of resistance genes is an urgent need. With the advent of next-generation sequencing, bioinformatics has evolved with time with the motto of addressing these challenges through extensive data analysis and interpretations. The sequencing of the genome and transcriptome of a crop helps in accelerating crop improvement programs. The scanning of sequencing data for the presence of specific domains, especially resistance gene-specific domains/motifs, will lead to rapid, remarkable progress in crop improvement programs through targeted molecular marker development and gene-pyramiding. In this study, putative resistance genes that were already predicted earlier in the pearl millet transcriptome were further analysed through in silico methods for targeted molecular marker development for biotic stresses. A total of 25 transcripts harbouring R-domains from each of the 5 different R-gene classes were analysed for different properties.

The properties studied were cellular localisation, presence of signal peptide, prion-like properties (PrLP-like), ability to form stress granule and ability to undergo liquid-liquid phase separation (LLPS). The analysis of putative resistance transcripts for PrLP-like properties will help in knowing mode of regulation and/or mechanism that would be similar to prion-like proteins. As per recent reports, PrLPs are found to be present in plants and few microorganisms and known for their role in stress, defense and pathogenicity. This study outputs in identification of well-characterised R-domains containing transcripts that would be promising candidates for targeted molecular markers for biotic stresses in pearl millet. Thus, above targeted-in-silico approach will prove to be significant in reducing the cost, time, and physical efforts needed for developing molecular markers.

Keywords: Pearl millet, transcriptome, resistance gene, molecular marker, In silico analysis

IIZCAGV-26-T2-123

Biochar for Phosphorus nutrition in crops-An overview

Sudheer[1*], Kasturikasen Beura[1], Amit Kumar Pradhan[1], Ajay Kumawat[2] and Anshuman Kohli[1]

[1]Department of Soil Science, Bihar Agricultural University, Sabour, Bhagalpur, Bihar
[2]Department of Soil Science, Indian Agricultural Research Institute, New Delhi

Correspondence: sudheer87364@gmail.com

Abstract

Phosphorus (P) is a crucial nutrient for plant growth that cannot be replaced by any other element for its specific functions. Numerous agricultural soils throughout India are experiencing P deficiency, particularly in tropical and subtropical zones due to intense rainfall and elevated P fixation. Nevertheless, merely 5–20% of the P applied is utilized by the crop in the year after application. A significant portion of the applied ortho-phosphate frequently escapes into the water environment through runoff, with about 79% of P loss observed in rice fields. Biochar, a material created through the pyrolysis of biomass in low-oxygen conditions, is often utilized as a soil enhancer. Most of the modified biochar has the potential to alter soil physical and chemical characteristics such as soil structure, pH, cation exchange capacity and relative availability of nutrients like P. These differences in availability are linked to P forms and their presence in the soil matrix. Additionally, soil microorganisms and enzymes like phosphatase, which rise with biochar addition, can dissolve insoluble inorganic P and decompose organic P, thereby improving P availability. It supplies P in a manner that is easily accessible for plants to absorb. Biochar serves as a promising resource for producing slow-release P amendments aimed at enhancing soil P utilization efficiency and reducing P losses and for enhanced crop nutrition.

Keywords: Biochar, Phosphorus, Crop nutrition.

IIZCAGV-26-T2-124

Studies on Sucking Insect Pest of Cluster Bean [*Cyamopsis tetragonoloba* (L.) Taub.] in Gird Region

Dharmesh Pachoriya

Department of Entomology, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, 474011, Madhya Pradesh, India.

Corresponding Email: dharmeshpachoriya2000@gmail.com

Abstract

An investigation entitled "Studies on Sucking Insect Pest of Cluster Bean [*Cyamopsis tetragonoloba* (L.) Taub.] in Gird Region." Was conducted during *Kharif* season, 2025 at research farm RVSKVV, Gwalior, M.P. To study the seasonal incidence of insect pest of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub]. The observations on the incidence of sucking insect pest (aphid, jassid and whitefly) will be recorded at weekly interval on randomly selected ten plants in the early morning hours by observing three leaves (top, middle and bottom), from first appearance to maturity of the crop. Weekly data on meteorological parameter, viz., maximum and minimum temperature, morning and evening relative humidity, and rainfall will be collected from the meteorological observatory of the College of Agriculture, Gwalior. The impact of abiotic factors on population will also be studied through correlation and regression. Leaf Area Index (LAI): HG-365 typically has a lower LAI compared to varieties like HG 2-20. This can lead to slightly different microclimates within the canopy, often making it less prone to dense aphid clusters but still vulnerable to Jassids. Flea Beetle: Incidence is often noted later in the season, peaking around the 39th SMW (third week of September). Weather Correlation the infestation on HG-365 is highly sensitive to abiotic factors. *Temperature: There is a significant positive correlation with minimum temperature. Warmer nights often lead to rapid multiplication of Aphids and Jassids. *Rainfall: Moderate rainfall generally shows a positive correlation with Jassid and Whitefly populations in this region, as the humidity favors their development. *Humidity: High morning and evening relative humidity are key drivers for Aphid and Whitefly outbreaks. Recommendation: For HG-365, monitoring should be intensified from the last week of August to the end of September, as this window represents the "peak pressure" phase where economic thresholds are most likely to be crossed.

Keywords: Cluster Bean, Jassid, LAI, Season, Rh.

IIZCAGV-26-T2-125

Smart farming for sustainable agriculture

Shreya Kumari[1], D.K. Paliwal[1] , Anita Lamba[2], Sapna Kumari[3]

[1]Department of Agronomy, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior - 474002, Madhya Pradesh, India

[2]Department of soil science, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior - 474002, Madhya Pradesh, India

[3]Department of post harvest management(horticulture), Bihar Agricultural University, Sabour- 813210, Bihar, India

Corresponding Email: shreyranjan2000@gmail.com

Abstract

Precision farming (PF) is a technology-enabled approach to agricultural management that involves the observation, measurement, and analysis of spatial and temporal variability within fields to optimize crop production. It focuses on site-specific management practices that address the unique requirements of individual crops and field zones. In contrast, smart farming refers to the integration and application of advanced information and data technologies to enhance decision-making in complex agricultural systems, emphasizing data accessibility, processing, and intelligent utilization rather than solely precise measurement of field variability. A fundamental principle of precision agriculture is the "4R" concept, which advocates the application of the right input, at the right place, at the right time, and in the right amount. This approach aims to maximize resource-use efficiency, minimize input wastage, and promote environmental sustainability. Increased accuracy in input application reduces production costs by preventing the overuse of resources such as water, seeds, and fertilizers. Moreover, it contributes to environmental protection by reducing nutrient leaching and minimizing contamination of groundwater systems.Precision and smart farming systems employ a range of advanced technologies, including sensors, Geographic Information Systems (GIS), Global Positioning Systems (GPS), the Internet of Things (IoT), unmanned aerial vehicles (drones), and artificial intelligence (AI), to monitor, analyze, and manage agricultural operations efficiently. These technologies enable real-time data collection and site-specific interventions, thereby supporting both ecological and economic sustainability. Furthermore, smart farming facilitates environmentally sound agricultural practices through site-specific applications, representing a critical step toward sustainable agriculture. By optimizing input use and adopting best management practices, these approaches help maximize crop productivity, reduce the yield gap, and ensure efficient utilization of natural resources. Precision farming, in particular, utilizes satellite-based and information technologies to assess and manage the spatial and temporal variability of agricultural inputs such as seeds, fertilizers, and agrochemicals. Consequently, it plays a significant role in enhancing long-term agricultural sustainability while minimizing environmental impacts.

Keywords: Precision farming, management, sustainability, productivity, yield

IIZCAGV-26-T2-126

Production of potato (*Solanum tuberosum* L.) minitubers using Aeroponics technology and their biochemical profiling

Krati Tiwari[1], Sushma Tiwari[1]*, Avi Raizada[1], Madhurjit Singh Rathore[1], Deepali Singh[1], Yash Tale[1]

[1]Department of Molecular Biology and Biotechnology, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior

*Corresponding Author's mail ID: sushma2540@gmail.com

Abstract

Potato (*Solanum tuberosum* L.) is a globally important food crop, and the availability of high-quality seed material is essential for sustainable productivity. Aeroponics, a soilless

cultivation system, has emerged as an efficient technique for rapid and disease-free production of potato minitubers. The present study aimed to evaluate minituber production in an aeroponic system and studied their biochemical parameters for 17 different potato varieties, namely K. Surya, K. Chipsona-1, K.Chipsona-3, K. Bahar, K. Uday, K. Jyoti, K. Thar-2, K. Neelkanth, KFS, K. Frysona, FC-11, K. Fryom, K. Khyati, K. Thar-1, FLP, K. Pukhraj, and K. Mohan. In vitro–raised plantlets were established in a controlled aeroponic unit, and growth and yield traits such as plant height, root length, number of tubers per plant, and chlorophyll content were measured. Harvested minitubers were subjected to biochemical analyses, including estimation of starch content, total phenol content, and total soluble sugars (TSS). Results indicated that aeroponic cultivation produced uniform and healthy minitubers with reduced disease incidence and high multiplication rates. Morphological observations revealed that maximum plant height was recorded in KC-1, root length was highest in Kufri Thar-1, while the number of tubers per plant and chlorophyll content were highest in Kufri Surya. Biochemical profiling showed that starch content was highest in Kufri Khyati, phenol content was highest in FLP, and TSS was highest in Kufri Surya, indicating significant varietal differences in quality traits. Overall, aeroponics proved to be a promising and sustainable approach for large-scale production of high-quality potato minitubers, contributing to improved seed systems and enhanced crop productivity.

Keywords: Potato, Aeroponics, Minitubers, Biochemical, Yield traits

IIZCAGV-26-T2-127

Advances in Agri-Biotechnology and Smart Farming for Climate-Resilient Crop Improvement

Himakshi Patel

M.Sc. Research Scholar, Department of Genetics and Plant Breeding, JNKVV , Jabalpur , Madhya Pradesh , India.

Corresponding Email: patelhimakshi20@gmail.com

Abstract

Agriculture is increasingly challenged by climate variability, resource constraints, and rising food demand, necessitating innovative and sustainable solutions. This study aims to explore the role of agri-biotechnology and modern technological interventions in next-generation crop improvement and climate-resilient agriculture. The methodology involves a comprehensive analysis of biotechnological tools such as molecular breeding, tissue culture, and genome editing, along with precision farming technologies including sensors, remote sensing, and data-driven decision support systems. Additionally, the role of controlled environment agriculture (CEA) in ensuring stable crop production under adverse conditions is examined. The findings indicate that biotechnology enhances crop resistance to biotic and abiotic stresses, while smart farming technologies optimize input use efficiency and improve productivity. Stress biology approaches further contribute to understanding plant responses under extreme conditions, aiding in the development of resilient varieties. The integration of these approaches offers a sustainable pathway for improving agricultural productivity and

ensuring food security. The study concludes that combining biotechnology with smart agriculture is essential for building resilient and efficient farming systems.

Keywords: Agri-Biotechnology, Precision Farming, Climate-Resilient Agriculture, Genome Editing, Controlled Environment Agriculture, Stress Biology

IIZCAGV-26-T2-128

Carbon Credit Trading in India: Opportunities, Challenges and Future Prospects

Preeti Laxmi Dhruw [1*], Kuldeep [2]

[1]M.Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

[2]M.Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

*Corresponding Author Email: preetilaxmidhruw@gmail.com

Abstract

Carbon credit trading has emerged as a market-based mechanism to mitigate greenhouse gas emissions and address climate change. The concept revolves around allocating emission allowances to entities, which can be traded to incentivize reductions where they are most cost-effective. In India, carbon trading gained prominence through participation in global mechanisms like the Clean Development Mechanism (CDM) and is now evolving with domestic frameworks aimed at achieving climate commitments under the Paris Agreement. The primary objectives of this study are to examine the concept and evolution of carbon credit trading in India, analyze its opportunities in promoting sustainable development and green investments, identify key challenges in its implementation, and assess its future prospects in the context of national and global climate goals. Key findings indicate that India has significant potential in carbon trading due to its large industrial base and renewable energy expansion. Opportunities include attracting foreign investment, promoting clean technologies, and generating additional revenue streams. However, challenges such as regulatory uncertainty, lack of awareness, inadequate infrastructure, and issues related to monitoring and verification persist. Carbon credit trading in India holds considerable promise as a tool for sustainable economic growth and environmental protection. Strengthening regulatory frameworks, enhancing transparency, and increasing stakeholder awareness will be crucial for the effective development of a robust carbon market in the future.

Keywords: Carbon credit trading, Climate change mitigation, Greenhouse gas emissions, Sustainable development, , Environmental policy.

IIZCAGV-26-T2-129

Beyond Microbes: Microvita as the Key Regulators of Soil Health and Ecosystem Multifunctionality

Nivedit Deo[1] and Shomia Suman[2]

[1]Department of Soil Science, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India.
[2]Department of Horticulture (Floriculture and Landscaping), Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India.

Corresponding Email: deonivedit@gmail.com

Abstract

The soil beneath our feet functions as a complex living system whose productivity cannot be fully explained by chemical nutrients or microbial diversity alone. Identical fertilizer applications frequently yield inconsistent crop performance across locations, pointing to subtle regulatory factors operating beyond conventional soil science. This study introduces the concept of microvita—subtle living entities proposed by Prabhat Ranjan Sarkar in 1986—as potential orchestrators that bridge physical matter, chemical processes, and biological networks in soil ecosystems. Drawing from network ecology and long-term field observations, the framework posits that microvita selectively modulate microbial interactions and nutrient pathways, explaining site-specific responses and ecosystem multifunctionality. Analysis of soil food webs reveals that modular clusters, rather than overall species richness, strongly predict yield stability and resilience to stressors such as drought and degradation. Integrating microvita principles with modern practices like targeted composts, biochar amendments, and diversified crop rotations offers a pathway to restore degraded lands more efficiently than synthetic inputs alone. Experimental patterns from organic-amended soils demonstrate enhanced interconnected networks that align with microvita-driven "denominations," resulting in improved nutrient cycling, carbon sequestration, and stress tolerance. In conclusion, this microvital approach promises reduced chemical dependency, greater climate resilience, and sustainable agricultural productivity.

Keywords: Microvita, soil health, ecosystem multifunctionality, microbial networks, sustainable agriculture, ecological restoration

IIZCAGV-26-T2-130

Survey and prevalence of stem rot of cluster bean caused by *Sclerotium rolfsii* in major growing districts of Northern Madhya Pradesh

Neelam Soni[1*], R. S. Sasode[1], R. B. Jatav[1], Anita Kumari Pandey[1], Yogesh Kumar[1] and Sucharita Mohapatra[1]

[1]Department of Plant Pathology, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) 474002

*Email- sonineelam2310@gmail.com

Abstract

Cluster bean (*Cyamopsis tetragonoloba* L. Taub.), commonly known as guar, is an important legume crop widely cultivated in the arid and semi-arid regions of India. Stem rot of cluster bean caused by *Sclerotium rolfsii* Sacc., is a soil-borne disease that leads to significant crop

damage and yield loss. In 2023, a survey was conducted across 100 fields in 20 villages within three districts of northern Madhya Pradesh. The findings revealed that stem rot caused by Sclerotium rolfsii is a major pathological problem, with its occurrence confirmed in all surveyed districts. A roving survey was carried out in Gwalior, Morena and Shivpuri districts to evaluate the severity of the disease. In Gwalior district, the highest incidence of stem rot (25.33%) was recorded in Panihar village while the lowest incidence (2.67%) occurred in Patai village. In Morena district, Mitawali village reported the highest disease incidence of 18.67% whereas Joura village showed the lowest of 1.33%. In Shivpuri district, disease incidence varied from 2.67% in Karsena village to 20.00% in Karyawati village. The overall mean incidence of stem rot recorded during the survey was 11.81% in Gwalior, 10.10% in Morena and 10.89% in Shivpuri district.

Keywords: Cluster bean, Stem rot, Sclerotium rolfsii, Survey, Percent Disease Incidence

IIZCAGV-26-T2-131

Food Product Innovation

Srijan Sharma

Undergraduate student, B.Tech (Food Technology), Department of Food Technology, Raipur, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G)

Corresponding Author – srijansharmaa0810@gmail.com

Abstract

Food constitutes the fundamental commodity, profound manifestation of cultural identity, beyond boundaries to unite individuals, industries and nations. Food Technology is agriculture allied fields for processing grains and harvested products. The human experience is virtually linked to food encompassing the cycle of production, distribution, manufacturing, procurement and consumption. The cycle profoundly influences daily existence in professional and domestic spheres, political arenas and recreational, physiological well-being and imaginative faculties. New innovative field in a food considered as processed, semi processed, ultra processed. Food safety and standard authority of India (FSSAI) makes a guideline for each and every food product beyond its limit it should be considered as illegal. New model era Technology features loaded machines, AI has to know the data stats of new food products also, check the sustainability of new products in the market. Consumer demands propel product innovation, particularly in functional domains. By first dissecting a product's functions and subsequently recombining them much like transforming traditional yogurt into probiotic-enriched variants or staple grains into convenient ready-to-eat meals novel designs emerge. Health awareness is an important factor to concert in any food material as it is more reactive and contaminated over product time. This paper delineates a systematic approach to enhancing extant products via axiomatic design principle.

Keywords - Food, Innovation, Technology, FSSAI, Health, precautions.

IIZCAGV-26-T2-132

Climate Smart Agronomic Practices for Sustainable Crop Production

Shailesh [1*], Kuldeep [2]

[1]M. Sc. (Ag.) Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India
[2]M. Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

*Corresponding Author Email: janghelshailesh1999@gmail.com

Abstract

The phenomenon of climate change is posing considerable risk for the entire globe in terms of agricultural activities since there is an increase in drought, heat stresses, and erratic precipitation, which impacts negatively the yield of crops. The practice of climate smart agronomy is a sustainable strategy for addressing the issue in question while improving crop productivity. This article critically examines the major climate-smart agronomic strategies including conservation tillage, integrated nutrient management, adoption of drought-resistant varieties, efficient water management using drip irrigation and mulching, and precision agriculture practices. Such measures allow for more efficient use of resources, maintenance of soil health, and minimization of carbon emissions. There is evidence showing that a combination of organic and inorganic nutrient sources increases soil fertility levels and promotes microbial activities. In addition, the adoption of water-saving practices allows for efficient water usage under drought conditions. Finally, precision agriculture practices ensure that decisions are based on timely information, promoting more efficient use of inputs. Overall, climate smart agronomic strategies offer an all-round strategy for implementing sustainable crop production practices in the modern era.

Keywords: Climate smart agriculture, Sustainable farming, Resource use efficiency, Soil health, Precision agriculture, Water management

IIZCAGV-26-T2-133

Harnessing Digital Technologies for Precision Fruit Farming

Jeet Kumar Kurre, Jitendra Chandravanshi and Hemant Kumar

Department of Fruit Science

College of Horticulture and Research Station, Sankara- Patan, Durg (C.G.) 491001India

Abstract

Precision farming is an approach where inputs are utilized in precise amounts to get increased average yields compared to traditional cultivation techniques. The application of digital tools in the precision forming of fruit crops, focusing on improving productivity, reducing waste, and ensuring sustainability. Technologies such as remote sensing and satellite imagery provide big data analytics are employed to monitor crop health, optimize growth patterns, and prediction leveraging this yield. It involves applying the right treatments at the right time and location within a field. In horticulture, precision farming plays a crucial role in resource-efficient management as well as reducing significant labour requirement, including techniques like Fertigation, greenhouse cultivation, soil and leaf nutrient-based fertilizer

management. It fulfills the criteria of being a potential tool for orchard management with efficient technologies such as Global Positioning System (GPS), Geographic Information System (GIS), remote sensing, Variable Rate Technology, Yield mapping and monitoring (Alam etal. 2024).

Keywords: GPS, GIS, Micro propagation, Precision farming, remote sensing,

IIZCAGV-26-T2-134

Digital Pest Surveillance and Early Warning Systems for Climate-Resilient Agriculture

Bazar Thimmappa Charan Kumar[1], S.P.S. Tomar[2], Soumya Sephalika Dash[3], Neha Sharma[4]

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[2]Senior Scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[3]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[4]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: charankumarbt@gmail.com

ABSTRACT

The increasing variability in climate and the rapid spread of invasive pests have intensified the need for timely and accurate pest monitoring systems in agriculture. Digital pest surveillance and early warning systems are emerging as powerful tools to support climate-resilient crop protection. This review explores recent developments in digital technologies, including remote sensing, mobile-based applications, geographic information systems (GIS), and Internet of Things (IoT)-enabled sensors, for real-time monitoring and forecasting of insect pest outbreaks.

These systems enable continuous data collection on pest incidence, weather parameters, and crop conditions, allowing the generation of predictive models for early warning and decision support. The integration of machine learning algorithms further enhances the accuracy of pest detection and outbreak prediction, helping farmers take timely and need-based management actions. Such approaches reduce unnecessary pesticide applications, lower production costs, and minimize environmental risks. Case studies from different agro-climatic regions demonstrate that digital pest surveillance systems significantly improve pest management efficiency and crop productivity under changing climate scenarios. However, challenges such as limited digital literacy, infrastructure gaps, and data accessibility need to be addressed for large-scale adoption. Strengthening extension services, capacity building, and farmer-friendly digital platforms will be crucial for maximizing the benefits of these technologies. Overall, digital pest surveillance and early warning systems offer a promising pathway for enhancing pest management, improving resource-use efficiency, and building climate-resilient agricultural systems.

Keywords: Digital pest surveillance, Early warning system, Climate-resilient agriculture, IoT, GIS, Machine learning, Pest forecasting

IIZCAGV-26-T2-135

Climate Smart Agronomic Practices for Sustainable Crop Production

Shailesh [1*], Kuldeep [2]

[1] M. Sc. (Ag.) Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India

[2] M. Sc. (Ag.) Department of Soil Science, College of Agriculture Raipur, IGKV Raipur, 492012, Chhattisgarh, India

*Corresponding Author Email: janghelshailesh1999@gmail.com

Abstract

The phenomenon of climate change is posing considerable risk for the entire globe in terms of agricultural activities since there is an increase in drought, heat stresses, and erratic precipitation, which impacts negatively the yield of crops. The practice of climate smart agronomy is a sustainable strategy for addressing the issue in question while improving crop productivity. This article critically examines the major climate-smart agronomic strategies including conservation tillage, integrated nutrient management, adoption of drought-resistant varieties, efficient water management using drip irrigation and mulching, and precision agriculture practices. Such measures allow for more efficient use of resources, maintenance of soil health, and minimization of carbon emissions. There is evidence showing that a combination of organic and inorganic nutrient sources increases soil fertility levels and promotes microbial activities. In addition, the adoption of water-saving practices allows for efficient water usage under drought conditions. Finally, precision agriculture practices ensure that decisions are based on timely information, promoting more efficient use of inputs. Overall, climate smart agronomic strategies offer an all-round strategy for implementing sustainable crop production practices in the modern era.

Keywords: Climate smart agriculture, Sustainable farming, Resource use efficiency, Soil health, Precision agriculture, Water management

IIZCAGV-26-T2-136

To Study the role of Plant Growth Regulators (PGRs), in Fruit Production

Jitendra Chandravanshi[1], Jeet Kumar Kurre[2] and Hemant Kumar[3]

Department of Fruit Science (1, 2) and Floriculture and Landscaping[3]College of Horticulture and Research Station, Sakra-Patan, Durg (C.G.) 491001India

Abstract

Plant hormone is an organic compound, synthesized in one part of the plant and translocated to another part, where in very low concentrations it causes a physiological response. The plant

hormones are identified as promoters (auxins, gibberellins and cytokine), inhibitors (Abscisic acid and ethylene) and other PGRs like brassinostroids, salicylic acid, jasmonic acid and triacontanol. Plant Growth Regulators (PGRs) were soon identified that could improve yield, quality and postharvest life. Auxin is a first isolated plant hormone that promote apical dominance and swelling of ovary without fertilization to get seedless fruit ,gibberellins to help in formation of alpha amylase enzyme during seed germination that promote seed germination and dormancy break, cytokine also help in shoot formation from callus in tissue culture, ethylene is a only gaseous hormone that affect the quality of fruit by ripening and senescence, ABA also known as defence hormone that protect the fruit crop during water imbalance by closing of stomata. Brassinostroids, Salicylic acid, Jasmonic acid and other new generation PGRs also control the physical and metabolic activity. Plant metabolism, the sum of all chemical reactions in a plant cell, is a complex network of process essential for growth, development and response to environmental stresses, primary metabolites necessary of plant for complete its life cycle and secondary metabolites are restricted only in specific plant species this are responsible for test, aroma, colour quality of fruit and protect of fruit plant during stresss condition. Some PGRs affect the quality and quantity of metabolites. Continued population growth and limited land availability will facilitate the utilization of plant growth regulators (PGRs) in sustainable
horticulture to enhance fruit quality and yields.

Keyword: Apical dominance, fruit quality, plant growth regulator, plant metabolites, stress.

IIZCAGV-26-T2-137

Assessment of host resistance in cluster bean (*Cyamopsis tetragonoloba*) against *Alternaria cucumerina* var. *cyamopsidis* (Ranga. & Rao)

Anita Kumari Pandey1, Rajni Singh Sasode1, Neelam Soni1, Yogesh Kumar1, Rajbabbar Jatav1 and Sucharita Mahapatra1, Pratham Singh1

[1]Department of Plant Pathology, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) 474002

Corresponding Email: - anitapandey689@gmail.com

Abstract

Cluster bean (Cyamopsis tetragonoloba (L.)) is a significant leguminous crop primarily cultivated for guar gum production. Its productivity is considerably constrained by Alternaria cucumerina var. cyamopsidis, the causal organism of Alternaria leaf blight, which results in substantial yield reductions. A field study conducted at RVSKVV, Gwalior (Madhya Pradesh), assessed the resistance response of 27 cluster bean genotypes under natural conditions. The genotypes were classified based on their reaction to the pathogen, and none demonstrated complete immunity or high resistance. However, seven genotypes HG 19-4, HG 2-20, RGC-1033, RGr 20-15, RGC-1066, RGr-19-15, and GL-10 were identified as moderately resistant. Fourteen genotypes showed a moderately susceptible reaction, while six were categorized as susceptible. These findings emphasize the necessity of strengthening breeding programs to incorporate resistance against Alternaria leaf blight. The identified

moderately resistant genotypes can be utilized as potential sources in resistance breeding, facilitating the development of durable, disease-resistant varieties for sustainable cluster bean cultivation.

Keywords: Alternaria cucumerina var. cyamopsidis, cluster bean, Alternaria leaf blight, host resistance, genotypic evaluation

Keywords: Climate smart agriculture, Sustainable farming, Resource use efficiency, Soil health, Precision agriculture, Water management

IIZCAGV-26-T2-138

Agri Biotechnology and biotech innovation

Chanchal Jain

College of Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya Jabalpur 482004 Madhya Pradesh, India.

Corresponding author's email- cjain032006@gmail.com

Abstract

Agricultural biotechnology refers to the application of biological sciences and modern techniques to improve plants, animals, and microorganisms for enhanced agricultural productivity, sustainability, and resilience. It integrates tools such as genetic engineering, molecular markers, tissue culture, and genome editing to develop improved crop varieties with desirable traits like higher yield, pest and disease resistance, drought tolerance, and improved nutritional quality. Innovations such as transgenic crops and gene-edited plants have significantly contributed to global food security by reducing crop losses and input costs. Biotech innovation in agriculture also includes advancements in biofertilizers, biopesticides, and microbial technologies that promote eco-friendly farming practices and reduce dependence on chemical inputs. Techniques like CRISPR-Cas9 genome editing have opened new avenues for precise and efficient modification of genetic material, enabling faster development of improved crop varieties. Additionally, innovations in synthetic biology and omics technologies (genomics, proteomics, metabolomics) are enhancing our understanding of plant systems and accelerating crop improvement programs. Furthermore, agricultural biotechnology plays a crucial role in addressing climate change challenges by developing climate-resilient crops and sustainable agricultural practices. It also supports value addition through biofortification and improved post-harvest traits. Despite its immense potential, the adoption of biotech innovations faces challenges related to biosafety concerns, regulatory frameworks, ethical issues, and public acceptance. In conclusion, agricultural biotechnology and biotech innovation are essential drivers of modern agriculture, offering sustainable solutions to meet the growing global demand for food, fibre, and fuel while ensuring environmental conservation and economic viability

IIZCAGV-26-T2-139

Elucidating the Seed-Borne Behaviour, Systemic Localization, and Symptom-Linked Inoculum Advancement of *Fusarium oxysporum* f. sp. *ciceri* in Chickpea

R. K. Singh and Pinnamwar Keerthi

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Agriculture, Indore (MP) 452001

Corresponding Email- rakesh0429@gmail.com

Abstract

Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is one of the most widely distributed and destructive diseases of chickpea across the globe. The pathogen exhibits a unique capacity for perpetuation through both seed and soil, surviving mainly as chlamydospores in soil and as mycelium and resting spores in seed, thereby serving as a primary source of infection. The present investigation was conducted to study the seed-borne nature of the pathogen, its systemic movement within the host, and its relationship with symptom expression and time of infection. In susceptible genotypes, wilting symptoms were observed as early as 25 days after sowing under field conditions, while late wilting symptoms became prominent during flowering and podding stages. Late wilted plants exhibited chlorosis, drooping of rachis, leaflets and petioles, necrosis, and yellowing of foliage. The systemic progression of the pathogen was evaluated at five stages of pod formation, viz., <10%, 25%, 50%, 75%, and 100%. Systemic infection was found to be higher in plants exhibiting chlorosis symptoms compared to drooping symptoms. Seed infection was significantly greater in chlorotic plants (32.5%) than in drooping plants (7.5%). The mean systemic infection in chlorotic plants was highest in root (93.5%), followed by stem (74%), stalk (44%), and seed (32.5%), whereas in drooping plants it was 91.5%, 69%, 26.5%, and 7.5%, respectively. Root infection remained above 90% irrespective of the stage of pod formation. Infection in stem, stalk, and seed was highest when infection occurred at <10% pod formation stage and gradually decreased with delay in infection, reaching the lowest level at 100% pod formation stage. The study clearly indicates that early infection leads to greater systemic colonization and seed transmission of the pathogen, particularly in plants expressing chlorosis symptoms.

IIZCAGV-26-T2-140

Elevated CO_2 As a Novel Tool for Suppression of Fall Armyworm in Controlled Environment Agriculture

Kurru Charitha[1*], Pradyumn Singh[1], N. S. Bhadauria[1], S. P. S. Tomar[1], Neha Sharma[1], Rahul Patidar[1] and Soumya Shephalika Dash[1]

[1]Department of Entomology, RVSKVV, Gwalior (M.P.) 474002

[*]Corresponding email: charithak2021@outlook.com

Abstract

Fall armyworm control is still a major problem for contemporary crop production, especially in sheltered farming methods. A special platform for adjusting air conditions, such carbon dioxide (CO2) concentrations, for possible insect suppression is offered by controlled environment agriculture (CEA). Insect physiology, eating habits and developmental rates have all been demonstrated to be impacted by elevated CO2 levels above ambient amounts. By changing host plant biochemistry, such as raising carbon-to-nitrogen ratios and secondary metabolites, elevated CO2 can directly lessen pest damage to fall armyworms by lowering larval performance and feeding efficiency. Furthermore, under severe concentrations, hypercapnic circumstances may directly impact insect respiration, resulting in decreased survival, stunted growth and altered reproduction. In CEA systems, plant tolerance can be increased and pest outbreaks can be suppressed by strategically using enhanced CO2 in conjunction with optimal temperature and humidity regimes. However, this strategy's efficacy depends on keeping CO2 levels within ranges that don't negatively impact beneficial arthropods or crop output. To guarantee long-term sustainability, integration with biological control agents and other integrated pest management techniques id crucial. This strategy demonstrates the possibility of atmospheric modification as a cutting-edge, environmentally responsible agricultural entomology tool for controlling fall armyworm infestations.
Keywords: Controlled environment agriculture, elevated CO2, sustainability, integrated pest management, fall armyworm

IIZCAGV-26-T2-141

Climate Resilient Agriculture: Seeds Of Survival: Climate Resilient Varieties In Changing World

Yogeshwari Dangi

College Of Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, 482004, Madhya Pradesh, India

Corresponding Author's Email: yogeshwaridangi28@gmail.com

Abstract

Climate change is already affecting agriculture in visible ways—irregular rainfall, longer dry spells, sudden floods, and rising temperatures are making farming more uncertain than ever. For many farmers, especially smallholders, these changes directly impact crop yields and income. In this situation, climate-resilient agriculture has emerged as a practical and necessary approach, with improved crop varieties acting as true "seeds of survival." Climate-resilient varieties are developed to tolerate specific stresses such as drought, submergence, heat, and salinity. For example, drought-tolerant maize varieties have helped farmers maintain yields even during low rainfall years, while flood-tolerant rice varieties like Swarna Sub1 can survive prolonged submergence. Similarly, heat-tolerant wheat varieties are being promoted in regions facing rising temperatures, helping reduce yield losses during warmer winters. In addition to modern scientific advancements, traditional and indigenous crop varieties also play an important role. Millets such as sorghum and pearl millet are naturally resilient to harsh conditions and require less water, making them suitable for climate-vulnerable regions. Combining such traditional knowledge with improved breeding techniques can strengthen agricultural resilience. However, developing resilsient seeds alone

is not enough. Farmers need timely access to quality seeds, proper awareness, and support systems to adopt these varieties effectively. Strengthening local seed systems and promoting crop diversity are key steps toward building resilience. In a changing world, climate-resilient crop varieties offer a practical solution to sustain agriculture. By adopting these "seeds of survival," farmers can better cope with climate uncertainties while ensuring food security and stable livelihoods.

IIZCAGV-26-T2-142

Climate-Resilient Agriculture: Farming the Future: Climate-Resilient Crops for Sustainable Agriculture

Oshi Khampariya

College Of Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur,482004, Madhya Pradesh, India

Corresponding author's email: oshikhampariya72@gmail.com

Abstract

Farming the future" is no longer a vision—it is an urgent response to a rapidly changing climate. As rising temperatures, erratic rainfall, and extreme weather events redefine agricultural boundaries, the focus is shifting from maximizing yield to ensuring resilience. Climate-resilient agriculture represents this shift, where sustainability and adaptability go hand in hand to secure food systems for generations to come. At the core of thistransformation are climate-resilient crop varieties—intelligently developed crops that act as living solutions to environmental stress. Engineered through a blend of traditional knowledge and modern science, these varieties possess the ability to withstand drought, floods, salinity, heat stress, and emerging pest challenges. They not only protect productivity under adverse conditions but also reduce dependence on natural resources, making agriculture more efficient and eco-friendly. This booklet explores the concept of "Farming the Future" by highlighting the role of climate- resilient crops as catalysts for sustainable agriculture. It emphasizes how innovation in crop development can convert climate challenges into opportunities, paving the way for a resilient, productive, and environmentally balanced agricultural system.

Keywords: Climate resilience, Sustainable agriculture, Stress-tolerant crops, Climate-smart farming, Food security, Crop innovation

IIZCAGV-26-T2-143

Efficacy of Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS as seed treatment against early crop stage insect pests and diseases in Soybean

Rajiv Dubey and H.P. Singh

RVSKVV, College of Horticulture, Mandsaur

Email: rajivdubey.1503@rediffmail.com

Abstract

The field experiment was laid out with Soybean crop at Regional Horticulture Research Station, Jaora, Ratlam, Madhya Pradesh, India, during *Kharif*- 2024 and *Kharif*- 2025 in a Randomized Block Design to standardize the dose and to assess the bio efficacy and phytotoxicity of Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v (450 FS) against early crop stage insect pests and diseases in Soybean. Totat ten treatments were tested viz, Untreated Check, Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS [dose 0.225 g ai/kg seed (0.075+0.0187+0.131), Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS [0.45 g ai/kg seed (0.15+0.0375+0.263)], Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS [0.675 g ai/kg seed (0.225+0.055+0.395)], Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS [0.90 (0.30+0.075+0.526)], Sedaxane 500 FS [0.80 g ai/kg seed], Azoxystrobin 100 FS [0.20 g ai/kg seed], Thiamethoxam 30% FS [2.4 g ai/kg seed], Azoxystrobin 2.5% + Thiophanate Methyl 11.25% + Thiamethoxam25% [3.875 g ai/kg seed] and Pyraclostrobin 3.5% + Thiram 15% + Clothianidin 22.5% FS [2.87 g ai/kg seed (0.245+ 1.05+1.575)]. Among the treatments, Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v (450 FS) 1.5 ml/kg seed and Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS @ 1 ml/kg seed was found very effective and statistically superior over all the treatments against Seedling blight and Rhizoctonia rot disease in soybean along with Jassid control. Hence, Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v @ 1 ml/kg seed can be recommended as the optimum dose for managing Seedling blight and Rhizoctonia rot disease diseases and Jassid control of soybean. None of the doses of Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS was found phytotoxic to Soybean crops. Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS at the rate 1 ml/kg seed and Sedaxane 15% w/v + Azoxystrobin 3.75% w/v + Thiamethoxam 26.25% w/v FS at the rate 1.5 ml/kg seed showed significantly better results on germination and crop vigour over rest of the treatments and untreated check.

SUB THEME-III



AI ML, Data Analytics and Decision Support Systems in Agriculture, High-tech agriculture, digital tools, Advanced Integrated Pest and Disease Management Technologies (IPM/IDM)

IIZCAGV-26-T3-144

Artificial Intelligence in Agriculture: A Comprehensive Review of Technologies, Applications and Pathways to Sustainability

Soumya Patel[1] and Stuti Sharma[2]

[1]Ph.D. research scholar, Genetics and Plant Breeding, College of Agriculture, JNKVV, Jabalpur, M. P., India- 482004

[2]Assistant Professor, Genetics and Plant Breeding, College of Agriculture, JNKVV, Jabalpur, M. P., India- 482004

Corresponding Email: soumyapatel090698@gmail.com

Abstract

The agricultural industry is rapidly changing due to artificial intelligence (AI), which makes data-driven, accurate, and sustainable farming methods possible. Machine learning, deep learning, computer vision, robotics, and natural language processing are just a few of the AI technologies covered in this assessment, along with their applications in a variety of agricultural fields. Precision farming, crop and soil monitoring, pest and disease detection, smart irrigation, plant breeding, livestock management, and supply chain optimization are some of the major topics covered. AI's integration with cutting-edge technologies like big data analytics, remote sensing, and the Internet of Things (IoT) has greatly improved decision-making and resource efficiency. Despite its potential, data quality, infrastructure, expertise in the field, and accessibility are challenges to AI's adoption in agriculture, especially in developing nations. In order to ensure moral and inclusive implementation, the assessment also emphasizes the significance of collaborative frameworks, capacity building, and policy assistance. Future prospects suggest that AI can be crucial to attaining global food security and sustainable agricultural growth when paired with sophisticated breeding techniques and digital agriculture systems.

Keywords: Artificial intelligence, deep learning, internet of things, machine learning, resource use efficiency, sustainable farming

IIZCAGV-26-T3-145

Applications of Space-borne Imaging Spectroscopy in Agriculture: Modern Sensors and Emerging Trends

Simran Bhagat[1] and Yash Raj1,

1Department of Soil Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG) 492012, India.

Corresponding Email: msbhagat56@gmail.com

Abstract

Hyperspectral imaging spectroscopy is an advanced remote sensing approach that captures continuous, narrow spectral bands across the electromagnetic spectrum, enabling precise characterization of surface features based on their physical and chemical composition. Recent

advancements in optics and electronics have improved image quality, signal-to-noise ratio, and spatial and spectral resolution of modern space-borne sensors. Freely available space-borne missions such as EnMAP (Environmental Mapping and Analysis Program) and PRISMA (PRecursore IperSpettrale della Missione Applicativa), along with DESIS (Earth Sensing Imaging Spectrometer), EMIT (Earth Surface Mineral Dust Source Investigation), and HISUI (Hyperspectral Imager Suite), have expanded agricultural applications. This study evaluates their applicability in agriculture and environmental modelling using modern machine learning and deep learning techniques. Hyperspectral data have shown strong potential in estimating soil properties such as soil organic carbon (coefficient of determination 0.3 - 0.8) and in crop type mapping with high accuracy. Key crop biophysical parameters including Leaf area index, biomass, canopy water content, fraction of absorbed photosynthetically active radiation, and plant height, along with chemical properties such as Nitrogen content estimation, can be effectively retrieved. Crop stress detection using red-edge and narrowband indices supports monitoring of both biotic and abiotic stress conditions. Overall, space-borne imaging spectroscopy combined with advanced analytics offers strong potential for precision agriculture and sustainable farm management.

Keywords: Imaging spectroscopy, Remote sensing, Precision agriculture, Geospatial analysis, Crop health analysis, Agricultural modelling

IIZCAGV-26-T3-146

Drone Technology and Globalization: Benefits, Risks, and Future Opportunities

Lavesh Malviya, Ramnivas Patidar, Vijay Madan, and Sachin Anchal

College of Agriculture Rewa, (M.P) 486001

Corresponding Email: laveshmalviya13@gmail.com

Abstract

Globalization is increasingly driven by the integration of advanced technologies, among which drone technology has emerged as a significant innovation. The use of drones has expanded rapidly across multiple sectors, including agriculture, healthcare, and the military. In agriculture, drones provide farmers with real-time data, enabling them to make informed decisions regarding the efficient use of resources and farm inputs. In the healthcare sector, drones play a crucial role by delivering essential medical supplies—such as blood, vaccines, medicines, and laboratory samples—to remote and underserved areas, especially during emergencies in developing countries. In the military domain, drones enhance security and surveillance by monitoring enemy activities and supporting precision operations.

Despite these advantages, drones also present certain risks. Improper handling by untrained operators or technical failures during flight can lead to accidents, causing injury to individuals and damage to property. Furthermore, there is a growing concern about the misuse of drones by extremist groups, who may hijack them and alter their payloads for harmful purposes. This paper aims to provide a comprehensive analysis of current

developments in agricultural, medical, and military drone applications by examining their strengths, weaknesses, and potential opportunities.

Keyword: Drone Technology, Unmanned Aerial Vehicles (UAVs), Agriculture, Precision Farming, Healthcare Delivery.

IIZCAGV-26-T3-147

Climate Change and Insect Pest Infestation and Management

Sisodia Ankita Dinesh Singh[1*], N.S. Bhadauria[1], Kunjum Pradeeprao Likhitkar[1], Sarita[1], Shubham Singh[1]

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.

*Presenting author ankitasinghsisodia007@gmail.com

Abstract

Climate change has emerged as a major factor influencing the dynamics of insect pest populations, posing significant threats to global agriculture and food security. Rising temperatures, altered precipitation patterns, and increased atmospheric carbon dioxide levels directly affect insect biology, including their survival, reproduction, distribution, and feeding behavior. Warmer climates often accelerate insect life cycles, resulting in more generations per year and increased pest pressure on crops. Additionally, climate change facilitates the expansion of invasive pest species into new geographical regions, where they may encounter fewer natural enemies. Changes in climatic conditions also disrupt the synchrony between pests and their host plants, sometimes favoring pest outbreaks. Moreover, natural enemies such as predators and parasitoids may be adversely affected, weakening biological control mechanisms. These shifts can lead to increased crop damage, reduced yields, and greater reliance on chemical pesticides, which may further harm ecosystems and human health. Effective pest management under changing climatic conditions requires adaptive and integrated approaches. Climate-resilient Integrated Pest Management (IPM) strategies, including the use of resistant crop varieties, biological control agents, habitat management, and precision agriculture tools, are essential. Monitoring and forecasting systems using climate models and remote sensing technologies can aid in early pest detection and timely interventions. Furthermore, promoting agroecological practices and farmer awareness can enhance system resilience. In conclusion, climate change intensifies insect pest challenges, necessitating innovative and sustainable management strategies. Strengthening research, policy support, and extension services will be critical in mitigating the impacts of climate-driven pest outbreaks and ensuring agricultural sustainability.

Keywords: Climate change, Insect pests, Pest dynamics, Crop protection, Pest forecasting.

IIZCAGV-26-T3-148

Innovative Solutions in Indian Agriculture: The Influence of IoT and AI Technologies

Anjula Bhartiya[1], Dr. Shobhana Gupta[2], Dr. Siddharth Namdev[3], Sumit Kumar Shukla[4]

[1]Ph.D. scholar, Department of Agri. Extension Education, COA, RVSKVV, Gwalior.474002 Madhya Pradesh, India.

[2]Deputy Director Extension (DDE), RVSKVV, Gwalior.474002 Madhya Pradesh, India

[3]Guest Faculty, Department of Agri. Extension Education, COA, RVSKVV, Gwalior.474002 Madhya Pradesh, India.
[4]Ph.D. scholar, Department of Agri. Extension Education, CSJMU, Kanpur.208024 Uttar Pradesh, India.

Corresponding Email: anjulabhartiya1@gmail.com

Abstract

This research investigates the influence of IoT and AI on various facets of Indian agriculture, focusing on crop yield enhancement, resource management, and market connectivity. IoT and AI technologies provide innovative solutions such as precision farming, automated irrigation, and predictive analytics, which can greatly improve agricultural productivity and sustainability. IoT devices, including soil sensors, weather stations, and drones, deliver real time data that enables farmers to make well-informed decisions regarding crop management, pest control, and irrigation timing. AI algorithms analyze this data to forecast crop yields, optimize the use of inputs like water and fertilizers, and streamline supply chain operations. This study utilizes data from governmental sources, including the Ministry of Agriculture & Farmers Welfare and the National Sample Survey Office (NSSO), to evaluate the effectiveness and adoption of these technologies across various regions in India. The findings reveal that areas where IoT and AI technologies have been implemented experience a significant increase in crop yields, ranging from 15% to 20%. Furthermore, these technologies have contributed to a substantial reduction in water usage, with automated irrigation systems optimizing water resources by as much as 30%. Additionally, AIdriven market analytics have enhanced farmers' access to markets, enabling them to secure better prices for their products by forecasting market trends and demand.

Keywords: Innovation, Internet of Things, Artificial Intelligence, Indian Agriculture, Smart farming.

IIZCAGV-26-T3-149

IoT Applications for Smart Farming Technologies in India

Megha Mandloi[1] and D. K. Paliwal[2]

[1]Young Professional-I, RVSKVV, Gwalior
[2]Associate Professor (Agronomy), RVSKVV, Gwalior

Abstract

The rapid advancement of the Internet of Things (IoT) is revolutionizing agricultural practices worldwide, and its application in Indian agriculture is gaining significant attention as a pathway toward smart and sustainable farming. India, being predominantly an agrarian economy, faces numerous challenges such as climate variability, water scarcity, declining soil fertility, fragmented landholdings, and increasing input costs. IoT-based smart farming technologies offer innovative solutions to address these challenges by enabling real-time monitoring, automation, and data-driven decision-making across various agricultural operations. IoT in agriculture involves the integration of interconnected sensors, actuators, communication networks, and cloud-based platforms to collect, transmit, and analyze field data. These technologies facilitate continuous monitoring of critical parameters such as soil

moisture, temperature, humidity, nutrient levels, and crop health. Based on these data, farmers can make precise and timely decisions regarding irrigation scheduling, fertilizer application, pest management, and harvesting. In India, IoT applications are increasingly being used in precision agriculture, smart irrigation systems, greenhouse automation, livestock monitoring, and post-harvest management. One of the most significant applications of IoT in Indian agriculture is smart irrigation, which helps optimize water use efficiency by delivering water based on real time soil and weather conditions. This is particularly important in water-stressed regions. Similarly, IoT-enabled nutrient management systems improve fertilizer use efficiency, reducing input costs and minimizing environmental pollution. The integration of IoT with advanced technologies such as artificial intelligence (AI), machine learning (ML), and big data analytics further enhances predictive capabilities, enabling early detection of crop diseases, yield forecasting, and climate risk management. Review studies also highlight the role of IoT in improving farm productivity and profitability. Automated systems reduce labor dependency and operational costs while increasing accuracy and efficiency in farm operations. IoT-based decision support systems provide farmers with actionable insights through mobile applications, thereby bridging the information gap and enhancing farm management practices. These technologies are particularly beneficial for small and marginal farmers in India, who constitute a major portion of the farming community. Despite its immense potential, the adoption of IoT in Indian agriculture faces several challenges. High initial investment costs, lack of reliable internet connectivity in rural areas, limited technical knowledge among farmers, and issues related to data security and interoperability are major constraints. Additionally, the absence of standardized frameworks and inadequate institutional support hinder large-scale implementation. In conclusion, IoT-based smart farming technologies have the potential to transform Indian agriculture into a more efficient, sustainable, and resilient system. By improving resource use efficiency, enhancing productivity, and reducing environmental impact, IoT can play a crucial role in ensuring food security and economic growth. However, to realize its full potential, there is a need for supportive government policies, infrastructure development, capacity building, and increased awareness among farmers. The convergence of IoT with emerging digital technologies is expected to drive the next phase of agricultural transformation in India.

IIZCAGV-26-T3-150

AI-Powered Unmanned Aerial Vehicles for Crop Management”

Nitin Kumar Koumary[1], Anoop Kumar Dave[2], Rajesh Kumar Naik[2], Viren Manish Victor[2], Sanjay Kumar Gilhare[1], Shanker Lal Verma[1]

[1]Ph.D. Scholar, Department of Farm Machinery and Power Engineering, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), 492012, INDIA
[2]Professor, Department of Farm Machinery and Power Engineering, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), 492012, INDIA

Corresponding Email: nitinkoumary007@gmail.com

Abstract

Modern agriculture has become revolutionary with the intersection of the Artificial Intelligen ce (AI), Unmanned Aerial Vehicles (UAVs), and the Internet of Things (IoT), which allow int

elligent, datadriven crop management systems. This chapter presents a critical analysis of AIp owered UAVs deployment in the context of precision agriculture to improve the quality of de cisions, resource management, and sustainable food production. UAVs with sophisticated sen sors and imaging devices deliver highquality and realtime information on crop conditions, soi l levels, nutrient conditions, and pests dynamics. AI incorporation makes data processing mor e automated, using machine learning and deep learning algorithms, allowing predictive analyt ics and disease detection as well as forecasting yields with astonishing accuracy. Moreover, th e IoTrelated connectivity will guarantee the smooth connection between UAVs, ground senso rs, and farm management software, creating a harmonious digital environment of realtime mo nitoring and control. The chapter provides an overview of the current developments, major ap plications, and future research trends in AIbased UAV systems in the management of crops pr ecisely. This paper highlights the disruptive nature of AIpowered UAV in the implementation of climateresilient, sustainable, and intelligent agricultural systems in the future by highlighti ng examples of innovative use cases and technological synergies. Keywords: Artificial Intelli gence (AI), Unmanned Aerial Vehicles (UAVs), Precision Agriculture,Internet of Things (IoT), Crop Monitoring, Smart Agriculture.

IIZCAGV-26-T3-151

AI-Powered Integrated Pest Management in Sustainable Agriculture

Kiran Thakur[1], Satya Prakash Singh Tomar[1]

Department of Entomology, Rajmata Vijayaraje Krishi Vishwa Vidyalaya, Gwalior, 474002 Madhya Pradesh, India

Corresponding email: Kiranthakur5438@gmail.com

Abstract

As global agriculture moves toward the 2030 sustainability goals the transition from traditional scouting to AI-driven Integrated Pest Management (IPM) has become a strategic necessity. The latest advancements in deep learning and IoT-driven surveillance, specifically focusing on the deployment of YOLOv11 architectures for Fall Armyworm (Spodoptera frugiperda) in maize cultivation, detect early-stage larval feeding (pinholes) that are often missed by human scouts. In terms of sucking Pests (e.g., Aphids and BPH) in rice and vegetable systems, IoT-enabled smart traps monitor population densities at the plant base. Upon crossing economic thresholds, the system suggests cultural practices such as Alternate Wetting and Drying (AWD) or precision Variable Rate Application (VRA) of botanical oils reducing reliance on broad-spectrum synthetics. By integrating multi-modal data from drones, multispectral satellites and smart traps these systems now achieve identification accuracies exceeding 95%. A critical highlight is the I2-PDM (Intelligent and Integrated Pest and Disease Management) framework which utilizes long-term field data (1,368 days) to provide Predictive Outbreak Analytics with a 14-day lead time. Results indicate a transformative impact on field operations, showing a 50.7% reduction in pest populations and a 30% to 60% decrease in synthetic pesticide consumption. By bridging the gap between automated sensing and field-level decision support, this study provides a roadmap for building climate-resilient, data-driven agricultural systems. These innovations offer a vital

solution to current labor shortages and chemical resistance, ensuring robust food security and environmental health for the region.

Keywords: Precision IPM, Artificial Intelligence, IoT Surveillance, Smart Agriculture,

IIZCAGV-26-T3-152

Applications of Space-borne Imaging Spectroscopy in Agriculture: Modern Sensors and Emerging Trends

Simran Bhagat[1] and Yash Raj1,

1Department of Soil Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG) 492012, India.

Corresponding Email: msbhagat56@gmail.com

Abstract

Hyperspectral imaging spectroscopy is an advanced remote sensing approach that captures continuous, narrow spectral bands across the electromagnetic spectrum, enabling precise characterization of surface features based on their physical and chemical composition. Recent advancements in optics and electronics have improved image quality, signal-to-noise ratio, and spatial and spectral resolution of modern space-borne sensors. Freely available space-borne missions such as EnMAP (Environmental Mapping and Analysis Program) and PRISMA (PRecursore IperSpettrale della Missione Applicativa), along with DESIS (Earth Sensing Imaging Spectrometer), EMIT (Earth Surface Mineral Dust Source Investigation), and HISUI (Hyperspectral Imager Suite), have expanded agricultural applications. This study evaluates their applicability in agriculture and environmental modelling using modern machine learning and deep learning techniques. Hyperspectral data have shown strong potential in estimating soil properties such as soil organic carbon (coefficient of determination 0.3 - 0.8) and in crop type mapping with high accuracy. Key crop biophysical parameters including Leaf area index, biomass, canopy water content, fraction of absorbed photosynthetically active radiation, and plant height, along with chemical properties such as Nitrogen content estimation, can be effectively retrieved. Crop stress detection using red-edge and narrowband indices supports monitoring of both biotic and abiotic stress conditions. Overall, space-borne imaging spectroscopy combined with advanced analytics offers strong potential for precision agriculture and sustainable farm management.

Keywords: Imaging spectroscopy, Remote sensing, Precision agriculture, Geospatial analysis, Crop health analysis, Agricultural modelling

IIZCAGV-26-T3-153

Artificial intelligence in transforming precision agriculture for sustainable farming: Current status and future directions

Hiteshi Vyas ,Dr.Shashi Yadav,Nikhil Khare

Department of Soil science ,RVSKVV Gwalior ,M.P,India

vyashiteshi@gmail.com

Abstract

In order to feed the world's rapidly growing population, agriculture must increase food output by over 50% by 2050. It also has to deal with climate change and finite natural resources. Artificial intelligence (AI) has the potential to significantly change precision agriculture by enhancing crop management, maximizing resource efficiency, and encouraging sustainable farming methods. Using the Scopus database, a systematic literature review (SLR) was conducted. Out of the 8,145 articles that were initially found, 76 were chosen for in-depth analysis based on particular eligibility criteria. Crop monitoring, irrigation management, weed and pest control, yield prediction, and smart spraying technologies are just a few of the significant agricultural areas where this study looks at the use of AI. By facilitating data-driven decision-making and real-time monitoring, AI-based techniques like machine learning, computer vision, robotics, and the Internet of Things (IoT) improve agricultural output and sustainability. For instance, robotic systems provide accurate weed and pest management, while AI-powered irrigation systems increase water-use efficiency by integrating sensor data with meteorological information. Resource efficiency is further enhanced by yield prediction models and intelligent sprayers. Even with these developments, there are still certain research gaps, especially when it comes to expanding the use of sophisticated sensor systems and integrating AI with new fields like nutrient management. In addition to highlighting the advancements in AI-driven precision agriculture, this study highlights important areas that need more investigation to produce more resilient and sustainable agricultural systems.

Keywords: Artificial Intelligence (AI), Precision Agriculture, Crop Monitoring, Irrigation Management, Yield Prediction, Machine Learning Internet of Things (IoT), Sustainable Agriculture

IIZCAGV-26-T3-154

Innovative Solutions in Indian Agriculture: The Influence of IoT and AI Technologies

Anjula Bhartiya[1], Shobhana Gupta[2], Siddharth Namdev[3], Sumit Kumar Shukla[4]

[1]Ph.D. scholar, Department of Agri. Extension Education, COA, RVSKVV, Gwalior.474002 Madhya Pradesh, India.
[2]Deputy Director Extension (DDE), RVSKVV, Gwalior.474002 Madhya Pradesh, India
[3]Guest Faculty, Department of Agri. Extension Education, COA, RVSKVV, Gwalior.474002 Madhya Pradesh, India.
[4]Ph.D. scholar, Department of Agri. Extension Education, CSJMU, Kanpur.208024 Uttar Pradesh, India.

Corresponding Email: anjulabhartiya1@gmail.com

Abstract

This research investigates the influence of IoT and AI on various facets of Indian agriculture, focusing on crop yield enhancement, resource management, and market connectivity. IoT and AI technologies provide innovative solutions such as precision farming, automated irrigation, and predictive analytics, which can greatly improve agricultural productivity and

sustainability. IoT devices, including soil sensors, weather stations, and drones, deliver real-time data that enables farmers to make well-informed decisions regarding crop management, pest control, and irrigation timing. AI algorithms analyze this data to forecast crop yields, optimize the use of inputs like water and fertilizers, and streamline supply chain operations. This study utilizes data from governmental sources, including the Ministry of Agriculture & Farmers Welfare and the National Sample Survey Office (NSSO), to evaluate the effectiveness and adoption of these technologies across various regions in India. The findings reveal that areas where IoT and AI technologies have been implemented experience a significant increase in crop yields, ranging from 15% to 20%. Furthermore, these technologies have contributed to a substantial reduction in water usage, with automated irrigation systems optimizing water resources by as much as 30%. Additionally, AI-driven market analytics have enhanced farmers' access to markets, enabling them to secure better prices for their products by forecasting market trends and demand.

Keywords: Innovation, Internet of Things, Artificial Intelligence, Indian Agriculture, Smart farming.

IIZCAGV-26-T3-155

Management of major sugarcane pests for yield improvement: Progress and prospects

Jasmin Kris Sahu[1], Chetana Guru[2], Soumya Shephalika Dash[1], Neha Sharma[1], Varaparla Likhitha[1]

[1]Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, 474002, Madhya Pradesh, India

[2]Department of Entomology, Siksha O'Anusandhan, Bhubaneswar, 751003, Odisha, India

Corresponding Email: jasminkris2003@gmail.com

Abstract

Sugarcane (*Saccharum officinarum* L.) is a long-duration crop that generates a lot of biomass but its productivity is greatly hampered by many insect pests. Major pests include early shoot borer, internode borer, top borer etc which reduces 15-20% yield. Additionally sucking pests such as scales, pyrilla, whitefly reduces 10-20% of yield. Strong methods for controlling insect pests are necessary to maintain its productivity and yield of sugarcane production. Researchers have suggested a number of management stratergies to control insect pests such as cultural methods and physical methods, using bio-agents, bio-pesticides, botanicals, light/pheromone or combo traps and so forth. Cultural methods include earthing up for termite, deep summer ploughing, crop rotation, healthy setts for planting etc whereas in mechanical methods it includes clipping of leaves containing egg masses of top shoot borer, sugarcane pyrilla. It also includes collection and destruction of white grubs. In biological control, management can be done by use of parasitoids, predators and natural enemies such as the infestation of top shoot borer can be controlled by *Isotima javensis* where as sugarcane pyrilla can be controlled by *Epiricarnia melanoleuca.* The most transformative advancement lies in biotechnology, specifically the development of transgenic Bt sugarcane. Integrating

these biotechnological innovations with digital monitoring and precision agriculture offers a sustainable path to mitigate pest induced losses and ensure global sugarcane security.

Keywords: biotechnology, insect-pest, sustainability, productivity, management

IIZCAGV-26-T3-156

AI-Enabled Drone Technology with GPS & GIS for Precision Pest Management, Sustainable Agriculture and Rural Entrepreneurship Development

Shivam Singh[1], Shubham Singh[2],* Dr Rakesh Kumar[1]

[1]Agriculture University, Jodhpur, Rajasthan, India
[2]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.
*Corresponding author: entomologyshubham@gmail.com

Abstract

AI-enabled drone technology integrated with GPS and GIS is an emerging tool in agriculture and entomology for precision pest management and sustainable crop production. This study highlights the use of drones for real-time monitoring, pest mapping and early detection of insect outbreaks using spatial technologies. GPS and GIS support accurate identification of pest-infested areas, enabling targeted and efficient pesticide application. This reduces chemical use, lowers production costs and improves crop productivity. The technology also promotes rural entrepreneurship through drone-based agricultural services. In addition, it supports climate-resilient farming by improving data-driven decision-making and resource efficiency. The study concludes that AI, GPS and GIS-based drone systems are effective tools for sustainable agriculture, improved pest management and rural livelihood development.

Keywords: AI drones, GPS, GIS, precision agriculture, pest management, agricultural entomology, rural entrepreneurship.

IIZCAGV-26-T3-157

Edge-AI Driven Decision Support for Preemptive Integrated Pest Management

Sahil Sharma

College of Agriculture, Gwalior, 474011, Madhya Pradesh, India.

Corresponding Email ID- ganshika1801@gmail.com

Abstract

Objective of the abstract is to design and test a new ML-DSS framework that is a hybrid of edge and cloud computing to provide preemptive IPM/IDM support in high-tech agricultural settings Methodology related to this includes an IoT sensor network was employed over 50 hectares of dense crops to continually monitor variables of the microclimate such as canopy humidity, temperature, and leaf wetness. Such temporal information was integrated with

multi-spectral imagery collected using drones from above. A lightweight Convolutional Neural Network (CNN) model, designed specifically for edge computing, was used to identify pathogens under pre-symptomatic conditions based on visual information. At the same time, the Random Forest Machine Learning algorithm running on the cloud identified outbreak risks by analyzing microclimate time series. Information provided by both models fed the decision-making process of the DSS, which activated variable-rate localized biopesticide protocols. Key Findings includes the ML-integrated DSS achieved an accuracy rate of 94.2% in forecasting pathogen outbreaks up to 72 hours prior to the onset of visible symptoms. Compared to IPM schedules based on traditional calendars, the AI-powered system lowered the usage of non-selective chemical pesticides by 41% while boosting the overall crop production by 12.5%. Additionally, due to edge processing capabilities, data latency was reduced by 68%. In Conclusion, the Incorporation of edge computing with machine learning algorithms and multimodal analytics in agricultural decision-making systems is an innovative, scalable, and ecologically sustainable solution to IPM/IDM. The proposed technological solution effectively shifts crop protection from reactive measures to precise preventive approaches.

Keywords: Machine Learning, Decision Making System, IPM/IDM, Precision Agriculture, Edge Computing, Prediction Models.

IIZCAGV-26-T3-158

AI-Enabled Drone Technology in Agriculture: Advancements in Precision Pest Management, Sustainable Production and Rural Entrepreneurship Development

Shubham Singh[1] *, Shivam Singh[2], Satya Prakash Singh Tomar[1], Ankita Singh Sisodia[1], Bazar Thimmappa Charan Kumar[1],

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.
[2]Agriculture University, Jodhpur, Rajasthan, India

*Presenting author entomologyshubham@gmail.com

Abstract

AI-integrated drone technology is an emerging innovation in agriculture and entomology for improving crop monitoring, pest management and sustainable production systems. This study highlights the use of AI-based drones for real-time surveillance of insect pests and diseases, enabling early detection and precise control measures. The technology supports precision agriculture by reducing pesticide use, lowering production costs and improving crop productivity. It also promotes rural entrepreneurship by creating opportunities in drone-based agricultural services. In addition, AI drones enhance climate resilience through efficient resource management and data-driven decision-making. The findings indicate improved farm income, reduced environmental impact and better pest management efficiency. The study concludes that AI-enabled drone systems are a promising tool for sustainable agriculture, rural livelihood development and advanced pest management in agricultural entomology.

Keywords: AI drones, precision agriculture, pest management, agricultural entomology, rural entrepreneurship, climate-smart agriculture.

IIZCAGV-26-T3-159

Safe Solutions, Stronger Crops: Sustainable Tablet Formulations of *Trichoderma atroviride* for Biosecurity

Archie Mishra[1], Bhupesh Kumar Gupta[1], Rajni Singh Sasode[2], Rajbabbar Jatav[2] and Sucharita Mahopatra[2]
Department of Plant Pathology

[1] Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh-173230
[2] College of Agriculture, RVSKVV, Gwalior, Madhya Pradesh, India

E-mail: marchie737@gmail.com

Abstract

Soilborne pathogens such as *Pythium ultimum* and *Rhizoctonia solani* pose significant threats to tomato production, demanding biosafe and sustainable alternatives to chemical pesticides. This study developed eco-friendly tablet formulations of *Trichoderma atroviride* which aimed at enhancing disease regulation under biosecurity frameworks. Seven talc-based formulations, prepared with varying proportions of *T. atroviride*, talc, refined wheat flour and polyvinylpyrrolidone (PVP), were evaluated for stability, storage viability and biocontrol efficacy. Among them, the treatments with balanced concentration of refined wheat flour and polyvinylpyrrolidone (PVP) exhibited desirable properties, including near-neutral pH, rapid dispersibility, strong cohesion and prolonged shelf-life. The inclusion of natural binders enhanced mechanical stability and safe handling, supporting their suitability for secure deployment. Pot experiments confirmed that selected formulations, especially significantly reduced disease incidence while improving germination, biomass and seedling vigour. These findings demonstrate that optimized *T. atroviride* tablets combine biosafety with bioefficacy, ensuring pathogen suppression without ecological risks. With extended shelf-life, ease of transport and consistent field performance, such formulations offer a practical tool for integrated disease management. Their adoption strengthens agricultural biosecurity by reducing chemical dependency, mitigating pathogen-driven risks and supporting resilient, safe food production systems.

IIZCAGV-26-T3-160

AI-Enabled Controlled Environment Agriculture: Advancing Hydroponics and Protected Cultivation Systems

Arunaabh Trivedi[1]

1PhD Scholar, Department of Agricultural Economics, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior. 474002. Madhya Pradesh. India

Corresponding email: arunaabhtrivedi1900@gmail.com

Abstract

India's agricultural sector, burdened by erratic monsoon variability, groundwater depletion, and fragmented smallholder landholdings, necessitates technologically advanced alternatives to conventional open-field cultivation. This study investigates the systematic integration of Artificial Intelligence architectures within Controlled Environment Agriculture (CEA) frameworks, specifically targeting Deep Water Culture (DWC) and Nutrient Film Technique (NFT) hydroponic systems deployed under polyhouse structures across semi-arid agroclimatic zones of peninsular India. A heterogeneous IoT-embedded sensor matrix, encompassing electrical conductivity (EC), dissolved oxygen (DO), pH telemetry, and multispectral imaging, was interfaced with a CNN-LSTM hybrid model enabling closed-loop regulation of rootzone microenvironments and aerial phytoclimate parameters. Reinforcement learning algorithms dynamically optimized fertigation scheduling under rural grid-power constraints. Experimental trials on Lactuca sativa and Solanum lycopersicum cultivars demonstrated 38.6% enhanced water-use efficiency, 29.3% superior marketable biomass yield, and 43.7% reduced nutrient leachate loss over farmer-managed baselines. Hyperspectral reflectance models achieved 93.2% classification accuracy for early-stage Pythium and Botrytis detection. These outcomes establish a scalable AI-CEA paradigm aligned with India's National Horticulture Mission precision farming mandates, addressing infrastructural and socioeconomic constraints inherent to Indian protected cultivation ecosystems.

Keywords: Controlled Environment Agriculture, Hydroponic Systems, Artificial Intelligence, CNN-LSTM Hybrid Model, Precision Fertigation, Protected Cultivation

IIZCAGV-26-T3-161

An Integrated ICT-Based Digital Ecosystem for Smart Agriculture and Institutional Governance: Innovations from IGKV

Hem Prakash Verma and Eshant Kumar Sukdeve

[1*]Senior Research Fellow, FFP Project, ICAR-National Institute of Biotic Stress Management, Baronda, Raipur, (CG)

[2]Subject Matter Specialist (Ag Ext), KVK Dantewada, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (CG)

Abstract

Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, has developed a wide range of advanced digital applications aimed at strengthening agricultural extension, enhancing farmer-centric service delivery and promoting data-driven institutional governance through Information and Communication Technologies (ICTs). The *Millet Doctor* application facilitates bilingual (Hindi and English) diagnostic advisory services for small millets such as *Eleusine coracana* (ragi), *Paspalum scrobiculatum* (kodo) and *Panicum sumatrense* (kutki), enabling image-based identification and management of diseases, insect pests and nutrient deficiencies. Complementarily, *Crop Doctor 2.0* extends this capability to major cropping

systems including cereals, pulses, oilseeds and vegetables, integrating Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL) and Natural Language Processing (NLP) for precise, real-time and scalable decision support, along with access to agricultural schemes, farm mechanization resources and agri-informational services. The *e-Krishi Panchang* operates as a location-specific digital agro-advisory framework, delivering block-wise, season-wise and crop-specific recommendations based on agro-climatic parameters, while incorporating traditional calendrical intelligence such as muhurat, festivals and operational timings to optimize farm management practices. The *e-Haat App* functions as a digital agri-market linkage platform, enabling direct farmer-buyer interaction through geospatially enabled interfaces, real-time price discovery, demand analytics and supply chain optimization, thereby minimizing intermediary participation and enhancing farm-level profitability. Furthermore, the *Sankhya App* provides a comprehensive decision-support system for institutional administration by integrating real-time analytics on financial allocations, human resource demographics, student enrollment and academic metrics, thereby facilitating evidence-based planning and governance. Collectively, these digital interventions exemplify IGKV's strategic deployment of ICT-enabled solutions for advancing precision agriculture, market integration and institutional efficiency, contributing to the broader paradigm of sustainable and technology-driven agricultural development.

Key words: Artificial Intelligence, Precision Agriculture and Agricultural Market Linkages.

IIZCAGV-26-T3-162

Determination and Validation of Microbial consortia for effective management of Dry Root Rot of Chickpea

Moola Suma Sree[1], Jonnada Likhita[2], Meenakshi Arya*[3], D.R. Saxena*[1], Ashwini Kumar[1]

[1]Department of Plant Pathology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior-474002, M.P., India

[2]Department of Plant Pathology, Rani Lakshmi bai Central Agriculture University, Jhansi-284003, U.P., India

[2]ICAR-National Research Institute for Integrated Pest Management, New Delhi-110068, India

*Corresponding author email: meenakshirlbcau@gmail.com, saxenadr123@gmail.com

Abstract

In this study, a total of 50 rhizosphere bacteria (RB) were isolated from various forest ecosystems. Additionally, three fungal isolates (*Trichoderma* spp.), namely T16, T18 and T20 were obtained from ICAR-NRIIPM, New Delhi. All bacterial and fungal isolates were screened for their antagonistic activity against *Macrophomina phaseolina* under *in vitro* conditions using a dual culture assay. Out of these 50 bacterial isolates, two isolates (NRIIPM-B5 and NRIIPM-B16), along with all three *Trichoderma* isolates exhibited antagonistic activity against *Macrophomina phaseolina,* causing dry root rot of chickpea by inhibiting pathogen growth. The bacterial isolates showed 83.90 - 89.19 per cent of growth inhibition, while the *Trichoderma* isolates recorded 65.18 - 75.66 per cent of growth

inhibition of the pathogen in dual culture assays. Among these, NRIIPM-B5 and T18 demonstrated the highest antagonistic potential, effectively suppressing the growth of the pathogen. Subsequently, these five effective isolates were evaluated for their synergistic interactions and grouped into a microbial consortium. The selected bacterial and fungal isolates were characterized through Sanger sequencing of the *16S rRNA* gene and *ITS* region, respectively. The amplicon sizes were approximately 1500 bp for bacteria and 700 bp for fungi, and the PCR products were sent for sequencing. NCBI BLASTn analysis identified T16 as *Trichoderma* spp. and T18 as *Trichoderma viride*. Based on *in-vitro* studies, effective BCA were screened for compatibility studies by standard protocol. Based on their compatibility and antagonistic efficiency, the consortium (NRIIPM B-5 & NRIIPM B-16) was developed and applied in pot culture experiments. The results suggest that such microbial consortia can serve as an effective and sustainable alternative to chemical fungicides for managing dry root rot in chickpea. These findings highlight the potential of plant-associated microbes as biocontrol agents and contribute to the development of eco-friendly disease management strategies. Further research is required to elucidate the mechanisms of action, assess field-level applicability, and explore potential synergistic interactions with other biocontrol agents.

Keywords: Rhizospheric bacteria, *Trichoderma*, Chickpea, Biological control, Dry Root Rot

IIZCAGV-26-T3-163

Drone Technology and Globalization: Benefits, Risks, and Future Opportunities

Lavesh Malviya, Ramnivas Patidar, Vijay Madan, and Sachin Anchal
College of Agriculture Rewa, (M.P) 486001

Email: laveshmalviya13@gmail.com

Abstract

Globalization is increasingly driven by the integration of advanced technologies, among whic h drone technology has emerged as a significant innovation. The use of drones has expanded rapidly across multiple sectors, including agriculture, healthcare, and the military. In agricultu re, drones provide farmers with realtime data, enabling them to make informed decisions rega rding the efficient use of resources and farm inputs. In the healthcare sector, drones play a cru cial role by delivering essential medical suppliessuch as blood, vaccines, medicines, and labo ratory samplesto remote and underserved areas, especially during emergencies in developing countries. In the military domain, drones enhance security and surveillance by monitoring ene my activities and supporting precision operations. Despite these advantages, drones also pres ent certain risks. Improper handling by untrained operators or technical failures during flight can lead to accidents, causing injury to individuals and damage to property. Furthermore, ther e is a growing concern about the misuse of drones by extremist groups, who may hijack them and alter their payloads for harmful purposes. This paper aims to provide a comprehensive an alysis of current developments in agricultural, medical, and military drone applications by ex amining their strengths, weaknesses, and potential opportunities.

Keyword: Drone Technology, Unmanned Aerial Vehicles (UAVs), Agriculture,Precision Far ming, Healthcare Delivery.

IIZCAGV-26-T3-164

AI Data Analytics in Decision Support Systems in Agriculture

Namrata goswami
B. Tech, Swami Vivekanand college of Agricultural Engineering and Technology & Research Station, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G)
Corresponding Author: namratagoswami2926@gmail.com

Abstract

Artificial Intelligence (AI) and data analytics are transforming modern agriculture by improving decision-making through advanced Decision Support Systems (DSS). These systems analyze large volumes of agricultural data collected from sources such as satellites, sensors, weather stations, and field observations to provide accurate recommendations for crop planning, irrigation scheduling, pest and disease management, and efficient resource use. By integrating real-time and historical data, AI-powered DSS enables farmers to make timely and informed decisions that enhance productivity and reduce risks associated with climate variability and uncertain environmental conditions. AI-based analytics also supports precision agriculture by identifying patterns related to soil health,crop growth, and weather trends. Machine learning techniques help predict yield outcomes, recommend suitable crop varieties, and optimize fertilizer and water application. In addition, mobile-based DSS platforms improve accessibility of agricultural information for farmers and extension workers. Overall, AI-driven Decision Support Systems promote smart farming practices by improving efficiency, reducing input costs, strengthening climate resilience, and supporting sustainable agricultural development and long-term food security.

Keywords: Artificial Intelligence, Data Analytics, Decision Support Systems, Precision Agriculture

IIZCAGV-26-T3-165

Modern Approaches in Integrated Pest and Disease Management for Sustainable Crop Health

Rajesh Aarwe[1], B.K. Kachouli[3], Pankaj Maida[4], S.B. Singh[1] and R.P. Patel[2]

[1]Department of Entomology, [2]Department of Plant Pathology, [3]Department of Genetics & Plant Breeding, [4]Department of Vegetable Science, KNK College of Horticulture, Mandsaur, RVSKVV, Gwalior- 474002, (M.P.), India

*Corresponding Email: draarweofficial@gmail.com

Abstract

Plant health management remains a critical component of sustainable crop production, particularly in regions where diverse insect pests and pathogenic microorganisms significanly

constrain agricultural productivity. In India, changing climatic patterns, intensified cropping systems, and the widespread use of chemical pesticides have increased the complexity of pest and disease problems, necessitating more resilient and science based management strategies. Integrated Pest Management (IPM) and Integrated Disease Management (IDM) offer holistic approaches that emphasize prevention, monitoring, and need based interventions to maintain pest populations and disease incidence below economic damage levels. Recent developments in plant pathology and entomology have introduced innovative diagnostic and surveillance techniques that support early detection and timely management of crop health threats. Tools such as disease forecasting models based on weather parameters, digital pest scouting applications, and rapid pathogen identification methods have improved decision making at the field level. The utilization of entomopathogenic fungi, antagonistic microorganisms, and parasitoids has expanded the scope of biological control in both field and protected cultivation systems. Cultural practices including sanitation, crop diversification, resistant cultivar deployment, and optimized irrigation and nutrient management further strengthen plant defense mechanisms and reduce the risk of epidemic outbreaks. This paper examines the integration of emerging technologies with established plant protection practices to enhance the efficiency of IPM and IDM programs from plant pathology and entomology perspectives. Emphasis is placed on sustainable pest and disease suppression, reduced reliance on hazardous pesticides, and improved ecosystem stability. The continued advancement and adoption of these integrated strategies are essential for safeguarding crop health, improving farm productivity, and supporting environmentally responsible agriculture under evolving agro-ecological conditions.

Keywords: Plant Pathology, Entomology, Integrated Pest Management, Integrated Disease Management, Biological Control, Disease Forecasting, Sustainable Crop Protection

IIZCAGV-26-T3-166

Insects as Sustainable Resources in the Food Industry

Sisodia Ankita Dinesh Singh[1*], Satya Prakash Singh Tomar[1], Shubham Singh[1], Neha Sharma[1], Rahul Patidar[1], Soumya Shephalika Dash[1]

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.

*Presenting author ankitasinghsisodia007@gmail.com

Abstract

The increasing global demand for protein and the environmental challenges associated with conventional livestock production have intensified the search for sustainable food alternatives. Insects have emerged as a promising solution due to their high nutritional value, efficient feed conversion, and lower ecological footprint. Edible insects such as crickets, mealworms, and black soldier fly larvae are rich in protein, essential amino acids, vitamins, and minerals, making them suitable for human consumption as well as food processing industries. In addition to direct consumption, insects are being increasingly incorporated into value-added products such as protein powders, snack bars, baked goods, and animal feed. Their production requires significantly less land, water, and energy compared to traditional livestock, while generating fewer greenhouse gas emissions. Furthermore, insects can be reared on organic waste, contributing to waste management and circular economy practices. Despite these advantages, the widespread adoption of insect-based foods faces challenges

including consumer acceptance, regulatory frameworks, and standardization of processing techniques. Food safety concerns, allergenicity, and cultural perceptions also influence market growth. However, ongoing research and technological advancements are improving processing methods, enhancing palatability, and ensuring safety standards. In conclusion, insects represent a viable and sustainable alternative for the future of the food industry. Promoting awareness, developing clear regulations, and integrating innovative processing technologies can facilitate their acceptance and commercialization. Their inclusion in the global food system can contribute significantly to food security, environmental sustainability, and economic development.

Keywords: Edible insects, Sustainable protein, Food industry, Entomophagy, Nutritional value.

IIZCAGV-26-T3-167

Elucidating the Seed Borne Behaviour, Systemic Localization, and Symptom-Linked Inoculum Advancement of Fusarium oxysporum f. sp. ciceri in Chickpea

R. K. Singh and Pinnamwar Keerthi

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, College of Agriculture, Indore (MP) 452001

Email- rakesh0429@gmail.com

Abstract

Chickpea wilt caused by *Fusarium oxysporum f. sp. ciceri* is one of the most widely distributed and destructive diseases of chickpea across the globe. The pathogen exhibits a unique capacity for perpetuation through both seed and soil, surviving mainly as chlamydospores in soil and as mycelium and resting spores in seed, thereby serving as a primary source of infection. The present investigation was conducted to study the seedborne nature of the pathogen, its systemic movement within the host, and its relationship with symptom expression and time of infection. In susceptible genotypes, wilting symptoms were observed as early as 25 days after sowing under field conditions, while late wilting symptoms became prominent during flowering and podding stages. Late wilted plants exhibited chlorosis, drooping of rachis, leaflets and petioles, necrosis, and yellowing of foliage. The systemic progression of the pathogen was evaluated at five stages of pod formation, viz., <10%, 25%, 50%, 75%, and 100%. Systemic infection was found to be higher in plants exhibiting chlorosis symptoms compared to drooping symptoms. Seed infection was significantly greater in chlorotic plants (32.5%) than in drooping plants (7.5%). The mean systemic infection in chlorotic plants was highest in root (93.5%), followed by stem (74%), stalk (44%), and seed (32.5%), whereas in drooping plants it was 91.5%, 69%, 26.5%, and 7.5%, respectively. Root infection remained above 90% irrespective of the stage of pod formation. Infection in stem, stalk, and seed was highest when infection occurred at <10% pod formation stage and gradually decreased with delay in infection, reaching the lowest level at 100% pod formation stage. The study clearly indicates that early infection leads to

greater systemic colonization and seed transmission of the pathogen, particularly in plants expressing chlorosis symptoms.

Farmer-to-Farmer Mentorship Network

Prashant Maratha

R.A.K. College of Agriculture, Sehore, R.V.S.K.V.V., Gwalior

Corresponding author: Prashantmaratha@gmail.com

Abstract

The Farmer-to-Farmer Mentorship Network is an innovative, community-driven approach designed to enhance agricultural knowledge transfer by connecting experienced farmers with novice or struggling cultivators. Traditional extension systems often fail to provide timely, localized, and practical solutions, creating a gap in effective advisory services. This study proposes a digital mentorship ecosystem that integrates artificial intelligence, mobile communication, and data analytics to facilitate personalized guidance. The system employs an AI-driven matchmaking algorithm that pairs mentors and mentees based on crop type, geographic conditions, and specific farming challenges. The platform supports multilingual communication through video calls, messaging, and voice interactions, ensuring inclusivity and accessibility. Integration with farm data records and IoT-based sensors further enables evidence-based decision-making. Despite its potential, challenges such as digital illiteracy, connectivity constraints, limited algorithm precision, and data privacy concerns hinder its effectiveness. To address these issues, the proposed model incorporates offline functionalities, gamification strategies, multilingual interfaces, and robust monitoring systems. The network enhances knowledge exchange, promotes sustainable farming practices, and strengthens rural social capital. It improves productivity, resilience, and market access while bridging the gap between formal extension systems and practical field-level needs. Ultimately, the Farmer-to-Farmer Mentorship Network offers a scalable and sustainable solution for empowering farmers and transforming agricultural extension services.

Keywords: Farmer-to-Farmer Mentorship, community-driven approach, AI-driven matchmaking algorithm, IoT-based sensors

IIZCAGV-26-T3-169

AI-Enabled Sustainable Agriculture for Environmental Monitoring and Climate Adaptation in India

Vaibhav Laxmi Tiwari[1]

[1] ICAR-National Institute of Biotic Stress Management, Raipur, 493225 Chhattisgarh, India

Corresponding Email: vibhatiwari131998@gmail.com

Abstract

Environmental degradation and climate variability are major constraints in Indian agriculture, necessitating data-driven solutions for sustainable resource management. Soil erosion alone results in the loss of around 3 billion tons of soil annually in India **(**Food and Agriculture Organization estimates). This study explores the role of Artificial Intelligence (AI), Machine Learning (ML), and digital technologies in minimizing environmental impacts and enhancing climate adaptation. AI-based decision support systems enable real-time monitoring of soil moisture, crop health, and pest outbreaks, reducing excessive use of water, fertilizers, and pesticides. Platforms like e-NAM and remote sensing tools developed by Indian Space Research Organization improve resource efficiency and environmental monitoring. Digital tools also support climate forecasting and risk management. However, adoption barriers such as digital illiteracy and infrastructure gaps persist. The study recommends integrating AI into environmental governance, strengthening rural digital infrastructure, and promoting climate-smart advisory systems to achieve sustainable agricultural transformation in India.

Keywords: AI, digital agriculture, soil conservation, environmental monitoring, climate adaptation

IIZCAGV-26-T3-170

Leveraging AI and Digital Agriculture for Enhancing Farm Productivity and Market Efficiency in India: A Policy Perspective

Shubham Kumar Thakur[1], Sujit[1,], Richa Dubey[1] and Neha Suryavanshi[1]
College of Horticulture and Research Station, Chirmiri, M.C.B, 497442 Chhattisgarh, India

Corresponding Email: shubhamcks@gmail.com

Abstract

Indian agriculture faces persistent challenges of low productivity, price volatility, and information asymmetry, despite employing nearly 45% of the workforce (Economic Survey 2023–24)**.** This study examines the economic potential of Artificial Intelligence (AI), Machine Learning (ML), and digital platforms in improving farm-level decision-making and market efficiency. Digital initiatives such as e-NAM and farmer support schemes like PM-KISAN Scheme have expanded outreach, with millions of farmers now connected to digital ecosystems. AI-based advisory systems enable real-time decision-making related to weather forecasting, pest management, and input optimization, leading to improved productivity and reduced costs. Empirical evidence suggests that digital interventions can enhance farmers' income by 8–15% through better price discovery and reduced intermediaries (NABARD, 2022)**.** However, challenges such as digital illiteracy, limited rural connectivity, and data accessibility constraints restrict adoption. The study recommends strengthening digital infrastructure, promoting capacity building, and integrating AI-based decision support into extension services to ensure inclusive and efficient agricultural transformation in India.

Keywords: AI, digital agriculture, e-NAM, decision support, market efficiency, farm income

IIZCAGV-26-T3-171

Application of Artificial Intelligence, Machine Learning, Decision Support Systems and High-Tech Agriculture in Smart Integrated Pest and Disease Management for Climate-Resilient Agriculture

Kanchan Dubey

Department of Entomology, [RAK college , sehore], Madhyapradesh, India

Email: Kanchanhariomsharma2@gmail.com

Abstract

Climate change is posing serious challenges to agricultural sustainability by increasing pest and disease incidence and affecting crop productivity. In this context, the integration of Artificial Intelligence (AI), Machine Learning (ML), Data Analytics and Decision Support Systems (DSS) along with high-tech agricultural practices offers a promising pathway towards climate-resilient agriculture. AI and ML technologies analyze large volumes of agricultural data such as weather conditions, soil parameters and crop health to predict pest and disease outbreaks at an early stage. Data analytics helps in identifying patterns and trends, thereby improving the accuracy of these predictions. Decision Support Systems (DSS), such as those developed by platforms like Agricolus, transform complex data into simple and actionable recommendations, enabling farmers to make timely and informed decisions regarding irrigation, nutrient management and pest control. High-tech agriculture further strengthens this system by incorporating advanced practices such as protected cultivation, precision farming, micro-irrigation, fertigation, hydroponics, and the use of hybrid and genetically improved planting materials. These technologies not only enhance productivity and quality but also ensure efficient resource utilization and higher economic returns. The Integration of digital tools such as sensors, drones and mobile-based applications enables real-time monitoring and remote farm management. Together, these approaches significantly improve the efficiency of Integrated Pest Management (IPM) and Integrated Disease Management (IDM) by reducing excessive chemical use, lowering production costs and minimizing environmental risks. Despite its advantages, the adoption of these technologies is constrained by high initial investment, limited digital literacy and infrastructural challenges. However, with proper support and training, the combined use of AI, ML, DSS and high-tech agricultural practices can transform traditional farming into a sustainable, efficient and climate-resilient system.

Keywords: AI, Machine Learning, DSS, High-tech Agriculture, IPM, IDM, Climate-Resilient Agriculture

IIZCAGV-26-T3-172

AI, Data Analytics and Decision Support Systems in Agriculture

Tripti Dwivedi[1]

[1]UG Student, JNKVV, College of Agriculture, Rewa-486001. Madhya Pradesh, India

Corresponding Email: triptidwivedi290@gmail.com

Abstract

Artificial Intelligence and data analytics are quite significant in farming these days. They help farmers to deal with the issues such as changing weather, pest attacks, and application of the appropriate volumes of inputs such as water and fertilizers. Using Artificial Intelligence, it is possible to analyze the image to identify the presence of disease in crops. Data analytics assists in knowing the situation of the soil, rainfall, and the performance of crops over time. Farmers can also benefit with decision support systems. They provide suggestion regarding when to irrigate crops, the type of fertilizers to apply and the way to organize the practice of crops. Big farms are not the only beneficiaries of these technologies, but small and marginal farmers can also benefit provided they are made easy and affordable. Nevertheless, the fact remains that a large portion of farmers do not adopt these technologies due to them being unfamiliar with them, low level of digital literacy, and low internet connectivity. Therefore, a need to train and educate farmers appropriately exists. With the help of innovations and the use of the latest technology, the productivity can be increased, and the process of agriculture can be more sustainable.

Keywords: Artificial Intelligence, Data Analytics, Decision Support Systems, Sustainable Agriculture, Precision Farming

IIZCAGV-26-T3-173

AI-Driven Decision Support System for Climate-Resilient Smart Agriculture

Shaurya Bansal

RVSKVV, COA, GWALIOR, [M.P], INDIA

Corresponding Email: taau0238@gmail.com

Abstract

Climate variability poses significant challenges to agricultural productivity and sustainability. This study proposes an AI-driven decision support system (DSS) designed to enhance climate-resilient farming practices through real-time data analysis and predictive modeling. The system integrates machine learning algorithms with field-level data such as soil moisture, weather parameters, and crop health indicators collected via sensors and remote sensing tools. The methodology involves training predictive models to recommend optimal irrigation schedules, crop selection, and pest management strategies. Results from pilot testing indicate improved resource-use efficiency, reduction in input costs, and enhanced crop yield stability under varying climatic conditions. The system also demonstrates adaptability by continuously learning from new data inputs, enabling dynamic decision-making for farmers. This approach supports precision agriculture and reduces dependency on traditional practices that are often less responsive to climate uncertainties. Overall, the proposed framework highlights the potential of AI and data analytics in promoting sustainable agriculture, improving farmer resilience, and ensuring food security in changing environmental conditions.

Keywords: Smart agriculture, Machine learning, Climate resilience, Decision support system, Precision farming, Data analytics

IIZCAGV-26-T3-174

Agro-Ecosystem Analysis based pest management (AESA)

Sarita[1], Dr. Neha Sharma[2], Dr. Rahul Patidar[3], Ankita Sisodia[4]

Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. 474002. Madhya Pradesh, India.

Corresponding Email: saritasarita8038@gmail.com

Abstract

AESA is a hands-on, interactive approach that enables farmers to understand the connections between pests, beneficial species, soil health, and weather patterns, allowing them to make informed and sustainable pest management decisions. Unlike conventional methods that depend on chemicals, AESA integrates regular field observations, sampling techniques, and a visual diagram tool for decision-making concentrating on the Pest: Defender (P:D) ratio. The widely accepted safe ratio of 2:1 assists in deciding if action is needed, highlighting bio-intensive methods such as botanical insecticides, biological control, and cultural practices prior to thinking about synthetic chemicals. Case studies on brinjal and pigeon pea demonstrated that AESA-based integrated pest management (IPM) provides notably improved outcomes. In the case of brinjal, the fields that received treatment resulted in a greater yield of healthy fruit (32.83 t/ha) and net returns (₹6,57,445/ha), yielding a cost-benefit ratio of 3.03, compared to 2.19 for the farmers' traditional methods. Regular monitoring of P:D ratios in pigeon pea facilitated prompt, necessity-driven actions, decreasing unnecessary pesticide application. Consequently, AESA demonstrates efficiency in minimizing pest damage and dependence on chemicals, while promoting profitability and ecological harmony. Nevertheless, its effectiveness relies on collective involvement via Farmer Field Schools and consistent follow-up. AESA functions as a planning resource and a hands-on manual for sustainable, climate-adaptive pest control.

Keywords: AESA, Pest: Defender (P:D) ratio, biological control, Farmer Field Schools (FFS), Bio- intensive Pest Management

IIZCAGV-26-T3-175

A Novel Framework for Data-Driven Optimization in Smart Systems

Aarav Sharma[1], Priya Mehta[2] and Rohan Verma[3]

[1]Department of Computer Science, National Institute of Technology, Mysore. 452308 Karnataka, India.

[2]School of Data Science, Global Tech University, Chennai. 534645. Tamil Nadu, India

[3]Department of Electrical Engineering, Metro City University, Indore. 463043. Madhya Pradesh, India.

Corresponding Email: aarav.sharma@exa.com

Abstract

The rapid advancement of smart technologies has created a growing demand for efficient and adaptive data-driven optimization frameworks capable of operating in dynamic and large-scale environments. This study presents a novel hybrid optimization approach that combines machine learning techniques with classical optimization algorithms to enhance system performance and flexibility. The proposed framework is designed to process continuous real time data streams, enabling more accurate and responsive decision-making across complex smart systems, including intelligent transportation networks, smart energy grids, and Internet of Things (IoT) infrastructures. To evaluate its effectiveness, the model was tested on multiple datasets representing real-world scenarios. The results indicate significant improvements in accuracy, scalability, and computational efficiency compared to traditional methods. Additionally, the framework demonstrates strong robustness when exposed to uncertain and rapidly changing conditions, maintaining consistent performance levels. The integration of adaptive learning mechanisms further allows the system to evolve over time without requiring manual reconfiguration. Overall, the findings highlight the potential of hybrid data-driven models to significantly improve optimization processes and support the development of more intelligent, resilient, and efficient smart systems.

Keywords: Data-driven optimization, Smart systems, Machine learning, IoT, Real-time analytics, Hybrid models

IIZCAGV-26-T3-176

Is precision agriculture sustainable? A meta-review of the environmental impacts of precision agriculture

Nikhil Khare, Dr. Shashi Yadav and Hiteshi Vyas

Department of Soil science, RVSKVV Gwalior, M.P, India

Corresponding author: Nikhilkhare7012@gmail.com

Abstract

Precision agriculture (PA) is increasingly recognized as an effective approach to meet global food demands while conserving natural resources and minimizing environmental impacts. This review study compiles evidence from field trials to evaluate the environmental benefits associated with the adoption of PA practices.A systematic analysis of 444 English-language research articles on PA and sustainability was conducted, of which 54 studies provided field-based or modeling evidence. Among these, 45 studies reported positive environmental outcomes, including reduced use of fertilizers, pesticides, and herbicides; decreased water consumption and contamination (e.g., runoff); improved soil health; and lower greenhouse gas emissions and fuel usage.The most consistent evidence was observed in grain production systems, where variable rate technologies significantly reduced fertilizer application compared to conventional or uniform practices. However, the analysis also indicates that some studies claim sustainability benefits of PA without sufficient supporting evidence.

Therefore, further research is required to establish clear sustainability metrics and models, and to empirically evaluate PA across diverse agricultural systems.

Keywords: Precision Agriculture (PA), Sustainability, Environmental Benefits, Variable Rate Technology, Resource Efficiency, Soil Health, Greenhouse Gas Emissions, Field Trials

IIZCAGV-26-T3-177

AI-Powered Unmanned Aerial Vehicles for Crop Management

Nitin Kumar Koumary[1], Anoop Kumar Dave[2], Rajesh Kumar Naik[2], Viren Manish Victor[2], Sanjay Kumar Gilhare[1] and Shanker Lal Verma[1]

[1]Ph.D. Scholar, Department of Farm Machinery and Power Engineering, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), 492012, INDIA
[2]Professor, Department of Farm Machinery and Power Engineering, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), 492012, INDIA

Corresponding Email: nitinkoumary007@gmail.com

Abstract

Modern agriculture has become revolutionary with the intersection of the Artificial Intelligence (AI), Unmanned Aerial Vehicles (UAVs), and the Internet of Things (IoT), which allow intelligent, data-driven crop management systems. This chapter presents a critical analysis of AI-powered UAVs deployment in the context of precision agriculture to improve the quality of decisions, resource management, and sustainable food production. UAVs with sophisticated sensors and imaging devices deliver high-quality and real-time information on crop conditions, soil levels, nutrient conditions, and pests dynamics. AI incorporation makes data processing more automated, using machine learning and deep learning algorithms, allowing predictive analytics and disease detection as well as forecasting yields with astonishing accuracy. Moreover, the IoT-related connectivity will guarantee the smooth connection between UAVs, ground sensors, and farm management software, creating a harmonious digital environment of real-time monitoring and control. The chapter provides an overview of the current developments, major applications, and future research trends in AI-based UAV systems in the management of crops precisely. This paper highlights the disruptive nature of AI-powered UAV in the implementation of climate-resilient, sustainable, and intelligent agricultural systems in the future by highlighting examples of innovative use cases and technological synergies.

Keywords: Artificial Intelligence (AI), Unmanned Aerial Vehicles (UAVs), Precision Agriculture, Internet of Things (IoT), Crop Monitoring, Smart Agriculture.

IIZCAGV-26-T3-178

AI-Driven Decision Support Systems for Agricultural Extension: Enhancing Climate-Resilient Farming

Ujjwal Manoj Surapagu[1*], Bazar Thimmappa Charan Kumar[2*]

[1]College of Agriculture, Rajmata Vijay Raje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[2]College of Agriculture, Rajmata Vijay Raje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: ujwalmanojagrilexten@gmail.com

Abstract

The integration of Artificial Intelligence (AI) and Information and Communication Technology (ICT) is transforming agricultural extension systems by enabling efficient, data-driven, and farmer-centric advisory services. Traditional extension approaches often face challenges such as limited reach, delayed information dissemination, and inadequate adaptation to climate variability. In this context, AI and ICT tools including mobile applications, remote sensing, Internet of Things (IoT) devices, and decision support systems offer innovative solutions to bridge the gap between scientific knowledge and farmers' practices. The use of AI and ICT tools to improve agricultural extension services for climate-resilient and sustainable farming is examined in this review study. While ICT platforms like mobile phones, SMS services, and digital extension portals increase farmers' access to information, AI-based models enable precise weather forecasting, crop disease detection, yield prediction, and customized advising services. Real-time monitoring, effective resource management, and prompt decision-making are made possible by the integration of these technologies, increasing productivity and lowering climate change risks. The report also emphasizes the significance of institutional assistance, digital literacy, and capacity building in guaranteeing farmers' successful adoption of these technologies. There is also discussion of issues including pricing, data privacy, and infrastructure constraints. The results imply that the combined application of AI and ICT in extension systems can greatly enhance the distribution of knowledge, encourage sustainable farming methods, and increase resistance to climate uncertainties. All things considered, AI and ICT-driven extension strategies offer a viable solution to update agricultural advising systems and accomplish climate-resilient and sustainable farming.

Keywords: Artificial Intelligence (AI), Information and Communication Technology (ICT), Decision Support Systems (DSS), Digital Agriculture, Farmer Advisory Services

IIZCAGV-26-T3-179

Application of data-driven decision support systems for integrated management of Brown planthopper (*Nilaparvata lugens* Stål) in rice.

Parul Dahariya, Richa Dubey
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, 492012, Chhattisgarh, India
Corresponding Email: paruldahariya3@gmail.com

Abstract

Brown planthopper (*Nilaparvata lugens* Stål) is one of the most destructive insect pests of rice, with the potential to cause total crop failure under outbreak conditions. Its management

has become increasingly difficult due to shifting climatic conditions and growing resistance to commonly used insecticides, both of which have been further aggravated by calendar-based spray practices that overlook actual pest pressure. The present study was undertaken to develop a field-data-based decision support approach for improving integrated pest management (IPM) in rice ecosystems. Pest population data, local weather parameters, and treatment response records were compiled across rice growing seasons and analysed to identify population thresholds, environmental triggers, and patterns associated with BPH outbreaks. The study further evaluated the comparative efficacy of chemical insecticides and fungal biopesticides, with the aim of optimising control measures and reducing unnecessary chemical inputs. Results are expected to provide reliable intervention thresholds and guide the selection of appropriate control strategies, including the judicious integration of biopesticides such as *Metarhizium anisopliae* and *Beauveria bassiana* alongside conventional insecticides. The proposed framework, supported by real-time monitoring and field observations, is anticipated to improve pest control efficiency, reduce selection pressure for resistance, and support ecologically sound rice production under variable climatic conditions.

Keywords: Brown planthopper, decision support system, data analytics, integrated pest management, climate-resilient agriculture

IIZCAGV-26-T3-180

Smart Bijuka – AI-Driven Intelligent Crop Protection System

Pravash Singh
B. Tech (CSE - AI/ML)

Abstract

Crop loss due to animal intrusion remains a significant challenge in Indian agriculture, particularly in rural and semi-remote regions where manual surveillance is inefficient and labour-intensive. This paper proposes Smart Bijuka, an AI-driven autonomous crop protection system that integrates computer vision, Internet of Things (IoT), and renewable energy for real-time, intelligent farm security. The system employs a Passive Infrared (PIR) sensor for energy-efficient motion detection, which triggers an ESP32-CAM module enabling 360° field monitoring. A YOLO-based Convolutional Neural Network (CNN) is utilized for real-time classification of intrusions as human or animal, trained on labelled agricultural datasets to ensure robustness under diverse environmental conditions. A key innovation of the system is its adaptive, context-aware deterrence mechanism, which generates animal-specific acoustic signals with dynamic intensity and activates a 180° servo-driven human-like movement to simulate realistic scarecrow behaviour. Additionally, the system incorporates self-learning and predictive analytics, where historical intrusion data is analysed to identify patterns and proactively activate alert mechanisms during high-risk periods.Powered by a solar-assisted 12V energy module, the system ensures reliable off-grid operation. Experimental results demonstrate 92–95% classification accuracy, 1–2 seconds response time, and 30–40% energy savings compared to conventional methods. Smart Bijuka provides a cost-effective, scalable, and intelligent solution for precision agriculture, contributing to

reduced crop loss and sustainable farming aligned with UN Sustainable Development Goal 2 (Zero Hunger).

Keywords: Smart Agriculture, Artificial Intelligence, IoT, Animal Intrusion Detection.

IIZCAGV-26-T3-181

Ecological Engineering for Insect Pest Management

Himanshu Kumawat
Department of Entomology, RVSKVV, Gwalior,474002
Corresponding Email: himanshukumawat750@gmail.com

Abstract

Ecological Engineering (EE) is the design and management of agricultural systems based on ecological principles to enhance ecosystem services while reducing dependence on external inputs like chemicals and energy. In pest management, EE moves beyond simple pest-control methods and focuses on natural processes and interactions among crops, pests, and their natural enemies (Nes). Instead of a linear approach, it emphasizes a holistic system where biodiversity and ecological balance play a key role in maintaining pest populations at manageable levels. The main aim of EE is to strengthen biological pest control by improving the availability, diversity, and efficiency of natural enemies such as predators and parasitoids. Monocropping systems are usually less diverse and do not support Nes effectively, as these organisms need resources like pollen, nectar, alternative prey, and shelter for survival. By increasing crop diversity and providing such resources, EE creates a favorable environment for Nes, leading to more stable and sustainable pest suppression. Additionally, natural enemies require resources throughout the year, even before sowing and after harvesting. Ecological engineering ensures continuous availability of food and refuge through practices like planting flowering species, maintaining habitats, and providing alternate hosts. This approach helps sustain NE populations and improves long-term pest regulation, making EE an important strategy for sustainable agriculture.

Keywords: Ecological Engineering (EE), Ecosystem Services, Biological Pest Control, Natural Enemies

IIZCAGV-26-T3-182

Bio-efficacy of biodynamics against whitefly population in green gram

Shradha Parmar[1*], A.K. Saxena[2], S.B. Das[2], Pradyumn Singh[1], Neha Sharma[1] and Soumya Shephalika Dash[1]

[1]Department of Entomology, RVSKVV, Gwalior, M.P.
[2]Department of Entomology, JNKVV, Jabalpur, M.P.

[*]Corresponding Author- shrddhap0@gmail.com

Abstract

A field experiment was conducted at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M. P.). Result showed that out of 8 different biodynamics tested against whitefly in green

gram, the population of whitefly in all the treatments was significantly lower than control. The lowest mean population of whitefly was recorded with brahmastra 45ml/L (3.84 adult/plant) which was significantly superior to all other treatments. Followed by brahmastra 30ml/L (4.07 adult/plant) which was significantly better than all other treatments except agniastra 45ml/L (4.18 adult/plant). The next effective treatment was agniastra 30ml/L (4.29 adult/plant) which significantly better than neemastra 30ml/L (4.55 adult/plant), dasparni ark 45ml/L (4.67 adult/plant) and dasparni ark 30ml/L (4.82 adult/plant) except neemastra 45ml/L (4.46 adult/plant). The highest population was recorded in control (6.74 adult/plant) which was significantly inferior to all other treatments.

Keywords: Agniastra, Brahmastra, Dasparni ark, Neemastra and Whitefly

SUB THEME-IV



Value Chains, Sustainable Agri Products Production & Marketing, Skill-Oriented Agri Training Modules and Transfer of Technology (ToT) Models, Start-ups & Innovation for Youth Empowerment, Livestock and Fisheries for Sustainable Livelihoods

IIZCAGV-26-T4-183

Growth, Instability and Structural Transformation of Wheat Production in Madhya Pradesh (1994–2025)

Vinit Kumar Jaiswal[1]*, Sneha Pandey[2] and Sachin Rathour[2]

[1]Ph.D. Scholar, Department of Agricultural Economics, College of Agriculture, RVSKVV, Gwalior. Pin code 474002. (M.P.) India
[2]Guest Faculty, Department of Agricultural Economics, College of Agriculture, RVSKVV, Gwalior. Pin code 474002. (M.P.) India

Corresponding Email: jaiswalwinit@gmail.com

Abstract

This study analyzes the growth dynamics, instability, and structural transformation of wheat production in Madhya Pradesh over the period 1994–2025, using time-series secondary data. The importance of the study lies in its attempt to understand long-term production behavior in the context of food security, technological change, and climate variability. Methodologically, the study employs compound annual growth rate (CAGR) analysis to estimate growth trends, the Cuddy–Della Valle instability index to measure variability, and decomposition analysis to identify the relative contribution of area and yield to output growth. The empirical results reveal a significant expansion in wheat cultivation, with area increasing from approximately 3.20 million hectares in 1994–95 to 7.75 million hectares in 2024–25, while production rose sharply from 5.10 million tonnes to 24.51 million tonnes and productivity improved from 1,590 kg/ha to over 3,100 kg/ha. The estimated growth rates indicate that area, production, and yield increased at about 2.7%, 5.1%, and 2.3% per annum, respectively, suggesting that production growth has been predominantly driven by productivity gains rather than mere area expansion. The instability analysis indicates relatively low variability, with indices of around 7.0% for area, 11.5% for production, and 5.5% for yield, reflecting a stable production environment. Furthermore, the results point to a clear structural shift from area-led growth in the earlier period to productivity-led growth in recent years, supported by improvements in irrigation infrastructure, adoption of high-yielding varieties, and better agronomic practices.

Keywords: Wheat, Growth Analysis, Instability, Cuddy–Della Valle Index, Productivity growth

IIZCAGV-26-T4-184

Adoption of IPM Practices among Farmers: Constraints and Extension Strategies

Bazar Thimmappa Charan Kumar[1], Dr. S.P.S. Tomar[2], Ujjwal Manoj Surapagu[3], and Dr. Neha Sharma[4],

[1]Ph.D. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

[2]Senior Scientist, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[3]M.Sc. scholar, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[4]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.

Corresponding email: charankumarbt@gmail.com

Abstract

Integrated Pest Management (IPM) is widely recognized as a sustainable approach to managing insect pests while minimizing environmental and health risks. However, the adoption of IPM practices among farmers remains uneven across different regions due to various socio-economic and institutional constraints. This review examines the key factors influencing the adoption of IPM and identifies practical extension strategies to enhance its uptake in farming communities. Major constraints include limited awareness and technical knowledge, inadequate access to quality inputs such as bio-pesticides and pheromone traps, higher perceived risk compared to conventional pesticide use, and lack of timely advisory services. Small and marginal farmers often face additional challenges related to financial limitations and limited exposure to training programs. These barriers restrict the effective implementation of IPM despite its proven benefits in reducing pesticide use and improving crop health. The study highlights the role of extension systems in promoting IPM through farmer training, demonstrations, participatory approaches, and use of digital advisory platforms. Strengthening linkages between research institutions, extension agencies, and farmers can facilitate better knowledge transfer and adoption. Community-based approaches and farmer field schools are particularly effective in building confidence and practical skills among farmers. Overall, improving awareness, ensuring input availability, and adopting innovative extension strategies are essential for scaling up IPM adoption. Enhancing farmer participation and capacity building will contribute to sustainable pest management, reduced environmental impact, and improved agricultural productivity.

Keywords: Integrated Pest Management, adoption, farmers, extension strategies, sustainable agriculture, pest control

IIZCAGV-26-T4-185

Documentation and Digital Transformation of Agricultural Indigenous Technical Knowledge (ITKs) Through E-Booklet Development

Kapil Maran[1], Y. D. Mishra[2] and Siddharth Namdeo[3]

[1]PhD Research Scholar, Department of Agricultural Extension Education, RVSKVV, Gwalior (M.P.)
[2]Scientist & HOS, Department of Agricultural Extension Education, RVSKVV, Gwalior (M.P.)
[3]Assistant Professor (Cont.), Department of Agricultural Extension Education, RVSKVV, Gwalior (M.P.)

Corresponding Email: kapilmaran515@gmail.com

Abstract

This research, conducted at Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, addresses the critical need to preserve and validate traditional agricultural wisdom through modern digital platforms. Agriculture has long been the backbone of human civilization, yet many sustainable indigenous practices are at risk of being obscured by the undocumented nature of this knowledge and the widespread use of modern technology. The post-green revolution era has introduced challenges such as diminishing soil productivity, increased crop toxicity and rising input costs, making the revitalization of Indigenous Technical Knowledge (ITK) essential for long-term sustainability. This study focuses on the development, standardization and perceived utility of an electronic booklet a compact, high-quality digital file accessible across various platforms specifically documenting ITKs in the Gird region of Madhya Pradesh. The research employs an exploratory and descriptive design, utilizing an action research framework that involves a cyclical process of planning, action, observation and reflection. The study area encompasses all five districts of the Gird zone: Bhind, Gwalior, Morena, Sheopur and Shivpuri. Data will be gathered from 300 farmer respondents, selected via the Population Proportionate Method, as well as key informants and subject matter experts for content validation. The core objectives include documenting existing agricultural ITKs, developing a standardized e-booklet and assessing its perceived utility among farmers while analyzing how variables like digital literacy, innovativeness and scientific orientation influence its adoption. Ultimately, this research aims to create a reliable database of time-tested technologies, providing extension workers and the farming community with scientifically sound, low-cost and location-specific alternatives to modern chemical-intensive farming.

Keyword: Indigenous Technical Knowledge (ITK), E-Booklet, Agricultural Sustainability, Digital Literacy

IIZCAGV-26-T4-186

Evaluation of mango varieties for nectar

Abhishek koshle
UG 4th Student
Department of Fruit Science
Mahatma Gandhi Udyanikee Evam Vanikee Vishwavidyalaya, Durg (C.G.)

Corresponding Auther- koshleabhishek7@gmail.com

Abstract

The present investigation entitled “Evaluation of mango varieties for nectar” was conducted at the Horticulture Processing Laboratory, Department of FruitScience, College of Agriculture, IGKV, Raipur (Chhattisgarh) during 2017–2018. The experiment consisted of ten mango varieties and was laid out in a Completely Randomized Design (CRD) with three replications. The study aimed to evaluate physico-chemical characteristics of mango fruits

and assess the quality, storage behavior, and economic feasibility of nectar prepared from different varieties. The results revealed significant variation among mango varieties. Maximum fruit weight (380g) and pulp weight (266.76 g) were recorded in Kakna (local), while the highest pulp:seed ratio (4.38) was observed in Dashehari. Among chemical parameters, Mallika exhibited the highest total soluble solids (22°Brix), total sugars (17.81%), and non-reducing sugars (13.81%). The maximum ascorbic acid content (56.34 mg/100 ml) was found in Langra, whereas Totapari recorded the highest acidity (0.35%). Nectar prepared from Totapari showed the highest organoleptic scores for aroma, taste, and overall acceptability. Maximum retention
of ascorbic acid was observed in Langra-based products, while Mallika recorded higher TSS and sugar content. During storage (0–90 days), TSS, acidity, total sugars, and reducing sugars increased, whereas ascorbic acid, pH, non-reducing sugars, and sensory quality decreased. Economic analysis indicated that Totapari was the most profitable variety, recording the lowest cost of production, highest net returns, and maximum benefit-cost ratio for nectar preparation. Totapari is the most suitable variety for nectar production based on sensory quality and economic returns, while Mallika and Langra are superior for chemical quality parameters.

Keywords: Mango varieties, Nectar, Physico-chemical properties, TSS, Ascorbic acid, Organoleptic evaluation, Storage, Totapari, Mallika, Langra

IIZCAGV-26-T4-187

Strengthening Sustainable Agri Products Production & Marketing, Indigenous Practices and Innovative Approaches

Kaushal Kumar[1], Hraday Kumar[2] and Satish Chandra Verma[3]

[1]Research Scholar Baba Raghav Das Post Graduate College, Deoria, Uttar Pradesh-274001
[2]Assistant professor Baba Raghav Das Post Graduate College, Deoria, Uttar Pradesh-274001
[3]Professor Baba Raghav Das Post Graduate College, Deoria, Uttar Pradesh-274001

Corresponding Email: kaushal.tdc@gmail.com

Abstract

Sustainable agriculture and well-functioning marketing systems play a vital role in achieving food security, protecting natural resources, and improving the socio-economic conditions of farmers. However, increasing pressures such as climate change, declining soil fertility, water scarcity, and unstable market conditions demand a transition toward more adaptive and resilient agricultural systems. This seminar examines strategies for enhancing the production and marketing of sustainable agricultural products by effectively integrating natural resource management, indigenous knowledge, and modern innovations. Traditional farming practices, shaped by generations of experience, provide practical and locally suitable solutions for maintaining soil health, preserving biodiversity, and managing production risks. When these time-tested methods are supported by contemporary technologies—such as precision agriculture, digital marketplaces, and efficient value chain systems—they can lead to higher productivity, lower production costs, and better market opportunities for farmers. The

discussion also emphasizes the importance of sustainable farming approaches, including organic agriculture, climate-resilient practices, and collective initiatives like farmer-producer organizations (FPOs) to improve bargaining power and market efficiency. Furthermore, the seminar underlines the importance of supportive policies, skill development, and infrastructure improvements such as storage, transportation, and processing units to reduce post-harvest losses and enhance farmers' income. By blending traditional wisdom with modern scientific advancements, agriculture can become more sustainable, economically viable, and inclusive. Such an integrated approach not only strengthens production systems but also builds robust marketing networks that contribute to long-term rural development.

Keywords: Sustainable Agriculture, Indigenous Practices, Climate-Resilient Farming, Agricultural Marketing, Value Chain Development.

IIZCAGV-26-T4-188

Women in Livestock Farming: Challenges and Gender-Sensitive Solutions

Richa Vishal Sharma[1], Mandeep Singh[2] and Puneet Malhotra[3]

[1] Indira Gandhi Krishi Vishwavidyalaya, Raipur
[2]Centre for One Health
[3]Directorate of Livestock Farms, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab

Abstract

Women have been vital contributors to agriculture for centuries, particularly in livestock farming. In rural communities, women are actively involved in animal care, feeding and management (89.17%), milking (52.50%), poultry rearing and the production of dairy and other livestock-based products (73.33%). Despite their substantial contribution to household livelihoods, food security and rural economies, women livestock farmers continue to face persistent gender-based disparities that limit their access to resources, information and essential support services. Female livestock owners encounter multiple, interconnected challenges. Limited access to productive resources such as land, credit and livestock remains a major constraint, as land ownership is predominantly male-dominated in many regions, restricting women's ability to expand or formalize their farming enterprises. In addition, women often experience a significant knowledge and information gap due to inadequate access to training on improved animal husbandry practices, disease prevention, nutrition and market trends. This gap contributes to lower productivity and reduced income-generating opportunities. Moreover, socio-cultural norms and traditional gender roles limit women's participation in decision-making processes, reducing their autonomy and control over livestock resources and farm management. Addressing these challenges requires effective and gender-sensitive approaches to information dissemination and service delivery. Women-centered agricultural extension programs that recognize women's specific roles, responsibilities and time constraints can play a crucial role in bridging knowledge gaps. The involvement of female extension workers can enhance communication, trust and participation. Mobile technology and digital platforms, including mobile applications, text messaging and voice-based advisory services, offer cost-effective tools for delivering timely

information on weather conditions, market prices and livestock management practices. Improving women's access to financial services through tailored microfinance schemes can support investments in livestock assets and infrastructure. Encouraging women's participation in farmer cooperatives enhances collective bargaining power and access to inputs and markets. Furthermore, gender-sensitive policies and legal reforms are essential to promote women's land ownership, inheritance rights and access to credit. Awareness and sensitization campaigns can help challenge entrenched gender norms and promote equity. Collectively, these interventions can empower women livestock farmers and contribute to inclusive and sustainable agricultural development. Therefore, it can be concluded that Empowering women in livestock farming through gender-sensitive extension services, improved access to resources, financial inclusion, digital technologies and supportive policies is essential to overcome existing disparities. Such integrated interventions can enhance women's productivity, decision-making capacity and livelihoods, ultimately promoting inclusive and sustainable agricultural development.

Keywords: Women, Livestock, Animal Husbandry, Knowledge

IIZCAGV-26-T4-189

Value Addition in Agriculture: A Pathway to Enhanced Farmer Income and Sustainability

Tripti Dwivedi[1*], R. K. Tiwari[2] and Aditya Bhooshan Srivastava[3]

[1]UG Student, JNKVV, College of Agriculture, Rewa. 486001. (M.P.)
[2]Chief Scientist, Department of Agronomy, JNKVV, College of Agriculture, Rewa. 486001. (M.P.)
[3]Guest Faculty, Department of Economics, JNKVV, College of Agriculture, Rewa. 486001. (M.P.)

Corresponding Email: triptidwivedi299@gmail.com

Abstract

Value addition in agriculture is emerging as a crucial strategy to enhance farmers' income and minimize post-harvest losses. Rather than selling raw agricultural produce at lower prices, farmers can significantly increase its market value through simple practices such as cleaning, grading, processing, and improved packaging. For instance, transforming fruits into jams, juices, or pickles, and processing grains into value-added products, not only ensures higher returns but also improves shelf life and reduces wastage. Importantly, value addition does not necessarily require large-scale industrial infrastructure or heavy capital investment. Small-scale initiatives at the farm or village level can generate substantial benefits. These activities create additional income opportunities and promote employment, particularly for rural youth and women. In the current agricultural scenario, where income stability is a major concern, value addition offers a viable pathway toward economic resilience and diversification. Despite its potential, the adoption of value addition practices remains limited due to several constraints, including lack of awareness, inadequate access to processing facilities, and weak market linkages. Addressing these challenges requires targeted interventions such as capacity-

building programs, promotion of local agro-processing enterprises, and strengthening of market access. With appropriate policy support, institutional backing, and grassroots-level implementation, value addition can play a transformative role in making agriculture more profitable, sustainable, and future-ready.

Keywords: Value Addition, Agro-Processing, Farmer Income, Post-Harvest Management, Rural Development

IIZCAGV-26-T4-190

Sustainable Agri Products Production and Marketing

Anjali Nagbhire[1]

[1]BSc. (Hons.) Agriculture Jawaharlal Nehru Krishi Vishwavidyalaya Jabalpur 482004, Madhya Pradesh, India

Corresponding Email - anjalinagbhire89@gmail.com

Abstract

Sustainable agriculture is a crucial approach to ensure food security while conserving natural resources and protecting the environment. This study focuses on the production and marketing of sustainable agricultural products, eco-friendly farming practices such as organic cultivation, integrated nutrient management, water conservation, and reduced chemical inputs. These practices not only improve soil health and biodiversity but also enhance the long-term productivity of agricultural systems. It helps to farmers to reduce input costs, increase resilience to climate change, and produce high-quality, food. However, challenges such as limited awareness, initial transition costs, and lack of technical knowledge can hinder widespread adoption. From a marketing perspective, sustainable agricultural products are gaining increasing demand due to rising consumer awareness about health and environmental issues. Effective marketing strategies, including certification (like organic labeling), value addition, branding, and direct marketing channels (farmers' markets, online platforms), play a key role in ensuring better price realization for farmers. Strengthening supply chains and improving market access are also essential for promoting these products. The study concludes that integrating sustainable production methods with efficient marketing systems can significantly improve farmers' income, ensure environmental sustainability, and meet consumer demand for safe and nutritious food. Policy support, education, and infrastructure development are necessary to scale up sustainable agriculture practices.

Keywords - Sustainable agriculture, Organic farming, Value addition, Market linkages, Farmer income

IIZCAGV-26-T4-191

Value Addition in Agriculture: A Pathway to Enhancing Farmers' Income, Rural Development, and Sustainable Growth

Bharat Tomar

UG (B.Sc. Hons Ag.) from RVSKVV, Gwalior and PG (MBA in Agri-business management) from JNKVV, Jabalpur Madhya Pradesh.

Abstract

Agriculture remains the backbone of the rural economy; however, farmers often face low profitability due to their dependence on the sale of unprocessed primary produce. Value addition in agriculture has emerged as a transformative approach to enhance farmers' income, minimize post-harvest losses, and promote sustainable agricultural practices. It involves the conversion of raw agricultural commodities into higher-value products through processing, preservation, packaging, branding, and efficient market linkages.This study explores various value addition strategies such as agro-processing, product diversification, and the adoption of innovative technologies in food preservation and supply chain management. It also highlights the role of farmer-producer organizations (FPOs), digital marketing platforms, and government schemes in strengthening the value chain. By enabling farmers to directly participate in processing and marketing activities, value addition not only increases profit margins but also generates rural employment and entrepreneurship opportunities.the study emphasizes sustainability by promoting reduced wastage, better resource utilization, and environmentally friendly practices. The objective is to analyze the impact of value addition on economic growth and to identify key challenges such as lack of infrastructure, technical knowledge, and market access. The findings suggest that with proper training, policy support, and technological integration, value addition can significantly improve the socio-economic condition of farmers and contribute to inclusive and resilient agricultural development.

IIZCAGV-26-T4-192

Transforming Agricultural Value Chains for Doubling Farmers' Income in India: An Economic and Policy Framework

Shubham Kumar Thakur[1], Sujit[1], Richa Dubey[1] and Neha Suryavanshi[1]

[1]College of Horticulture and Research Station, Chirmiri, M.C.B, 497442 Chhattisgarh, India

Corresponding Email: shubhamcks@gmail.com

Abstract:

India's agricultural sector, while employing nearly 45% of the workforce and contributing about 18% to GDP (Economic Survey 2023–24), is constrained by fragmented markets, weak infrastructure, and inefficient value chains that limit farmers' income. This study presents an economic and policy framework for strengthening agricultural value chains to enhance income realization and rural livelihoods. Evidence indicates that farmers receive only 25–40% of the consumer price in traditional supply chains due to multiple intermediaries and high transaction costs (NABARD, 2022). Post-harvest losses further exacerbate the problem, estimated at 5–10% in cereals and up to 20–25% in perishables (ICAR estimates). Strengthening Farmer Producer Organizations (FPOs) under the Central Sector Scheme for

Formation and Promotion of FPOs, along with digital platforms like e-NAM, can improve collective bargaining, price discovery, and market access. The study recommends investment in cold chains, agro-processing, and rural logistics, alongside policy reforms promoting direct marketing and private sector participation. An integrated value chain approach is critical for achieving sustainable income growth, reducing losses, and enhancing competitiveness of Indian agriculture at the national level.

Keywords: Value chain, FPOs, market efficiency, post-harvest losses, farm income, policy framework

IIZCAGV-26-T4-193

Organic Farming in India: Regulatory Framework, Entrepreneurial Opportunities and Pathways for Sustainable Value Chain Development

Harshita Verma[1]

[1]B.Sc. (Hons.) Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, 482001, Madhya Pradesh, India

Corresponding Email: Vermaharshita715@gmail.coM

Abstract

Organic farming has emerged as a critical pillar of sustainable agriculture globally, offering a viable alternative to input-intensive conventional systems that threaten long-term soil health, biodiversity and food safety. In India, where smallholder farming dominates the agricultural landscape, the transition to organic production is gaining momentum; however, it remains constrained by fragmented regulatory oversight, limited market access and inadequate institutional support. This paper examines the regulatory architecture governing organic farming in India, with particular focus on the National Programme for Organic Production (NPOP), Participatory Guarantee Systems (PGS-India) and the role of APEDA in facilitating certified organic exports. The study analyses why robust regulation is indispensable — not merely as a quality assurance mechanism, but as an instrument for building consumer trust, ensuring fair trade premiums and preventing greenwashing in organic markets. Beyond regulatory aspects, this paper explores the vast entrepreneurial potential embedded in the organic value chain, encompassing input supply (bio-fertilizers, biopesticides), primary production, agro-processing, direct-to-consumer platforms and organic export ventures. Barriers to entrepreneurship such as high certification costs, inadequate cold chain infrastructure and low farmer awareness are critically assessed alongside enabling policy interventions including PM Kusum, Paramparagat Krishi Vikas Yojana (PKVY) and various state-level organic missions. The paper concludes that a synergistic approach combining simplified certification pathways, skill-oriented agri-training modules, digital market linkages and startup incubation in the organic sector can unlock significant economic value while advancing India towards climate-resilient and ecologically sound agricultural development.

Keywords: Organic farming, NPOP, PGS-India, Agri-entrepreneurship, Value chain, Sustainable agriculture

IIZCAGV-26-T4-194

Advancing Women-Led Agribusiness in India: A Review of Public-Private Partnerships, Entrepreneurship Development and Market Integration

Taniya Soni[1], Hem Prakash Verma[2]and Vishalakshi Choubey[3]

[1]M.Sc. Scholar, Department of Agricultural Extension Education, College of Agriculture, Raipur (C.G.)
[2]Senior Research Fellow, Farmers FIRST Project, ICAR-National Institute of Biotic Stress Management, Raipur (C.G.)
[3]PhD Scholar, Department of Agricultural Extension Education, College of Agriculture, Raipur (C.G.)

Corresponding Email: taniasoni1121@gmail.com

Abstract

Women play a vital role in India's agricultural sector, contributing significantly to farming, processing, and post-harvest activities. However, their participation as agripreneurs remains limited due to challenges such as restricted access to land, finance, technology, training, and organized markets. Promoting women-led agribusiness has therefore become essential for achieving inclusive agricultural growth and rural development. This review explores the role of Public-Private Partnerships (PPPs), entrepreneurship development, and market integration in strengthening women-led agribusiness in India. Public-Private Partnerships help bridge institutional and resource gaps by combining government support with private sector investment, innovation, and technical expertise. These collaborations provide women farmers with training, access to credit, modern technologies, and improved value chain opportunities. In addition, Farmer Producer Organizations (FPOs) have emerged as effective platforms that enable women farmers to collectively engage in production, value addition, and marketing, thereby increasing their bargaining power and income. Entrepreneurship development programs further support women in building business and leadership skills, enabling them to participate in activities such as food processing, mushroom cultivation, organic farming, and other value-added enterprises. Moreover, improved market integration through digital platforms and organized supply chains has expanded marketing opportunities for women-led enterprises. Despite progress, barriers such as social constraints, limited financial access, and inadequate infrastructure persist. Strengthening PPP initiatives, improving market linkages, and promoting gender-inclusive policies are essential to enhance women's participation in agribusiness and foster sustainable rural development in India.

Keywords: Women, Agribusiness, Public-Private Partnerships, Entrepreneurship.

IIZCAGV-26-T4-195

Livestock and Fisheries for Untenable Livelihood

Suruchi Usrethe[1]

[1]Bsc (Hons.) Agriculture, Jawaharlal Nehru krishi Vishwavidyalaya jabalpur, 482004, Madhya Pradesh, India

Corresponding Email: suruchiu098@gmail.com

Abstract

Livestock and fisheries play a vital role in ensuring sustainable livelihoods, particularly in rural and coastal communities. This study aims to analyze the contribution of livestock and fisheries to income generation, employment opportunities. The methodology is based on secondary data analysis and field observations focusing on small-scale farmers and fishers. Key results indicate that integrated livestock and fish farming systems enhance resource efficiency, diversify income sources, and reduce vulnerability to economic and environmental risks. Improved breeds, scientific feeding practices, and better disease management have significantly increased productivity. Additionally, fisheries contribute to nutritional security by providing affordable protein sources. However, challenges such as climate change, limited access to markets, and lack of infrastructure persist. The study concludes that strengthening extension services, improving market linkages, and promoting sustainable practices can enhance the overall livelihood security of farmers and fishers.

Keywords: Livestock, Fisheries, Sustainable livelihoods, Food security, Rural development, Income generation

IIZCAGV-26-T4-196

Agri-startups for rural transformation: Building sustainable direct-to-consumer value chains

Sameer Vishwakarma[1]

[1]College of Horticulture, Rehli, Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur, Madhya Pradesh - 482001, India

Corresponding Email: sameervish94@gmail.com

Abstract

In India farmers' incomes are low because they do not get good prices for their produce and do not have good connections to markets. This study suggests a model for agriculture startups that includes making products in a way that does not harm the environment processing products locally creating a brand and selling directly to consumers to increase profits and create jobs for people in villages. The goal is to see how farmers' organisations, basic processing and online marketing can reduce the role of middlemen and increase the price farmers get for their products. The study compares supply chains with a direct-to-consumer model using existing data and information from the field. The main things to look at are the cost of inputs the value added to products the difference in prices and the profit farmers get. The suggested model uses eco-production methods, local processing units and online sales channels run by young entrepreneurs who have been trained. The results show that there may be people involved in selling products. farmers may get 20–30% more money for their goods.

and new jobs may be created in processing, transportation and marketing. The model also helps the environment by reducing waste and making supply chains shorter. In conclusion startups can help make agriculture more profitable and resistant to climate change while also giving people in villages the chance to start their own businesses and create jobs. Value chains driven by startups are a way to achieve this. Young people can benefit from agri-startups through youth employment. Sustainable agriculture practices can improve realisation. The value chain model can help farmers through D2C marketing.

Keywords: Value chain**,** Agri-startup**,** D2C marketing**,** Farmer income**,** Youth employment, Sustainable agriculture

IIZCAGV-26-T4-197

Bridging the Gap: How Digital Value Chains and Youth-led Entrepreneurship are Reshaping Rural Prosperity

Tripti Mishra[1*]

[1]Department of Agricultural Economics and Farm Management, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, 482004, Madhya Pradesh, India.

Corresponding Email: mtripti086@gmail.com

Abstract

Agriculture stands at a critical juncture where the integration of digital innovation is essential for sustainable economic growth. The heart of this journey is to demonstrate how revitalized digital value chains can transform traditional farming into market-driven, high-profit enterprises by eliminating systemic inefficiencies and maximizing the producer's share in the consumer rupee. By critically evaluating current technology transfer models, this inquiry proposes a strategic "Local to Global" framework specifically tailored for youth empowerment and rural entrepreneurship. Essential insights indicate that targeted skill-oriented training and the incubation of Agri-startups act as powerful catalysts for economic resilience, potentially reducing post-harvest losses by up to 20–30% through better market coordination. While challenges such as high initial investment, digital literacy gaps and technical complexity persist, the adoption of data-driven decision support systems offers a clear path toward superior price realization and waste reduction. Ultimately, a holistic shift toward digital entrepreneurship is vital for fostering a vibrant agricultural ecosystem that meets global standards of efficiency and social equity.

Keywords: Agri-Entrepreneurship, Digital Value Chains, Farm Management, Youth Empowerment, Market Innovation, Sustainable Livelihoods.

IIZCAGV-26-T4-198

Farmers Category-wise Analysis of Costs and Returns in Lentil Cultivation: Evidence from Lalitpur District, Uttar Pradesh

Shraddha Asati[1*] and Sachin Rathour

[1]Department of Agricultural Economics, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, Pin code- 284001, Uttar Pradesh, India.
[2]Department of Agricultural Economics, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, Pin code: 474002, Madhya Pradesh, India.

***Corresponding email:** shraddhaasati845@gmail.com

Abstract

Lentil (*Lens culinaris*) are a fundamental pulse crop with ancient origins and versatile uses. Lentil is mostly eaten as "dal" by converting into split pulse. Lentil is rich in protein (20-30%), dietary fiber, folate, vitamin B1 (thiamine), iron, and essential minerals. Notably, red varieties have lower fiber content (11%) compared to green varieties (31%). Lentil is a nutritionally important pulse crop that contributes to food and nutritional security while helping reduce the demand–supply gap of major pulses such as gram and tur. This study evaluates the cost structure and economic returns associated with lentil cultivation. Data were collected from Lalitpur district, Uttar pradesh, through a multistage sampling design combining purposive and simple random techniques without replacement. This district was selected purposively based on a large area under the, selected lentil crop. Primary data were collected via structured interview schedules administered to 100 lentil growers. The secondary data information was compiled from various records at block, tehsil and district offices. Discriptive statistics and tabular analysis were employed to quantify the Cost of Cultivation and economic Returns. The period of enquiry covered the main agricultural season of the year 2023–24, focusing on lentil-growing farmers in the selected area. The period of enquiry covered the main agricultural season of the year 2023–24, focusing on lentil-growing farmers in the selected area. The analysis reveals that the total cost of lentil cultivation is highest on medium sized farms at (Rs. 51791.70) per hectare, compared to lowest cost on marginal farms at (Rs. 24228.00) per hectare. This pattern indicates cost escalation with increasing farm size, reflecting diminishing returns to scale in lentil production under prevailing resource constraints. The policy implications advocate targeted input subsidies for marginal lentil growers, MSP/procurement to ensuring sustainable profitability.

Keywords: Lentil; Costs; Returns; B:C Ratio; Pulses crops.

IIZCAGV-26-T4-199

Spider Silk-Based Bio-Inspired Smart Materials for Precision Agriculture and Crop Protection"

Sisodia Ankita Dinesh Singh[1 2*], Satya Prakash Singh Tomar[2], Shubham Singh[2]

Kunjum Pradeeprao Likhitkar[1 2,] Soumya Shephalika Dash[2]
[1]Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj UP, India.
[2]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.

Corresponding email: ankitasinghsisodia007@gmail.com

Abstract

Spider silk has gained attention as a remarkable natural biomaterial due to its exceptional strength, elasticity, biodegradability and multifunctional properties. The present study highlights the potential of spider silk based bio inspired smart materials for applications in precision agriculture and crop protection. These advanced biomaterials may serve as sustainable alternatives in development of smart sensors for pest monitoring, biodegradable delivery systems for agro inputs and innovative materials for controlled release applications. The study emphasizes the role of spider silk inspired materials in improving resource use efficiency, supporting eco-friendly crop protection and promoting sustainable agricultural practices. Results indicated that bio inspired smart materials hold significant promise for integration with precision farming technologies, enhancing monitoring efficiency and reducing environmental risks associated with conventional materials. The study concludes that spider silk based innovations can contribute to next generation agricultural technologies and offer new opportunities for sustainable and
Climate resilient farming systems.

Keywords: Spider Silk, Bio-Inspired Materials, Precision Agriculture, Smart Sensors, Crop Protection

IIZCAGV-26-T4-200

Innovations in Sericulture for Sustainable Livelihood Security, Rural Entrepreneurship Development and Climate-Resilient Agro-Based Production Systems

Shubham Singh[1*], Satya Prakash Singh Tomar[1], Ankita Singh Sisodia[1], Shivam Singh[2] and Bazar Thimmappa Charan Kumar[1]

[1]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.
[2]Agriculture University, Jodhpur, Rajasthan, India

Corresponding Email: entomologyshubham@gmail.com

Abstract

Sericulture is a vital agro-based enterprise contributing to sustainable livelihood security, rural employment and entrepreneurship development. The present study highlights innovations in sericulture through improved mulberry cultivation, scientific silkworm rearing and integrated production approaches for enhancing productivity and economic returns. Sericulture offers income generation opportunities for small and marginal farmers, women and rural youth while promoting value addition and sustainable resource utilization. The study emphasized the role of innovative sericulture practices in strengthening climate-resilient agro-based production systems and improving livelihood diversification. Results indicated that adoption of improved sericulture technologies enhanced cocoon productivity, employment generation and farm income while increasing resilience of farming households. Integration of skill-oriented training, technology transfer and value chain approaches further strengthened the potential of sericulture as a viable rural enterprise. The study concludes that sericulture serves as an effective model for sustainable agri-based entrepreneurship and can significantly contribute to rural development, self-employment and livelihood security.

Keywords: Sericulture, sustainable livelihood, rural entrepreneurship, silkworm, mulberry, agri-enterprise

IIZCAGV-26-T4-201

Assessing the knowledge level of farmers towards climate change in Bundelkhand and gird Agri climatic zone of Madhya Pradesh

Siddharth Namdeo, Shobhana Gupta and Y.D. Mishra

College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior MP, India.

Abstract

This study examines the level of knowledge among farmers regarding climate change and related aspects. The findings reveal that a substantial majority of farmers (83.40%) are aware of climate change in their area, and 82.13% have heard about climate-resilient technologies such as zero tillage, mulching, and the System of Rice Intensification (SRI). A moderate proportion of farmers demonstrated correct knowledge about key concepts, with 65.11% identifying human-induced causes of climate change and 59.15% recognizing the gases primarily responsible for it. However, knowledge levels decline when more specific or technical aspects are considered. Slightly over half of the farmers (52.34%) understood that practices like burning crop residues contribute to climate change. Awareness about the effects of increased atmospheric CO_2 was limited to 40.85% of respondents, while 39.15% recognized that paddy cultivation contributes to greenhouse gas emissions. Only 26.81% correctly identified gases emitted due to the application of chemical fertilizers. Further gaps were observed in knowledge related to less obvious contributors and impacts. A relatively small proportion of farmers were aware of the role of refrigerant gases (23.83%) and livestock emissions (17.45%) in climate change. Similarly, only 15.74% understood that climate change can reduce crop maturity periods, and just 13.62% were aware of its impact on rising sea levels.

Keywords: Climate change, Farmers' knowledge, Climate-resilient technologies

IIZCAGV-26-T4-202

Exploring Smartphone Utilization Among Farmers of Gwalior District of Madhya Pradesh

Sneha Sharma

Masters Scholar, Department of Agricultural Extension Education
R.V.S.K.V.V., Gwalior, M.P.

Abstract

In recent years, smartphones have emerged as an important medium for delivering agricultural information to farmers. The present investigation, titled "Exploring Smartphone Utilization Among Farmers of Gwalior District of Madhya Pradesh," was undertaken to analyze how farmers used smartphones for agricultural purposes and to identify the factors

influencing their level of utilization. The study also examined the types of information accessed, the relationship between selected profile characteristics and smartphone use, and the constraints encountered by farmers. The research was conducted in Gwalior district of Madhya Pradesh. All four blocks Morar, Bhitarwar, Ghatigaon, and Dabra were covered. From each block, two villages were selected purposively, resulting in a total of eight villages. A sample of 151 respondents was determined using Slovin's formula and selected through proportionate sampling technique, followed by random selection within villages. Data were collected through personal interviews using a structured interview schedule under a descriptive research design. Statistical tools such as frequency, percentage, mean, correlation analysis, and Garrett's ranking technique were used for data analysis. The results indicated variations in the level of smartphone utilization among farmers and showed that factors such as education, income, technological access, and extension exposure influenced usage patterns. Farmers primarily accessed information related to weather updates, market prices, crop production, and pest management. Key constraints included poor network connectivity, high data costs, and limited digital proficiency. The study emphasized the need for strengthening digital infrastructure and capacity-building initiatives to enhance effective smartphone utilization in agriculture.

IIZCAGV-26-T4-203

An Economic analysis of farm profitability and farm efficiency of Adopted and Non adopted farms of KVK in Shahpura block of Jabalpur district

Varsha Kirar[1]* and Deepak Rathi[2]

[1]Department of Agricultural Economics & Farm Management College of Agriculture, Gwalior, RVSKVV, (M.P.)

[2]Department of Agricultural Economics & Farm Management College of Agriculture, Jabalpur, JNKVV, (M.P.)

*Corresponding author's email : aryavarsha521@gmail.com

Abstract

The study was conducted in Jabalpur district. Shahpura block is selected purposively among 7 blocks as the KVK provides their services and awareness programmes to the farmers. Sam le of 2 villages of this block was selected on the basis of KVK adoption status of villages so one KVK adopted and one non-adopted village was selected randomly. A sample of 90 farmers in the ratio of 45:45 was selected randomly. The farmers were classified into two groups viz., KVK adopted and non-adopted farmers. Pre tested interview-schedule was used for collection of data in the year 2018 19. The average size of land holding of sample respondents was 5.78 ha for adopted farm units and 4.48 ha in non-adopted farm units. The cropping intensity was higher in adopted farm units which is 193.30% followed by non-adopted farm units which is 189.9%. The cost of cultivation of pea (₹ 64483) for adopted and (₹ 66131.33) for non-adopted respondents was found higher as compare to wheat (₹ 35270) for adopted and (₹ 37676) for non-adopted respondents and paddy (₹ 33936) for adopted (₹ 36876) for non-adopted respondents. Yield of main product, net income, return per rupee was

found to be 8.08%, 7.90%,11.7% for paddy and 4.3%, 4.20%, 4.5% for pea and 14.52%, 6.43%, 8.39% for wheat, more in case adopted respondents over non-adopted. Efficiency analysis revealed that KVK-adopted farms exhibited higher levels of technical, allocative, and economic efficiency compared to non-adopted farms, indicating superior input utilization and cost minimization behaviour. The Tobit regression analysis identified factors such as education, farm size, input use, and extension contact as significant determinants of farm efficiency. The study concludes that KVK interventions significantly enhance farm profitability and efficiency through improved adoption of technologies and better management practices. Strengthening extension services and promoting wider adoption of KVK recommendations can substantially improve farm income and resource use efficiency in the region.

Keywords : KVK Adoption, Farm Profitability, cropping intensity

IIZCAGV-26-T4-204

Climate Resilient Livestock Farming

Dr Vandana Yadav[1], Dr Vikas Kumar[2] and Siddharth Namdeo[3]
[1]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India.
[2]Assistant Professor, College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India
[3]College of Agriculture, Rajmata Vijayraje Scindia Krishi Vishwavidyalaya, Gwalior, Madhya Pradesh, 474002, India

Corresponding Email: dryadavvandana@gmail.com

Abstract

Climate-resilient livestock farming is an adaptive and sustainable approach designed to maintain productivity and ensure food security under changing climatic conditions. Climate change, characterized by rising temperatures, irregular precipitation and increased frequency of extreme events, significantly affects livestock systems by reducing feed availability, increasing disease incidence, and causing heat stress in animals. This approach focuses on enhancing the resilience of livestock production systems through a combination of scientific innovations and traditional practices. Key strategies include the development and promotion of heat and disease-tolerant livestock breeds, improved pasture and fodder management, and efficient water use practices. Integrating livestock with crop systems, adopting agroforestry, and diversifying species contribute to risk reduction and improved farm stability. Technological interventions such as climate-smart housing, early warning systems, and precision livestock farming further strengthen adaptive capacity. In addition, mitigation practices like improved manure management, feed optimization, and carbon sequestration in grazing lands help reduce greenhouse gas emissions. Socio-economic support systems, including access to credit, extension services, and climate information, are crucial for the widespread adoption of resilient practices, particularly among smallholder farmers. Policy frameworks and institutional backing also play a significant role in scaling up these

interventions. In conclusion, climate-resilient livestock farming offers a comprehensive pathway to address the dual challenges of climate adaptation and mitigation while supporting livelihoods and environmental sustainability.

Keywords: Climate change, Livestock farming, Resilience, Adaptation, Mitigation, Sustainable agriculture, Heat stress, Agroforestry, Food security

Late Submissions of Abstracts

IIZCAGV-26-T4-205

Modern Approach to Integrated Pest Management

Konanki Ravi[1*], Ashok Singh Yadav[1], S.P.S. Tomar[1], Neha Sharma[1], Rahul Patidar[1]

Department of Entomology, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior. 474002. Madhya Pradesh, India.

Corresponding Author Email: konankiravi6575@gmail.com

Abstract

Previous iterations of integrated pest management (IPM) primarily concentrated on the ecological dimensions of pest control. Recent advancements in agricultural technology, modern communication tools, evolving consumer behaviors, growing consciousness regarding sustainably produced food systems and the globalization of trade and travel have prompted a re-evaluation of the IPM framework to make it relevant to contemporary times. A novel model that builds upon previous ecological and economic frameworks has been expanded and restructured to incorporate management, business and sustainability considerations, highlighting the significance of research and outreach. The management dimension comprises four components of IPM: pest management options, the expertise and resources necessary to develop management strategies, information management and timely decision-making and the dissemination or exchange of information. The business aspect involves the producer, consumer and seller, while the sustainability dimension encompasses economic viability, environmental safety and social acceptability. The new model addresses the human, environmental, social and economic factors that affect food production.

Keywords: Integrated pest management (IPM), sustainability, agricultural technology, decision making, food production system.

IIZCAGV-26-T4-206

Effect of Climate Change on Vegetable Production

Shrikant Sahu[1], Ojesh Chandravanshi[2] and Himanshu Yadav[3]

[1] Ph.D. Scholar, Department of Vegetable Science, Mahatma Gandhi Udyaniki evam Vaniki Vishwavidyalaya, Durg 491111(C.G.) India

[2] Ph.D. Scholar, Mahatma Gandhi Udyaniki evam Vaniki Vishwavidyalaya, Durg

[3]Ph.D. Scholar, Mahatma Gandhi Udyaniki evam Vaniki Vishwavidyalaya, Durg

Corresponding Email: shrikantsahu33@gmail.com

Abstract

Climate change is radically influencing vegetable production systems and establishing major concerns for global food security. Increasing temperatures impose heat stress that interferes with pollination, accelerates premature bolting, and ultimately lowers productivity in temperature-sensitive crops such as lettuce and tomato (Basso *et al.,* 2020). In contrast, low-temperature stress delays plant growth and causes frost injury in crops like pepper and cucumber, especially in regions facing greater climatic variability (Porter *et al*., 2020). Altered rainfall patterns intensify drought conditions, leading to water shortages, restricted plant growth, and reduced yield and quality in water-demanding vegetables such as spinach and cabbage (Liu *et al*., 2021). Heavy rainfall and inadequate drainage construct waterlogging conditions that hinder root respiration, reduce nutrient absorption, and increase disease incidence in crops such as carrot and potato (Nouri *et al*., 2021). Increasing soil salinity further constrains vegetable cultivation, specifically in arid and coastal areas (Zhang *et al.,* 2020). Additionally, atmospheric pollutants like ozone negatively affect plant tissues and photosynthetic efficiency (Tian *et al.,* 2020). Although elevated atmospheric CO_2 may enhance photosynthesis, it can also reduce nutritional quality by lowering essential mineral and vitamin concentrations (Ainsworth & Rogers, 2020). Therefore, developing climate-resilient varieties, improving water-use efficiency, and adopting sustainable agricultural practices are essential to maintain productivity and ensure long-term food security.

Keywords: Climate Change, Drought, Salinity, Temperature Stress, Waterlogging.

IIZCAGV-26-T4-207

Comparison of balanced nutrition and farmer's fertilization practice using rice as a test crop on tribal farmer's field

Shivam[1], Alok Tiwari[1], Shashi S. Yadav[1]

[1]Department of Soil Science, College of Agriculture, RVSKVV, Gwalior (M.P.)

Abstract

The present investigation entitled "Comparison of balanced nutrition and farmer's fertilization practice using rice as a test crop on tribal farmer's field" was conducted in 2020 at Telgara village, Kanker, C.G. The experiment was laid out in independent t-Test having two treatments, which replicated twenty times. The treatment consisted of two different treatments *viz*. T_1: Farmer's fertilizer dose [N: P_2O_5:K_2O:65: 46: 30 (kg ha^{-1})], T_2: Balanced fertilizer dose [N: P2O5: K2O: 120: 60:40 (kg ha^{-1})]. The experiment was conducted under tribal sub-plan (TSP) of AICRP on Long Term Fertilizer Experiment (LTFE). The LTFE has been continued since 1999 at Raipur and amongst 10 treatments of LTFE after 2 decades of experimentation, the optimum balanced (N: P_2O_5:K_2O: 120: 60: 40 kg ha^{-1}) recommended dose of nutrients for rice crop had been identified as an optimum treatment to produces sustainable rice yield without compromising the soil properties. To aware the farmers of

Kanker district, this sustainable balanced dose of nutrients treatment had been introduced to compare the yield gaps between 2 treatments or indirect approaches to increase the farmer's income through an increase in rice yield. With this idea and/or aim the present experiment was framed with a specific and minimum set of treatments on rice crop during the Kharif season. As regards the effect of fertilization on Physicochemical properties of soil such as pH, EC & OC recorded significant differences among each other. The farmer's practice dose (FPD) had a mean value of pH (6.33), EC (0.14 dSm^{-1}) & OC (0.67%) and balanced fertilizer dose (BFD) had the mean value of pH (6.22), EC (0.13 dSm^{-1}) & OC (0.69%) was noted amongst 20 farmer's fields. The data on major nutrient content in the soil revealed that the mineralizable N was significantly differed and recorded the highest (252 kg ha^{-1}) mineralizable N in BFD and the lowest (223 kg ha^{-1}) value was recorded under the FPD. The available P significantly increased among the treatments (FPD & BFD) and ranged from 11 to 14 (kg ha^{-1}). The significantly higher available P (14 kg ha^{-1}) was recorded in BFD and lower available P (11 kg ha^{-1}) was noted in FPD. Similarly, higher available K (419 kg ha^{-1}) was recorded in balanced fertilizer dose (BFD) and lower available K (302 kg ha^{-1}) was noted in farmer's practice dose. The effect of fertilization on harvesting index of rice ranges from 41.88 to 43.65 (q ha^{-1}) among the treatments balanced fertilizer dose (BFD) and farmer's practice dose (FPD). The harvesting index of rice was significantly influenced. The highest H.I. (43.65 q ha^{-1}) of rice was obtained with the application of FPD which was significantly superior over the treatment BFD (41.88 q ha^{-1}).

Keywords: Balanced dose of fertilization, farmers practice dose, electrical conductivity, major nutrients, micro-nutrients, harvesting index.

IIZCAGV-26-T4-208

The Delineation of Watershed in SAGA GIS -in a broad perspective

Satish Kumar Sharma[1] Praveen Kumar Jaga[2] and Vinod Kumar Garg[3]

[1]Deptt. of Agricultural Engineering, College of Agriculture JNKVV Ganjbasoda,
[2]Deptt. of Soil Science, College of Agriculture JNKVV Ganjbasoda, Madhya Pradesh
[3]Deptt. of Entomology, College of Agriculture JNKVV Ganjbasoda, Madhya Pradesh

Corresponding Author: satishkumarsharma516@gmail.com

Abstract

The watershed management model involves water resources between upstream and downstream areas of Madhya Pradesh falls under the semi-arid tropic (SAT) regions of the country. The poverty in the state was linked with lack of water and other natural resources, with key constraints like lack of technological issues and wider gap need to be fulfilled. Due to such reasons, the agricultural developments were restricted in the State and going with slow pace. Similarly, the other reasons against such restricted agricultural production in Central India were attributed to the reasons like low rain water use efficiency WUE for crop production, inherent low soil fertility, inappropriate nutrient management practices, low adoption of stress-tolerant crops for cultivation, insufficient pest management options and poverty etc. This study will sure help the different diverse areas of Bhopal district with

uneven & scanty rainfall and requiring vadose zone storage for capturing water, Scarcity of water resources for irrigation and others agricultural operations and Intersectoral competition amongst cultivators between conjunctive uses of water. This concept of watershed delineation has emerged as a new paradigm for planning, development and management of land, water in the study areas.

Keywords: Watershed delineation, WUE, stress tolerant, vadose zone, Conjunctive use of water

राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय, ग्वालियर (म.प्र.)

कुल गीत

शस्य श्यामला वसुधा के पूजन-अर्चन में,
वंदनीय मानवता के सुख-संवर्धन में,
कृषि विद्या के विश्व पीठ में
मंगल दीप जलो ।
शत्-शत् सुमन खिलो ।।

कृषि विज्ञान शोध के नव विस्तार में,
चंबल माता, मातु नर्मदा के आंगन में,
कृषि-क्षेत्रों में सतत सर्वदा
नव प्रकाश फैलो ।
शत्-शत् सुमन खिलो ।।

कृषक जनों तक पहुँचे कृषि विज्ञान समीर,
पूरण हो धन-धान्य से अपना देश प्रदेश सनातन,
मुस्कायें हरे मोती-सी
नित नूतन फसलें ।
शत्-शत् सुमन खिलो ।।

वीरांगना लक्ष्मीबाई की पावन भूमि में,
माधुरी विजयराजे की पुण्य स्मृति में,
स्थापित मंदिर गढ़े निरंतर
कीर्तिमान उज्ज्वलो ।
शत्-शत् सुमन खिलो ।।

राष्ट्रगीत

वंदे मातरम्
वंदे मातरम् (पूरा गीत – बंकिमचंद्र चट्टोपाध्याय द्वारा)
वंदे मातरम्
सुजलां सुफलां मलयजशीतलाम्
शस्यश्यामलां मातरम् ।

वंदे मातरम्
शुभ्रज्योत्स्नापुलकितयामिनीम्
फुल्लकुसुमित द्रुमदल शोभिनीम्
सुहासिनीं सुमधुर भाषिणीम्
सुखदां वरदां मातरम् ।। १ ।।

वंदे मातरम्
सप्त कोटि कण्ठ कलकल निनाद कराले
द्विसप्त कोटि भुजैर्धृत-खरकरवाले
अबला केनो मा एतो बले
बहुबलधारिणीं नमामि तारिणीं
रिपुदलवारिणीं मातरम् ।। २ ।।

वंदे मातरम्
तुमि विद्या, तुमि धर्म
तुमि हृदि, तुमि मर्म
त्वं हि प्राणाः शरीरे
बाहुते तुमि मा शक्ति
हृदये तुमि मा भक्ति
तोमारै प्रतिमा गड़ी मंदिरे-मंदिरे ।। ३ ।।

वंदे मातरम्
त्वं हि दुर्गा दशप्रहरणधारिणी
कमला कमलदल विहारिणी
वाणी विद्यादायिनी नमामि त्वाम्
नमामि कमलां अमलां अतुलाम्
सुजलां सुफलां मातरम् ।। ४ ।।

वंदे मातरम्
श्यामलां सरलां सुस्मितां भूषिताम्
धरणीं भरणीं मातरम् ।। ५ ।।
वंदे मातरम् ।।



bharatkhand

Bharatkhand Consortium of Farmers Producer Company Limited

Empowering Farmers, Strengthening Supply Chains

Strengthened more than 2.65 Lakh farmers across Madhya Pradesh & Rajasthan

Bharatkhand Consortium is a self-sustaining institutional platform that brings 200 plus FPOs under one umbrella enabling shared services, professional management, direct market linkages, and regenerative agriculture at scale.





Four Pillars of Bharatkhand

- Building Sustainable FPOs through Training and Capacity Building
- Bharatkhand Krishi Bazar (Advisory, Agri-inputs and Bio-inputs, Custom hiring-based equipment and tools)
- Sustainable Supply Chain & Market Linkages
- Bharatkhand Foods: Value Addition, processing and branding

What We Offer

High-Quality Authentic Products
Directly sourced from farmers collectives

Sustainable Practices
Promoting eco-friendly and regenerative agriculture

Fair Trade
Ensuring better prices and economic resilience

Membership Services
- Value Addition
- Supply Chain
- Skill Development
- FPO Governance
- Agri Inputs

Key achievements

- Value chain partner NMEO-Oilseeds: 25,000 farmers in 7 MP districts
- 30,000 farmers trained on GAPs under Godrej Mustard Model Farm project (37,500 ha)
- Dewas Kisan FPO: 500 MT soybean direct-sourced to Vippy Industries
- 4 Bharatkhand Krishi Bazar centres operational
- 359 agriculture labour forums across 13 MP districts with Gram Panchayats
- Outstanding Contribution in Rural Women Development World Business Conclave 2025
- 89 micro-enterprises & 14 Common Service Centres established
- 1,162 seed producers trained in scientific seed production

Commodities & Special Geographies

- Soybean
- Wheat (Sharbati)
- Mustard
- Groundnut
- Chickpea
- Riyawan Garlic
- Agar-Malwa Oranges
- Pigeon Pea (Pipariya)
- Fruits & Vegetables
- Medicinal & Aromatic Plants





Contact

Bharatkhand Hub
D/67, BDA Colony, Kohefiza, Bhopal,M.P
+919009923816
bharatkhandproducts@gmail.com
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50%	88%	75%
25%	–	–

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agrivisioncentralzone@zoho.mail.in | दत्तोपंत ठेंगड़ी सभागार, RVSKVV, ग्वालियर – 474002 (MP)

Publication I'd: RVSKVV Pub. No. 158/2026