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2nd International Conference
Book of Abstracts

Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences

[AI-CIAS 2024]







Organized by

Division of Veterinary Biochemistry
Faculty of Veterinary Sciences and Animal Husbandry
Sher-e-Kashmir University of Agriculture Sciences and Technology Kashmir, Shalimar, Srinagar-190025
AFTEFS & VITAL BIOTECH EDUCATION GROUP, KOTA

on
15- 17 October, 2024
at
SKUAST-Kashmir



- **Prof. (Dr.) Nazir Ahmad Ganai**
- **Dr. Shahzada Mudasir Rashid**
- **Dr. Rahil Razak**
- **Dr. Jitendra Mehta**
- **Dr. Krishnendra Singh Nama**
- **Ms. Kounser Jan**

VITAL BIOTECH PUBLICATION

INTERNATIONAL CONFERENCE ON

AI-CIAS 2024

Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences

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Faculty of Veterinary Sciences and Animal Husbandry
SHER-E-KASHMIR UNIVERSITY OF AGRICULTURE SCIENCES AND TECHNOLOGY-KASHMIR
SHALIMAR, SRINAGAR-190025

Under the aegis of

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

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VITAL BIOTECH PUBLICATION

Kota, Rajasthan, India
http://www.vitalbiotech.org/bookpublication/

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VITAL BIOTECH get Accredited by following International organization

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https://www.portico.org/publishers/vital/
101 Greenwich Street, 18th Floor
New York, NY 10006

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Published by Vital Biotech Publication
First Edition: 2024

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Product Form:
Digital download, online and Paperback

Edition:
ISBN: 978-81-978622-7-4

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Rajasthan-324009 India
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Printed at: Vinayak Printers, Kota

शिवराज सिंह चौहान
SHIVRAJ SINGH CHOUHAN

सत्यमेव जयते

कृषि एवं किसान कल्याण और
ग्रामीण विकास मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली
Minister of Agriculture & Farmers Welfare and Rural Development
Government of India
Krishi Bhawan, New Delhi

D.O. No. 420 /AM



संदेश

अपार हर्ष का विषय है कि कृषि विज्ञान एवं तकनीकी शेर-ए-कश्मीर महाविद्यालय, श्रीनगर एवं एग्रीकल्चर फोरम फ़ॉर टेक्निकल एजुकेशन ऑफ़ फार्मिंग सोसाइटी द्वारा तीन दिवसीय अंतर्राष्ट्रीय सम्मलेन का आयोजन 15 से 17 अक्टूबर तक एग्रीटेक इंटेलिजेंस एंड बियॉन्ड: कृषि और संबद्ध विज्ञान में अत्याधुनिक नवाचार विषय पर किया जा रहा है।

कृषि भारतीय अर्थव्यवस्था की रीढ़ है। प्रधानमंत्री श्री नरेंद्र मोदी जी के नेतृत्व में किसानों और कृषि क्षेत्र का हित सर्वोपरि है तथा केंद्र सरकार राज्यों को हर संभव सहायता प्रदान करने के लिए वचनबद्ध है। भारतीय कृषि प्रणाली को और अधिक सुदृढ़ करने के लिए फसलों के विविधिकरण को बढ़ावा देना, सूचना प्रौद्योगिकी का उपयोग, डिजिटल फसल सर्वेक्षण, किसान रजिस्ट्री, ई-नाम, कृषक संगठनों को मजबूत बनाना, प्रधानमंत्री फसल बीमा योजना और कृषि यांत्रिकीकरण सरकार की प्राथमिकता पर है। देश को आत्मनिर्भर बनाने के लिए सरकार कृत-संकल्पित होकर कार्य कर रही है।

कश्मीर में कृषि का इतिहास, इस क्षेत्र की सांस्कृतिक पहचान और विरासत का हिस्सा रहा है। घाटी के बागानों में सेब, नाशपाती, आड़ू, अखरोट, बादाम और चेरी जैसे फल और खेतों में पारंपरिक केसर की खेती इस क्षेत्र को भारत में एक अलग ही पहचान देता है। इस भू-भाग में फसल विविधिकरण और प्राकृतिक खेती को बढ़ावा देने की भरपूर संभावनाएं है। यहाँ के कृषि उत्पादों के मूल्य-संवर्धन एवं अंतर्राष्ट्रीय बाजार से जोड़ने का कार्य तेज करने का प्रयास जारी रहे, ताकि घाटी में खाद्य सुरक्षा के साथ पोषण सुरक्षा भी सुनिश्चित की जा सके।

शुभकामनाओं सहित,

(शिवराज सिंह चौहान)

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मनोज सिन्हा
उपराज्यपाल
जम्मू एवं कश्मीर
MANOJ SINHA
LIEUTENANT GOVERNOR
JAMMU & KASHMIR

सत्यमेव जयते

राजभवन
जम्मू–180001/श्रीनगर–190001
RAJ BHAVAN
JAMMU-180001/SRINAGAR-190001

I am delighted to know that the SKUAST-Kashmir is organizing the 2nd International Conference on **"AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences(AI-CIAS 2024),"** from October 15th- 17th, 2024, at the Faculty of Veterinary Sciences, SKUAST-Kashmir, Shuhama, Srinagar.

This event comes at a pivotal moment, as we face growing challenges in agriculture, veterinary, and medical sciences. The integration of artificial intelligence offers transformative potential, from boosting agricultural productivity and enhancing disease diagnostics to fostering sustainable practices. Such innovations will not only uplift these sectors but also accelerate India's journey toward becoming a global leader in science and technology.

I am confident that the insights and collaborations the conferenceaim to promote will address the challenges and explore new opportunities in agriculture and allied sciences, and contribute to our nation's progress.

My best wishes to the organizers for this commendable initiative. I extend my greetings and felicitations to all those associated with the AI-CIAS 2024 and wish the conference all success.

Manoj Sinha
(Manoj Sinha)

27th September 2024,
Srinagar.

Phone : 0191-2560225, 2544537 (Jammu), 0194-2501616, 2501313 (Srinagar), Email: (i) rajbhawan-jk@nic.in (ii) pps-lgjk@jk.gov.in

सत्यमेव जयते

डॉ. हिमांशु पाठक
DR. HIMANSHU PATHAK
सचिव (डेयर) एवं महानिदेशक (आईसीएआर)
Secretary (DARE) &
Director General (ICAR)

भारत सरकार
कृषि अनुसंधान और शिक्षा विभाग एवं
भारतीय कृषि अनुसंधान परिषद
कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली–110 001

GOVERNMENT OF INDIA
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संदेश

मुझे यह जानकर प्रसन्नता हुई कि कृषि आधारित अंतर्राष्ट्रीय सम्मेलन (ए.आइ.-सी.आइ.ए.एस.-2024) श्रीनगर, कश्मीर में 15-17 अक्टूबर, 2024 के दौरान शेर-ए-कश्मीर कृषि विज्ञान और प्रौद्योगिकी विश्वविद्यालय कश्मीर, एग्रीकल्चर फोरम फ़ॉर टेक्निकल एजुकेशन ऑफ़ फार्मिंग सोसाइटी एवं वाइटल बायोटेक एजुकेशन ग्रुप, कोटा द्वारा विज्ञान के विभिन आयामों को सम्मिलित करते हुए स्मार्ट-एग्रीकल्चर और भविष्य आधारित पोषण सुरक्षा के लिए आयोजित किया जा रहा है।

भारत में कृषि के पिछले नौ दशकों के दौरान उल्लेखनीय परिवर्तन हुए है, जिससे न केवल खाद्य आवश्यकताओं में आत्मनिर्भरता सुनिश्चित हुई है, अपितु पोषण सुरक्षा में भी पूर्णता आयी है। आविष्कारों और नवाचारों ने प्रौद्योगिकियों में सुधार को ना केवल नए पंख दिए है, अपितु उनके व्यापक उपयोग से कृषि उत्पादन में आशातीत वृद्धि भी हो रही है। भविष्य की मांग को पूरा करने के लिए कृषि के हर क्षेत्र में और सुधार के लिए नवप्रवर्तन की आवश्यकता है। कृषि तकनीकी में प्रज्ञता (ए.आई.), वर्तमान कृषि प्रणाली की सबसे महत्वपूर्ण आवश्यकता है। फसलों की उत्पादकता बढ़ाने के लिए कृषि की कृषि पद्धति में परिवर्तन पौधों, मिट्टी, पानी और पोषक तत्वों का प्रबंधन आदि इसी के विविध पक्ष है। एशियाई देश विशेष रूप से भारतीय परिवेश ए.आई. सिद्धांतों/विधियों के अनुकूल है किन्तु इसके निमित्त देश भर में व्याप्त कृषि की पारंपरिक प्रथाओं पर उपलब्ध जानकारियों के और अधिक अध्ययन करने की आवश्यकता है। अत: उक्त तथ्यों पर ध्यान देने का यही अनुकूल समय है। मुझे आशा है कि इस सम्मेलन में उपलब्ध प्रौद्योगिकियों की मौजूदा स्थिति पर गहनता से विचार-विमर्श किया जाएगा; अनुसंधान अंतरालों की पहचान और इससे जुड़े वर्तमान मुद्दों के समाधान के लिए एक कार्य योजना बनायी जाएगी।

मैं सम्मेलन की पूर्ण सफलता की कामना करता हूं।

(हिमांशु पाठक)

दिनांक 1 अक्तूबर, 2024
नई दिल्ली

भारतीय कृषि अनुसंधान परिषद
कक्ष क्र. 101, कृषि अनुसंधान भवन-II, नई दिल्ली-110 012, भारत
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
Room No. 101, Krishi Anusandhan Bhavan-II, Pusa, New Delhi-110012, India

डॉ. सुरेश कुमार चौधरी
उप महानिदेशक (प्राकृतिक संसाधन प्रबंधन)
Dr. Suresh Kumar Chaudhari
Deputy Director General (Natural Resources Management)

17.09.2024



Message

It gives me immense pleasure to extend my heartfelt greetings to the organizers and participants of the International Conference on "AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024)." This conference serves as an excellent platform for bringing together experts, researchers, and policymakers to discuss innovative approaches and transformative technologies that will shape the future of agriculture.

The integration of artificial intelligence into agriculture marks a revolutionary shift in how we approach food production, resource management, and environmental sustainability. AI has the potential to address some of the most pressing challenges in modern agriculture, from enhancing crop yields and improving soil health to optimizing water usage and mitigating the impacts of climate change. I am confident that the discussions at AI-CIAS 2024 will lead to cutting-edge research and actionable strategies that will greatly benefit the agricultural community.

Once again, I would like to congratulate SKUAST-Kashmir for organizing such a significant event on emerging areas to address the present and visualized agrarian problems in climate changed scenario. I wish AI-CIAS 2024 great success and look forward to the positive outcomes and innovations that will emerge from this conference.

(S.K. Chaudhari)

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Prof. Nazir Ahmad Ganai
Vice-Chancellor

Message



It gives me immense pleasure to extend my warmest greetings to all the esteemed participants of the International Conference on ***"AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024)".*** SKUAST-Kashmir, has always been committed to creating a competent human resource base, offering technology back-up, and facilitating outreach to ensure food, nutritional, and economic security for the region. Our efforts align with a broader objective of improving One Health, which integrates human, animal, and environmental well-being.

The AI-CIAS 2024 conference marks an important milestone in our pursuit of these objectives. By bringing together experts from diverse fields, this event serves as a platform for deliberating on the role of Artificial Intelligence (AI) in solving contemporary challenges in agriculture and allied sciences through cutting-edge research. The presence of renowned scientists and researchers from across the country and abroad, and the presentation of over 300 research findings, promises to make this Congress an enriching and transformative experience for all participants.

The thoughtful discussions that will take place over the course of this Congress are expected to pave the way for new insights and innovative solutions, driving progress in the sector.

We express our heartfelt gratitude to the different sponsoring agencies especially JKST & IC, for their generous financial support in making this conference possible.

I wish AI-CIAS 2024 great success and look forward to seeing this initiative grow into a regular and prestigious event.

Yours sincerely,

(Nazir Ahmad Ganai)

Place: Shalimar, Srinagar
Dated: 17.09.2024

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भारतीय कृषि अनुसंधान परिषद/ INDIAN COUNCIL OF AGRICULTURAL RESEARCH
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Message

It gives me immense pleasure to extend my heartfelt greetings to all the organizers, participants, and distinguished guests of the International Conference on "AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024)." This event is a unique platform that brings together leading experts, researchers, and policymakers from around the world to explore transformative technologies and innovative solutions shaping the future of agriculture and allied sciences.

The integration of artificial intelligence into agriculture signifies a paradigm shift in addressing global food security, environmental sustainability, and efficient resource management. With AI's potential to revolutionize crop yield optimization, soil health, water management, and climate resilience, the discussions at AI-CIAS 2024 will undoubtedly drive forward groundbreaking research and actionable insights. These innovations have the power to redefine modern agriculture, empowering communities and fostering sustainable development.

I would like to commend SKUAST-Kashmir for organizing this prestigious conference and express my deepest gratitude to all our partners, sponsors, and participants for their invaluable support. I am confident that AI-CIAS 2024 will serve as a catalyst for impactful outcomes and innovations that will benefit the global agricultural sector for years to come.

Wishing everyone a successful and fruitful conference.

Date : 26.09.2024

(Shanti Kumar Sharma)



Indian Council of
Agricultural Research

Vice-Chancellor, CCS HAU, Hisar

Message

It is with great pleasure and a deep sense of pride that I extend my heartfelt greetings to the distinguished organizers, participants, and honored guests of the International Conference on **"AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024)."** This esteemed gathering, hosted by SKUAST-Kashmir, stands as a profound commitment to advancing the frontiers of agriculture, veterinary, medical, and allied sciences.

In this transformative era, where artificial intelligence is revolutionizing industries across the globe, agriculture emerges as a field ripe with untapped potential. AI offers unprecedented opportunities to elevate food production, optimize resource management, and promote environmental sustainability, ushering in a new paradigm of innovation and efficiency. I am confident that the deliberations at AI-CIAS 2024 will generate groundbreaking ideas and solutions to address some of the most pressing challenges of our time, including climate change, food security, and the well-being of both humanity and the animal kingdom.

The diverse expertise gathered at this conference is a testament to the spirit of collaboration and shared knowledge that drives global progress. I am certain that AI-CIAS 2024 will serve as a vibrant forum for the exchange of pioneering research, transformative innovations, and visionary strategies that will reshape the future of agriculture and allied sciences.

I would like to express my sincere gratitude to the organizing committee, partners, and sponsors for their unwavering support and dedication in bringing this remarkable event to life. Your contributions will undoubtedly foster discussions that will inspire meaningful change and long-lasting impact.

I extend my warmest wishes to all participants, and I am confident that the insights gained here will significantly contribute to the betterment of the global agricultural community.

Best regards,

(Prof. B.R. Kamboj)



Patron
AI-CIAS 2024

Sher-e-Kashmir University of
Agricultural Sciences and
Technology Kashmir

From the Desk of Director Research

It is with great pleasure that I extend a warm welcome to all participants of the AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024) Conference. I am honored to be part of this momentous event, which brings together experts, researchers, and practitioners from diverse fields, all united by a shared vision to shape the future of agriculture and allied sciences.

In an era of rapid technological advancement, the intersection of artificial intelligence with agriculture, veterinary sciences, and allied disciplines holds transformative potential. The AI-CIAS 2024 conference provides a platform for knowledge exchange, innovation, and collaboration that will drive solutions to global challenges such as food security, sustainable farming, animal welfare, and environmental stewardship.

This gathering is not just a celebration of groundbreaking research and technological strides, but a testament to the power of interdisciplinary cooperation. The distinguished speakers, presentations, and discussions at this conference will lay the foundation for a future where cutting-edge innovations contribute to the holistic well-being of humans, animals, and the environment.

I would like to express my gratitude to the organizing committee, our partners, sponsors, and delegates for making this event possible. Together, we are forging a strong stem—a solid foundation for future growth, prosperity, and scientific excellence.

Wishing you all an insightful conference!

(Haroon Rashid Naik)



Patron
AI-CIAS 2024

Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir

From the Desk of Director Extension

It gives me immense pleasure to welcome all the esteemed delegates, researchers, and practitioners to the AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024) Conference. As the Director of Extension, I am proud to witness the convergence of brilliant minds and groundbreaking ideas that will shape the future of agriculture and allied sciences.

This conference arrives at a critical time when the world is looking to harness the power of technology, particularly artificial intelligence, to address some of the most pressing challenges we face today—sustainable agriculture, food security, animal welfare, and environmental health. The role of extension in bridging the gap between innovative research and field application is crucial, and this event underscores our commitment to transferring knowledge and technologies that will enhance productivity, improve livelihoods, and ensure sustainability.

AI-CIAS 2024 is more than just an academic gathering; it is an opportunity to foster collaboration between scientists, industry leaders, and policymakers. Through the insightful discussions and presentations that will take place, we aim to create lasting impact, not only for the scientific community but for the wider world that depends on agriculture for its sustenance.

I extend my heartfelt thanks to the organizing team, our valued sponsors, and all the participants for making this conference a grand success. Let this be the beginning of many fruitful partnerships that will drive progress in agriculture and allied sciences.

(Dil Mohammad Makhdoomi)



DEAN-F.V.Sc & AH
SKUAST-K

Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir

Message

It is with immense pride and enthusiasm that I extend my heartfelt congratulations to the organizing committee of the AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture/Extension and Allied Sciences (AI-CIAS 2024) for bringing together this landmark conference. In an era where scientific and technological advancements are reshaping the global landscape, this event serves as a vital platform for fostering interdisciplinary collaboration across agriculture, veterinary science, and allied fields.

The Faculty of Veterinary Science is committed to promoting excellence in animal health, welfare, and sustainable practices, in alignment with the One Health approach that integrates human, animal, and environmental health. This conference, with its focus on innovations in artificial intelligence, biotechnology, and precision farming, perfectly aligns with our goals to improve livestock health and productivity, enhance disease control strategies, and ensure ethical animal practices.

I extend my best wishes to all participants, researchers, and guests. May this conference inspire innovative solutions and foster meaningful partnerships that will leave a lasting impact on our field and beyond.

(Prof S. A. Kamil)

सत्यमेव जयते
Government of Jammu and Kashmir



Deputy Commissioner
Srinagar Kashmir

Message

It is a matter of immense pride and joy to witness the International Conference on "AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024)" taking place in our region. This prestigious event provides a valuable platform for scientific minds to come together, share knowledge, and explore innovative solutions in agriculture and allied sciences—an area critical to the socio-economic development of our nation.

The significance of artificial intelligence in revolutionizing agricultural practices, improving productivity, and ensuring food security cannot be overstated. I am confident that the insights and discussions generated at AI-CIAS 2024 will contribute to meaningful advancements that will benefit our farmers, scientists, and policymakers alike.

I would like to extend my heartfelt appreciation to SKUAST-Kashmir and its partners for organizing this significant event and express my best wishes for its success. I look forward to seeing the positive outcomes of this conference and the potential for transformative change it holds for the agricultural sector in the region.

Wishing AI-CIAS 2024 a resounding success.

(Bilal Mohi-Ud-Din Bhat)

AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY (AFTEFS)
KOTA, RAJASTHAN

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Date: 01.10.2024

MESSAGE FROM CONFERENCE DIRECTOR & SOCIETY PRESIDENT



Dear participants and honored guests, On behalf of Agricultural Forum for Technical Education of Farming Society, Kota (Rajasthan), we take great pleasure in welcoming you to the International Conference on "Agritech Intelligence & Beyond : Cutting Edge Innovations in Agriculture & Allied Sciences" to be held at Sher-e-Kashmir College of Agricultural Sciences and Technology, Srinagar from 15th to 17th October. This conference provides an important platform to discover the latest innovations and research in agriculture and allied sciences.

The objective of this conference is to discuss the rapidly changing technologies and their potential impacts on the agriculture sector. We believe that sharing the latest ideas, research and innovations will help us find solutions to the challenges facing the agriculture sector and determine its future direction.

At this conference, you will gain valuable insights from internationally and nationally renowned experts on agricultural technology, data analytics, automation, and other related topics. We hope this initiative will generate new opportunities for ideas and collaboration.

Your participation and contribution is extremely important to us and we look forward to setting new standards in this field with you.

Thank You.

Dr. Jitendra Mehta
PRESIDENT, AFTEFS
VITAL BIOTECH, KOTA, RAJASTHAN



Convenor
AI CIAS- 2024

Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir

From the Desk of Convenor

It gives me immense pleasure to welcome all distinguished participants, speakers, and delegates to AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024). This conference, envisioned as a platform for groundbreaking innovation and collaboration, is the culmination of tireless efforts to bring together some of the finest minds from diverse fields—agriculture, veterinary sciences, biotechnology, and beyond.

As convener, I am proud to see this conference serve as a hub for sharing cutting-edge research, facilitating knowledge exchange, and fostering collaborations that will propel advancements in agriculture, veterinary medicine, and allied sciences. It is through such interactions that we can develop sustainable, innovative solutions that benefit not just our regions but have far-reaching global impact.

I extend my sincere thanks to our keynote speakers, panelists, sponsors, and the organizing team for making this event possible. I am confident that the ideas and partnerships formed here will continue to shape the future of our fields long after the conference concludes. Let us use this opportunity to inspire each other and pave the way toward a brighter and more sustainable tomorrow.

Wishing you all a productive and insightful experience at AI-CIAS 2024.

(Zahoor Ahmad Pampori)



Sher-e-Kashmir University
of Agricultural Sciences and
Technology Kashmir

Organizing Secretary
AI-CIAS 2024

From the Desk of Organizing Secretory

It gives me immense pleasure to welcome you to the AgriTech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024) conference. As we convene to explore the vast potential of artificial intelligence (AI) in shaping the future of agriculture, veterinary, medical, and allied sciences, it is imperative to address the profound challenges faced by these sectors.

Today, we confront a myriad of challenges that hinder progress. In agriculture, climate change, resource scarcity, and inefficiencies in crop and livestock management demand innovative solutions. In the veterinary and animal husbandry sectors, disease control, animal welfare, and zoonotic threats remain critical areas of concern. Similarly, the medical sciences are grappling with the need for early diagnosis, effective treatment options, and affordable healthcare solutions for an ever-growing population.

These challenges are not insurmountable. The advent of artificial intelligence offers us a powerful tool to bridge gaps and unlock new avenues of growth. AI-driven technologies can optimize crop yields, improve precision farming practices, and revolutionize livestock management through real-time monitoring and predictive analytics. In veterinary sciences, AI can enhance disease surveillance and control systems, ensuring the health and welfare of animals, while safeguarding public health through the One Health approach. In medicine, AI holds the potential to transform diagnostic accuracy, accelerate drug discovery, and enhance personalized healthcare.

The AI-CIAS 2024 conference serves as a platform for thought leaders, scientists, and innovators to come together and explore these cutting-edge technologies. We are committed to finding solutions that can propel India toward becoming a global leader in agriculture, healthcare, and veterinary sciences. By harnessing the power of AI, we can not only overcome existing challenges but also strengthen India's position as a thriving economy, driven by scientific excellence and sustainable development.

I look forward to the insights and collaborations that will emerge from this prestigious event. Together, we can build a brighter, more prosperous future for all.

(Shahzada Mudasir Rashid)

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MESSAGE FROM CONFERENCE CO-ORDINATOR & SOCIETY VICE PRESIDENT



The International conference on "Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS – 2024)" hosted by the Division of Veterinary Biochemistry, Faculty of Veterinary Sciences and Animal Husbandry, Shuhama-190006, SKUAST-Kashmir, from October 15-17, 2024 in collaboration with Agriculture forum for Technical Education for Farming Society, Kota (Rajasthan) serves as a premier platform for exploring the latest advancements and innovations in the field of agriculture and related sciences. This conference aims to bring together leading experts, researchers, and industry professionals to discuss ground-breaking research, emerging technologies, and practical solutions to the challenges faced in agriculture. It provides an opportunity for networking, knowledge exchange, and collaborative discussions on the future of agritech.

I extend our profound thanks to Division of Veterinary Biochemistry, Faculty of Veterinary Sciences and Animal Husbandry, Shuhama, SKUAST-Kashmir for hosting this insightful conference. Your commitment to advancing agricultural sciences and facilitating meaningful dialogue had been instrumental to the success of this event.

I also express my deep gratitude to all the participants for their valuable contributions in the form of abstracts and manuscripts and their enthusiastic participation. I am sincerely hopeful that your involvement will enriched the discussions during the technical sessions and pave the way for future innovations in the field.

I am confident that this will make the conference a truly memorable and impactful experience.

Thank You.

Dr. Krishnendra Singh Nama

VICE PRESIDENT, AFTEFS
KOTA, RAJASTHAN

FARMER'S PARK

SUSTAINABLE SOLUTIONS

MESSAGE FROM THE FOUNDER & CEO OF FARMER'S PARK



It is with profound pride and gratitude that I announce **Farmer's Park** collaboration with the 2nd International Conference on Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences (AI-CIAS 2024), This esteemed event, hosted by the Agriculture Forum for Technical Education of Farming Society **(AFTEFS)** in partnership with SKUAST-Kashmir underscores a pivotal advancement in our mission to revolutionize agriculture and allied sciences

At **Farmer's Park,** we uphold the principle that sustainability is an ongoing journey. Our commitment is demonstrated through initiatives such as complimentary soil testing, tailored farm input recommendations, and comprehensive marketing support for organic and natural farmers. These efforts underscore our dedication to fostering innovation and supporting farmers. The **AI-CIAS 2024,** conference presents an unparalleled platform to engage with global experts, exchange critical insights, and explore groundbreaking solutions that will shape the future of agriculture.

I extend my sincere appreciation to the organizers for their unwavering efforts in convening this monumental event. The knowledge and solutions derived from this forum will undoubtedly contribute to adoption of more resilient, sustainable agricultural practices worldwide.

FARMER'S PARK is honored to be an integral part of **AI-CIAS 2024** and we look forward to leveraging the collaborations and innovations that will shape the future of agriculture.

With heartfelt gratitude and optimism for the journey ahead,

Pragathi

Pragathi Reddy
FOUNDER & CEO,
FARMER'S PARK

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MESSAGE FROM FOUNDER & CEO VITAL BIOTECH



On behalf of **VITAL BIOTECH**, I am delighted to extend my best wishes to the **Division of Veterinary Biochemistry, Faculty of Veterinary Sciences & AH, SKUAST-Kashmir** for organizing the **International Conference on Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences**, to be held from **15th to 17th October, 2024**.

This prestigious conference, under the esteemed **Agriculture Forum for Technical Education of Farming Society (AFTEFS)**, is a landmark event that brings together global experts to address the challenges and opportunities in agriculture and allied sciences. It offers a unique platform for knowledge exchange, collaboration, and exploration of innovative technologies that will shape the future of agriculture. The focus on cutting-edge innovations is timely and essential in today's rapidly evolving agricultural landscape.

At **VITAL BIOTECH**, we are committed to fostering technological advancements in agriculture, and we strongly believe that conferences like this are key to driving progress. The dialogue and ideas generated here will not only impact scientific research but also have practical applications for farmers, industries, and policymakers, helping to improve productivity, sustainability, and food security.

I am confident that the discussions and presentations will inspire new approaches and solutions to the pressing issues faced by the agricultural sector today. We look forward to seeing the groundbreaking innovations and fruitful partnerships that will emerge from this event.

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

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

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AFTEFS/SKUAST-K/AG/2024/313	Effects of Volcanic Action on Land Fertility	[1]Dr. Renu Devi and [2]Dr. Joginder Singh*
AFTEFS/SKUAST-K/AG/2024/314	Role of different micronutrient on plant height, number of leaves and plant spread of broccoli (*Brassica*	Pushpanjali Pankaj*, Yaspal Singh Nirala, Pushpalata Tirkey and

	oleracea var. *italica*) cv. green magic	Archana Kerketta
AFTEFS/SKUAST-K/AG/2024/315	Studies on White Leaf Hopper in Different Rice Ecosystem and Correlation with Weather Parameters	Yaspal Singh Nirala[1]*, Pushpanjali Pankaj[2], Pushpa Lata Tirkey[1] and Gajendra Chandrakar[1]
AFTEFS/SKUAST-K/AG/2024/316	Global barley (*Hordeum vulgare* L.) collection from ICARDA: genome-wide association studies for heat tolerance	Swati Verma[1], Shikha Yashveer[1], Yogender Kumar[1] and Ramesh Pal Singh Verma[2]
AFTEFS/SKUAST-K/AG/2024/317	Robotics and Automation in Agriculture	Gali Krishna Chaithanya[1*] and Bhagya Laxmi Sahu[2]
AFTEFS/SKUAST-K/AG/2024/318	Climate-Smart Agriculture: Pathways to Resilience and Adaptation	Bhagya Laxmi Sahu[1*] and Gali Krishna Chaithanya[2]
AFTEFS/SKUAST-K/AG/2024/319	Evaluation of wheat genotypes for seedling resistance to stripe rust (*Puccinia striiformis* f. sp. *tritici*) pathotypes under controlled environmental conditions	Ajit Singh[1]*, Rajender Singh[1], Vipul[1] and Keshav Saharan[1]
AFTEFS/SKUAST-K/AG/2024/320	Analysis of forty maize (*Zea mays* L.)inbred lines for heat stress tolerance under Normal vs. Late Spring sowing conditions	Kiran, Preeti Sharma, M.C. Kamboj, Narender Singh, Harbinder Singh, Swati Verma and Kuldeep Jangid
AFTEFS/SKUAST-K/AG/2024/321	Quality of Early Childhood Care and Education (ECCE) centre Environment on Social and Emotional Development of Preschool Children	Soumya Hirelingannavar[1*] and Manjula Patil[2*]
AFTEFS/SKUAST-K/AG/2024/322	Efficacy of bioagents on the gowth inhibition of *Klebsiella aerogenes* causing stem rot in pearl millet	Sheetal Dhariwal[1*] and Vinod Kumar Malik[2]
AFTEFS/SKUAST-K/AG/2024/323	Differential Response of Wheat Genotypes to *P. triticina* Pathotype 12-5 at Seedling Stage	Pooja[1], Rajender Beniwal[2] and Mamta[3]
AFTEFS/SKUAST-K/AG/2024/324	Machine Learning-Based Hazard Identification in Agricultural Machinery Operations	Shalini Dwivedi
AFTEFS/SKUAST-K/AG/2024/325	Integrating microbial culture with nitrogen application for improving wheat production in conservation agriculture in Indian Punjab	Rajbir Singh Khedwal[1,2*], Jayesh Singh[2], Anu Kalia[2] and Kiran Khedwal[1]
AFTEFS/SKUAST-K/AG/2024/326	Impact of Climate Change on Flowering, Fruit Set, and Yield in Major Fruit Crops	Shiv Kumar Ahirwar[1*]

AFTEFS/SKUAST-K/AG/2024/327	Enhancing Shelf Life and Quality of Ber (*Ziziphus mauritiana* L.) cv. Gola through Postharvest Treatments under Ambient Storage	Bhawna
AFTEFS/SKUAST-K/AG/2024/328	Effect of grafting method on various parameters in low chill peach cv Shan-i-Punjab in Haryana	Jaipal[1], RPS Dalal, Santosh Kumari
AFTEFS/SKUAST-K/AG/2024/329	Association studies of biochemical traits in upland cotton with whitefly	Lalit Kumar*, Sandeep Kumar, Minakshi Jattan
AFTEFS/SKUAST-K/AG/2024/330	Spatio-Temporal Assessment of Water Quality in Gosikhurd Reservoir, Maharashtra, India	Rinkesh Nemichand Wanjari
AFTEFS/SKUAST-K/AG/2024/331	Emerging Tilapia Lake Virus in Indian Aquaculture: Integrating Molecular Diagnosis, Pathobiological Evidence and Risk-Based Biosecurity	Muneshwar PavanKalyan Yash V. Charthad Muneshwar Tejashwini Mrunal Narendra Nasre

Section-B

SR. N0.	ABSTRACT TITLE	AUTHOR(s)
AFTEFS/SKUAST-K/MED/2024/A	Targeting Iron-Induced Cofilin Activation and Neuroinflammation in Microglia: Therapeutic Potential of Deferoxamine and a Novel Cofilin Inhibitor	Faheem Shehjar, Antonisamy William James, Reetika Mahajan, Zahoor A Shah¶
AFTEFS/SKUAST-K/MED/2024/B	Impact of Hyperchloremia and Hypernatremia on Microglial and Neuronal Survival During Oxygen-Glucose Deprivation/Reperfusion	Reetika Mahajan[1], Faheem Shehjar[1,] Adnan I. Qureshi[2] and Zahoor A. Shah[1]*
AFTEFS/SKUAST-K/MED/2024/C	After Effects of Pharmaceuticals and Personal Care Products (PPCPs) on the Biosphere and their Counteractive Ways	Muneeb U Rehman
AFTEFS/SKUAST-K/MED/2024/D	Anticancer Potential of Polyphenol-Rich Extracts from *Ipomoea pes-caprae* Against Breast Cancer: In-Vitro and In-Silico Investigations	Adil Farooq Wali[1], Sirajunisa Talath[1], Shorok Ashraf Mohamed Ali Rashed[2], Youssef Emad Elmenawi[2], Khulood Saleh Ahmed AlBarati[2], Ahmed hasan ali alshammari[2]
AFTEFS/SKUAST-K/MED/2024/E	Phytochemical, Antimicrobial, Antioxidant, and Anticancer Potential of Aqueous Extract of	Sirajunisa Talath and Adil Farooq Wali

	Ficus Carica Leaves Grown in the United Arab Emirates	
AFTEFS/SKUAST-K/MED/2024/01	A modified non-toxic trypan assay for long-term viability, fluorescence and FACs applications	Naveen Kumar*, Arbind Acharya#
AFTEFS/SKUAST-K/MED/2024/02	Medicinal and aromatic plants in agroforestry systems through socioeconomic Practices in Rajasthan, India	Ankit Kumar Jangid[1] and Pratima Shrivastava[2]
AFTEFS/SKUAST-K/MED/2024/03	Functions of Different Catalysts in Biomass Transformation Methods	Sonal Gupta[1*]
AFTEFS/SKUAST-K/MED/2024/04	Gluten intolerance in children with failure to thrive and our experience in a paediatric hospital of Kashmir	Dr Naseer Yousuf Mir[1*], Dr Junaid Mehraj[2]
AFTEFS/SKUAST-K/MED/2024/05	Exploring the phytochemical, antioxidant, and anti-microbial activity of buttermilk fortified with Chia seeds	Dr. Sonal Prasad[1]
AFTEFS/SKUAST-K/MED/2024/06	Bioaerosol assessment in the outdoor atmosphere of Public garden at Nampally area of Hyderabad district, Telangana state, India	*Chaya Pallati
AFTEFS/SKUAST-K/MED/2024/07	Prevention and Control of Zoonotic Diseases: An Integrated Approach to Reducing Spillover Risk	Navjot Singh Thakur[1,*], Kavitha K[2], Ensha Lomiya M.A.[3]
AFTEFS/SKUAST-K/MED/2024/08	Expression analysis of Cox 2 in Gastric Cancer in the Kashmiri Population	Insha Bashir[1], Sabhiya Majid[1], Mehnaaz Sultan Khuroo[2], Showkat Ahmad Kadla[3], Iqbal Saleem Mir[4]
AFTEFS/SKUAST-K/MED/2024/09	Comparative Antimicrobial Efficacy of Kashmir's Medicinal Plants	Bisma Nisar [1,2], Mudasir Ahmad Dar[1], Poornima Srivastava[2], Wajid Waheed[3], Mushtaq A Malik[1], Khalid Hussain Bhat[1,3]
AFTEFS/SKUAST-K/MED/2024/10	Phytochemical Analysis and Antimicrobial Activity of *Azadirachta indica*	Geeta D[1*] & Ramalingappa B[2]
AFTEFS/SKUAST-K/MED/2024/11	Investigating the neuronal circuits mediating Orbital Motioninduced	Junaid ul Shafi Mir, Sushma Rao, Nisha

	sleep in *Drosophila melanogaster*	Sharma, Shahnaz R lone*, Sheeba Vasu*
AFTEFS/SKUAST-K/MED/2024/12	Biomedical Applications of Polyhydroxyalkanoates in Tissue Engineering and Drug Delivery System: A Review	Dr. Sunita Jain
AFTEFS/SKUAST-K/MED/2024/13	Quality of Early Childhood Care and Education (ECCE) centre Environment on Social and Emotional Development of Preschool Children	SOUMYA HIRELINGANNAVAR[1*] AND MANJULA PATIL[2*]
AFTEFS/SKUAST-K/MED/2024/14	Ultrasonographic and Computed Tomography Evaluation of Prostatic Carcinoma in Canine Patients: A Diagnostic Study	Shivangi Diwedi, P. Bishnoi, Mahendra Tanwar, Narendra Kumar & Ruchi Patwa
AFTEFS/SKUAST-K/MED/2024/15	Radio-protective and Chemo-protective effect of glutathione based metal complex	-----
AFTEFS/SKUAST-K/MED/2024/16	Platinum-based Drugs for Cancer Therapy	Mominul Sinan
AFTEFS/SKUAST-K/MED/2024/17	Chitooligosaccharide: Synthesis and antioxidant potential	Surbhi Sahewalla[1*], Sonam Sihag[3], Yamini Tak[1], Vinod Saharan[2] and Ajay Pal[1]
AFTEFS/SKUAST-K/MED/2024/18	Detection of drug resistance pattern of Mycobacterium tuberculosis by CBNAAT IN SOUTH KASHMIR, INDIA	Bushra Yousuf Peerzada, Shah Aamina Samreen
AFTEFS/SKUAST-K/MED/2024/19	Zoonotic Disease Prevention and Control	Malti
AFTEFS/SKUAST-K/MED/2024/20	Evaluation of various techniques for monitoring the enrichment of *Pseudomonas aeruginosa* specific aptamers through SELEX process	N Jaya Lakshmi, Hariprasad P*
AFTEFS/SKUAST-K/MED/2024/21	Comparative Efficiency of DNA Tetrahedron and Exosomes in Drug Delivery of Epirubicin for Breast Cancer Treatment	Afnan Saleem[1*], Syed Mudasir Ahmad[1]

AFTEFS/SKUAST-K/MED/2024/22	A Comparative Study on Level of Gender Equality in Rural and Urban Areas of Mathura District	Madhulika Gautam
AFTEFS/SKUAST-K/MED/2024/23	PD-L1 (PROGRAMMED DEATH LIGAND-1) gene copy number variation (CNV)and expression analysis in skin cancer patients	Sadaf Saleem[1], Rafiqa Eachkoti[1], Yasmeen Jabeen[2], Summyia Farooq[3], Sanah Farooq[1], IqraFarooq[1]
AFTEFS/SKUAST-K/MED/2024/24	Glowing Carbon Based Quantum Dots: Syntheses, Properties and Applications	Parimal Routh
AFTEFS/SKUAST-K/MED/2024/25	Discovering the Untapped Potential of Fungal-Based Pancreatic Lipase Inhibitors for Obesity Management	Mohammed Asif Killedar[1] & Ramalingappa B*
AFTEFS/SKUAST-K/MED/2024/26	Minimally Invasive Biomarkers for Lung Cancer: A Studyon the Diagnostic potential of BCL-2 and RBP-4	Heena shafi[1], Sabhiya Majid[1], Naveed Nazir Shah[2]
AFTEFS/SKUAST-K/MED/2024/27	Anti-cancer Effect of Naringenin On Human Triple Negative Breast Adenocarcinoma Cell Line	Kounser jan[1], Shahzada Mudasir Rashid[2], Ishraq Hussain[2]
AFTEFS/SKUAST-K/MED/2024/28	Elucidating the role of Microalbuminuria as a Marker in Pre-Diabetic and Pre- Hypertensive Patients having risk of cardiovascular disease	Iram Hamid[1], Vinitha Ramanath Pai[2]
AFTEFS/SKUAST-K/MED/2024/29	To Study the prognostic and diagnostic role of Microalbuminuria and GFR in Diabetic and Hypertensive Individuals	Iram Hamid[1], Vinitha Ramanath Pai[2]
AFTEFS/SKUAST-K/MED/2024/30	Exploring the Potential of Naringenin: A Network Pharmacology Approach to Induce Apoptosis and Autophagy in Breast Cancer Cells	Basharat Ahmad Bhat[1], Suhail Ahmad Mir[2], Priti S Shenoy[3, 4], Laraibah Hamid[5], Ashraf Dar[6], Nasir Nisar[2], Pritha Ray[3,4], and Ghulam Nabi Bader[2]

AFTEFS/SKUAST-K/MED/2024/31	Approach to identify and isolate *C. dubliniensis* in laboratory and comparison of various methods for same	ABIROO JAN
AFTEFS/SKUAST-K/MED/2024/32	Biotechnology and Genetic Engineering: Genetic Modification and Gene Editing	Ratnesh Mishra
AFTEFS/SKUAST-K/MED/2024/33	Prediction, Cloning and Characterization of *narG* promoter of *Salmonella* Typhimurium	Pashupathi M[1], Pradeep Kumar Godwal[2], Rashmi Mishra[2], Meeta Saxena[2], Ajay Kumar[2]
AFTEFS/SKUAST-K/MED/2024/34	Targeting Breast Cancer: Chemoprofiling and Cytotoxicity of *Ziziphus nummularia* Leaves	Darakhshan Javaid[1]and Mohd Salim Reshi[1]
AFTEFS/SKUAST-K/MED/2024/35	Exploring the Hepatic Impact of Bisphenol A and Its Toxicological Mechanisms	[1]Syed Sanober Qadri and [1]Mohd Salim Reshi
AFTEFS/SKUAST-K/MED/2024/36	Reproductive toxicity of Bisphenol A (BPA): Unraveling Mechanism	Adfar Reyaz[1] and Mohd Salim Reshi[1]
AFTEFS/SKUAST-K/MED/2024/37	Prevalence of β-Lactam Resistance in Hospital Effluents: A Study on Antimicrobial Resistance in Healthcare Settings	Mohammad Vikas Ashraf
AFTEFS/SKUAST-K/MED/2024/38	Eco-Friendly Antibacterial Textiles: Harnessing Medicinal Plants for Sustainable Health Solutions in Community Medicine	[1]Neeta, [2]Nisha Arya and [3]Arpita Grover
AFTEFS/SKUAST-K/MED/2024/39	Screening of natural AMPK protein Kinase Activators for managing Metabolic memory and associated complications	Wajid Aslam Khan[a], Sourbh Suren Garg[b], Jeena Gupta*

Section-C

SR. N0.	ABSTRACT TITLE	AUTHOR(s)
AFTEFS/SKUAST-K/VET &	Comparative study of two Himalayan Snow Trout, *Schizothorax niger* and	Inab M. Bala[1*], Tasaduq H. Shah[1], Irfan Ahmad[2],

FIS/2024/01	*Schizothorax curvifrons* from meristics and karyotyping technique	Farooz. A. Bhat[1], Syed Talia Mushtaq[1], Nageena Nazir[3], Adnan Abubakr[4], Anayitullah Chesti[5], Asim I. Bazaz[1]
AFTEFS/SKUAST -K/VET & FIS/2024/02	Gene Editing in Fish Cell Line and its Applications	Gowhar Iqbal[1], Nevil Pinto[1], Arvind Sonwane[1], Kiran D. Rasal[1], Darshan Pawaskar[1], Mukunda Goswami[1]*
AFTEFS/SKUAST -K/VET & FIS/2024/03	Effect of water hyacinth (*Eichhornia crassipes*) leaf meal supplementation on meat composition of pangasius catfish (*Pangasianodon hypophthalmus*) juvenile	Bohare, H[1]*, Mahajan, S.[1] Dubey, S.[1], Singh, R.P.[1] and Rai, S.[1]
AFTEFS/SKUAST -K/VET & FIS/2024/04	Innovations in Nutraceuticals and Functional Foods: Advancing Nutritional Wellness of aquatic organisms	Kavitha M
AFTEFS/SKUAST -K/VET & FIS/2024/05	Whiteleg shrimp production, challenges and market dynamics: A global perspective	Abhimanyu[1*], Tejpal Dahiya[1], Ruksar[1], Ravi[1] & Rajender Kumar[2]
AFTEFS/SKUAST -K/VET & FIS/2024/06	Development of protein enriched papad using muscles of Pacific white shrimp (*Litopenaeus vannamei*) and storage study	Vivek Chauhan[1*], Shikha Ahalavat[2], Arya Singh[3], Shyni K[1]
AFTEFS/SKUAST -K/VET & FIS/2024/07	Image Processing Technology for Fish Disease Diagnosis	Arya Singh[1*], Megha K Bedekar[1], Vivek Chauhan[2], Gowhar Iqbal[1], Maharshi Limbola[1]
AFTEFS/SKUAST -K/VET & FIS/2024/08	Efficacy of *Salvia rosmarinus* on *Cyprinus carpio* against *Aeromonas hydrophila*	Ruksar[1]*, Tejpal Dahiya[1], Ravi[1], Abhimanyu[1] and Tannu Goyal[2]
AFTEFS/SKUAST -K/VET & FIS/2024/09	Smoking of Fish	Dr. Priti Mishra, Mr. Anil Kewat & Dr. Madhuri Sharma
AFTEFS/SKUAST -K/VET & FIS/2024/10	Effect of water hyacinth (*Eichhornia crassipes*) leaf meal supplementation on meat composition of pangasius catfish (*Pangasianodon*	Bohare, H[1]*, Mahajan, S.[1] Dubey, S.[1], Singh, R.P.[1] and Rai, S.[1]

	hypophthalmus) juvenile	
AFTEFS/SKUAST-K/VET & FIS/2024/11	Single nucleotide polymorphisms of Mannose binding lectin 2 (MBL2) gene & its association clinical mastitis in Murrah buffaloes	Shahid Ahmad Shergojry*, Archana Verma, I.D. Gupta, Nazir Ahmad Mir, Manzoor Ahmad Ganai, Ab Shakoor Khandy, Haseeb ur Rehman, Mussavir ul Nisha
AFTEFS/SKUAST-K/VET & FIS/2024/12	Evaluation of performances in different breeds of rabbit	G Saipriya, H Hamadani*, AA Khan, AH Sofi, IU Sheikh, RM Shah, M Abdullah and Shahnur Rehman
AFTEFS/SKUAST-K/VET & FIS/2024/13	Histomorphological Study of Infundibulum in Laying Kadaknath and White Leghorn	Bharti, S., Vaish, R., Gupta, N., Pandey, Y., Jain, P., Tekam, S., Lade, D and Singh, R.P.*
AFTEFS/SKUAST-K/VET & FIS/2024/14	Association of HSP90AA1 gene Genotypes with thermotolerance traits in Deoni breed of Indian Dairy cattle	Shahid Ahmad Shergojry*, K.P. Ramesha, Manzoor Ahmad Ganai, Ab Shakoor Khandy, Haseeb ur Rehman, Mussavir ul Nisha and Nazir Ahmad Mir
AFTEFS/SKUAST-K/VET & FIS/2024/15	Complement Component 4A gene Association with Clinical Mastitis in Murrah Buffaloes	Shahid Ahmad Shergojry*, Archana Verma, I.D. Gupta, Nazir Ahmad Mir and Mussavir ul Nisha
AFTEFS/SKUAST-K/VET & FIS/2024/16	Constraints perceived by the small-scale dairy farmers in the Baramulla district of Kashmir	H Hamadani*, IU Sheikh, P. Hannah Boje, MT Banday, AA Khan, HM Khan, IA Baba, RA Pattoo, S Adil
AFTEFS/SKUAST-K/VET & FIS/2024/17	Optimization of a cost-effective protocol for isolation of Seminal Extracellular Vesicles from ram semen using polyethylene glycol precipitation	Sanchi Rana[1]*, Farooz A Lone[1], Ghulam R Bhat[1], Isfaqul Hussain[2], Mudasir Andrabi[3], Muzamil Abdullah[4]

AFTEFS/SKUAST-K/VET & FIS/2024/18	Exploring Constraints in the Adoption of Dairy Management Practices by Dairy Farmers: a study in Uttarakhand	Pooja Karki[1] and M. A. Ansari[2]
AFTEFS/SKUAST-K/VET & FIS/2024/19	Canine Hip Dysplasia: Diagnostic Imaging and Surgical Treatment by Simultaneous Femur Head and Neck Ostectomy (FHO)	Ruchi Patwa (PhD Scholar, P. Bishnoi, A. K. Bishnoi, Sakar Palecha & Shivangi Diwedi
AFTEFS/SKUAST-K/VET & FIS/2024/20	Genetic Polymorphism of MBL1 gene in Murrah buffaloes	Shahid Ahmad Shergojry*, Archana Verma, I.D. Gupta, Nazir Ahmad Mir, Manzoor Ahmad Ganai, Ab Shakoor Khandy, Haseeb ur Rehman and Mussavir ul Nisha
AFTEFS/SKUAST-K/VET & FIS/2024/21	Direct Fed Microbials (DFM) and Solid State Fermented (SSF) Biomass: Their effect on the Digestion of Nutrients and Rumen Fermentation in Surti Buffaloes	Gaurang P. Mathukiya*, Paresh R. Pandya, and Kalpesh K. Sorathiya
AFTEFS/SKUAST-K/VET & FIS/2024/22	In silico identification and characterization of HSP90AA1 Protein Structure in Dairy Cows	Shahid Ahmad Shergojry1*, Archana Verma, Manzoor Ahmad Ganai, Ab Shakoor Khanday, Haseeb ur Rehman, Mussavir ul Nisha and Nazir Ahmad Mir
AFTEFS/SKUAST-K/VET & FIS/2024/23	Knocking-out of FecX gene in granulosa cells of goat using CRISPR/Cas Technology	M.K. Tripathi, Bosco Jose, Shivani Khanna, Vikrant Singh Chauhan, Mihir Sarkar and Gyanendra Singh
AFTEFS/SKUAST-K/VET & FIS/2024/24	Development and Characterization of Novel Gut Cell Line from *Clarius Magur* and Its Applications in Biotechnology	Gowhar Iqbal[1#], Nevil Pinto[1], Darshan Pawaskar[1], Yaswanth B S[2*]
AFTEFS/SKUAST-K/VET &	Assessment of Multidrug-Resistant Pseudomonas auruginosa from	Jayesh Dhoral *, S. Solanki, R. Singathia, D.K.

FIS/2024/25	Poultry	Sharma
AFTEFS/SKUAST-K/VET & FIS/2024/26	Characterization of major bacterial pathogens of *Litopenaeus vanname* shrimp	Karuna Bamel*,[1], Rachna Gulati[1], Khushbu Sharma[1], Keshav Bamel
AFTEFS/SKUAST-K/VET & FIS/2024/27	Antimicrobial Resistance Patterns of Staphylococcus aureus inBovine Mastitis Implications for Treatment Strategies	Muntaha Showkat[1], Mir Nadeem Hassan[2], Mahesh Kuchana[2]*, Sabia Qureshi[2], Mohd. Altaf Bhat[2], Mohd Isfaq ul Hussain[2], Zahid Amin Kashoo[2], Gulzar Ahmad Badroo[2], Mansoor Nabi[2] andIqra Hussain Shah[3]
AFTEFS/SKUAST-K/VET & FIS/2024/28	Prediction of Genetic Merit in Sheep Using Artificial Intelligence	Ambreen Hamadani*, Nazir A Ganai, S. Shanaz
AFTEFS/SKUAST-K/VET & FIS/2024/29	Effects of Antibiotic, Synbiotic and Thyme Essential Oil on Serum Biochemical Parametersof Broiler Chickens	A.A Bhat*, R.K Sharma, J. Palod, Shive Kumar, S.K. Singh, R. Huozha, Maansi and S. Adil
AFTEFS/SKUAST-K/VET & FIS/2024/30	EFFECT OF SUPPLEMENTATION OF SPIRULINA (*ARTHROSPIRA PLATENSIS*) POWDER AS FEED ADDITIVE ON THE PERFORMANCE OF BROILER CHICKS	Komal* and R. K. Dhuria
AFTEFS/SKUAST-K/VET & FIS/2024/31	Contribution of Dairy Sector in Rural Communities and its Challenges	Mayank Verma
AFTEFS/SKUAST-K/VET & FIS/2024/32	Optimising polyethylene glycol based exosome isolation from seminal plasma in sheep	Sanchi Rana[1]*, Farooz A Lone[1], Ghulam R Bhat[1], Isfaqul Hussain[2], Mudasir A Andrabi[3], Muzamil Abdullah[4]
AFTEFS/SKUAST-K/VET & FIS/2024/33	Production of high genetic merit cows by use of sexed semen at MLRI, Manasbal	Syed Mohmad Shah, Rameez A Dar, Anees A Shah, H M Khan, Syed Ansar Ul Haq, G G Sheikh, Arif A Pandit, Riaz A Shah and Manzoor A Yatoo
AFTEFS/SKUAST	Therapeutic efficacy of lugol's iodine	Rameez A Dar, Anees A

-K/VET & FIS/2024/34	in infectious repeat breeding	Shah, Syed Mohmad Shah, Raiz A Shah, G.G Shiekh, Manzoor A Yatoo, Syed Ansar Ul Haq and Arif A Pandit
AFTEFS/SKUAST -K/VET & FIS/2024/35	Optimization of procedures for in vitro embryo production in Jersey cattle	Syed Mohmad Shah, Syed Hilal Yaqoob, Faheem A Wani, Abrar Ahad, Arif A Pandit, Rameez A Dar, Anees A Shah, Riaz Ahmed Shah
AFTEFS/SKUAST -K/VET & FIS/2024/36	Induction of embryonic stem cell differentiation to germ cells (sperm & oocytes) under BMP4 stimulation	Syed Mohmad Shah[1], Rameez Ali Dar[1], Arem Qayoom[2], Anees Ahmed Shah[1]
AFTEFS/SKUAST -K/VET & FIS/ 2024/37	Development of nanoparticle based on green synthesis for sustainable aquaculture	Pooja[1]*, Dharambir Singh[1]
AFTEFS/SKUAST -K/VET & FIS/ 2024/38	Programmed Cell Death pathways in Bovine Mammary Epithelial Cells reveals Defective Efferocytosis as a potential factor for the development of Mammary Gland Fibrosis	Afnan Saleem[1]*, Syed Mudasir Ahmad[1]
AFTEFS/SKUAST -K/VET & FIS/ 2024/39	An Unusual Case of Adrenal Tumour in a Female Gaddi Dog	Rajat Sood, Rahul, Omer Khalil Baba, Nitin Dev Singh, Kuldip Gupta and Sashi Kant Mahajan
AFTEFS/SKUAST -K/VET & FIS/ 2024/40	Trace mineral profiles in crossbred cattle suffering from post-partum anestrous in Kashmir valley	Ghulam Rasool Bhat[1]*, Sabia Akhter[2], Mohd Iqbal Yatoo[1], Farooz Ahmad Lone[3], Sanchi Rana[3], Shahzada Mudasir Rashid[4] and Showqeen Muzamil[4]
AFTEFS/SKUAST -K/VET & FIS/ 2024/41	Effect of Herbal Extract and Enzyme Blend Supplementation on Zootechnical Parameters in Broiler Chicken	Dharmesh Tewari, Amit Tewari, V.K. Singh, Nidhi Verma, Aakash Wadal, Ankur Mishra, Prasad Shinde, Jayant Kakwani, Manish Srivastava,

		Pallavi Maurya, Ganesh
AFTEFS/SKUAST-K/VET & FIS/ 2024/42	Trace mineral profiles in crossbred cattle suffering from post-partum anestrous in Kashmir valley	Ghulam Rasool Bhat, Sabia Akhter, Mohd Iqbal Yatoo, Farooz ahmad Lone, Sanchi Rana, Shahzada Mudasir Rashid and Showqeen Muzamil
AFTEFS/SKUAST-K/VET & FIS/ 2024/43	Impact of seasons on anaerobic digestion of organic waste for biogas production	Prathyusha Suryapogu*, Kamla Malik, Shikha Mehta, Sujeeta Yadav and Pushpa Dhillon
AFTEFS/SKUAST-K/VET & FIS/ 2024/44	Effect of Dietary Incorporation of Rumen Protected Amino Acids on Milk Production and Serum Biochemical Parameters of Transition Murrah Buffaloes	[1]Khwairakpam Ratika and [2]Rajkumar James singh
AFTEFS/SKUAST-K/VET & FIS/ 2024/45	Detection and Isolation of Bovine Coronavirus in Hisar (Haryana)	Yamini Bhanot[1]*, Priyasi Mittal[1], Gurmesh Bishnoi[1,] Naveen Kumar[1], Baldev R Gulati[2]
AFTEFS/SKUAST-K/VET & FIS/ 2024/46	Study on Modulation of Toll Like Receptor-4 Mediated Inflammation in Bovine Mammary Epithelial Cells Using Artemesia absinthium and Curcuma longa	Insha Amin[1], Ishraq Hussain[1], Shahzada Mudasir Rashid[1,] and M. R. Mir
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AFTEFS/SKUAST-K/VET & FIS/ 2024/48	Key Solution of Organic Agriculture: Fish Based Fertilizer	Vyankatesh D. Tekade[1*], Shubham S. Janbandhu[2*], Smruthi Hareendran[3*]
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	Using Thermal Processing Technology	
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AFTEFS/SKUAST-K/VET & FIS/ 2024/53	Unravelling the Interplay Between Non-Structural Protein (NS4) Of Bluetongue Virusand Glyceraldehyde-3-phosphate dehydrogenase (GAPDH)	Saima Mushtaq[1*], Sonalika Mahajan[2], Gaurav K. Sharma[3], Ashwini Rameshrao Chaple[4]
AFTEFS/SKUAST-K/VET & FIS/ 2024/54	Evaluation of antioxidant activity in buffalo, cow and goat milk of two different seasons in Haryana, India	Neeru Yadav, Namrata, Shardulya Shukla, Arup Giri[*]
AFTEFS/SKUAST-K/VET & FIS/ 2024/55	ETHNO-VETERINARY PRACTICES FOR CURING DIFFERENT AILMENTS OF LIVESTOCK BY LOCAL PEOPLE OF HAMIRPUR DISTRICT, HIMACHAL PRADESH	Ram Chand Bhatti[1&2], A. N. Singh[2]
AFTEFS/SKUAST-K/VET & FIS/ 2024/56	Socio-Economic Status of Scheduled Castes (SC) – A Case Study inAnta Block, Baran District, Rajasthan	Ajay Sharma[1*], Dr. Pravesh Singh Chauhan[1], Dr. Pushpendra Sharma[2], Meena Rathore[2], Dr. Rajeev Kaushik[2], Dr. D.K. Singh[1]
AFTEFS/SKUAST-K/VET & FIS/ 2024/57	Nutraceuticals and functional foods	[1]Panchakarla Sedyaaw, [2]Shubham Janbandhu
AFTEFS/SKUAST-K/VET & FIS/ 2024/58	Molecular Epidemiology of ESBL-Producing *Escherichia coli* in Poultry in Kashmir Himalayas, India	Rabiya Manzoor[1], Ram Kumar Pandit*[2], Z. A. Kashoo[2], Sabia Qureshi[2], M. A. Bhat[2], M. I. Hussain[2], G. A. Badroo[2], M. N. Hassan[2], N.Tarfain[2], Faheem Ud Din[2], Mansoor Nabi[2], Mahesh

		Kuchana[2] and Kipa Yari[2]
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AFTEFS/SKUAST-K/VET & FIS/ 2024/62	ICHTHYOFAUNAL DIVERSITY OF BALASORE COAST AND ITS ADJACENT COASTAL AREAS	Sushree Swati Rout[1] and Bhaskar Behera[2]
AFTEFS/SKUAST-K/VET & FIS/ 2024/62	Molecular and Histopathological Studies of Lumpy skin disease in Uttarakhand	Irtiqa Manzoor[1], J.L Singh[2], Munish Batra[3], Maansi[4], A.H. Ahmad[5], Niddhi Arora[6]

SECTION-A

AFTEFS/SKUAST-K/AG/2024/A

Determination of flavonoid contents of Okra (*Abelmoschus Esculentus*) grown in Tashkent Region

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A present study was conducted to determine the impacts of biochar and mineral fertilizers (NPK) on flavonoids content of fruit in okra (*Abelmoschus Esculentus*). Study six treatments included T- control without biochar and mineral fertilizers, T2-biochar 1%, T3- N80P50K50 kg/ha, T4-N120P75K75 kg/ha, T5-biochar +N80P50 K50 kg/ha and T6-biochar +N120P75K75 kg/ha) used in the experiment. After sixty days, flavonoids content of fruit in okra contents of okra were analyzed. The biochar and combination of biochar with mineral fertilizers applications positively influenced the flavonoids contents. However, combined with NPK (120:75:75 kg/ha) and biochar treatment resulted in significant improvement in the apigenin content of okra. Results revealed that biochar alone treatment significantly increased flavonoids in okra plant fruits, such as, two flavonoid components, i.e., rutin and hyperoside respectively, compared with the control treatment. However, combination of biochar and mineral fertilizer NPK applications showed the most promising nutritional quality. The rutin and hyperoside contents was significantly improved with the application of biochar showed better effects than mineral fertilizer. Combination of biochar and NPK (120:75:75 kg/ha) treatment showed more positive effects on the gallic acid content of okra fruit. Since the rutin and hyperoside of okra fruit could be improved by organic fertilization, biochar (organic fertilizer) should be used in place of chemical fertilizer for environmentally sustainable production of better-quality okra.

Key words: Okra, biochar, mineral fertilizers, flavonoids, rutin, gallic acid

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AFTEFS/SKUAST-K/AG/2024/B

SOIL HEALTH MANAGEMENT USING MICROBES FOR CLIMATE-SMART AGRICULTURE

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Microorganisms are small living entities that may be found in almost all Natural environments, such as the air, water, soil, and even within people and animals. Microorganisms such as bacteria, viruses, and fungus are essential to the maintenance of healthy ecosystems. They provide vital functions including nutrient recycling, trash breakdown, and climate regulation. Since they have existed for billions of years, microorganisms have influenced the environment and created conditions that have allowed for the existence of bigger creatures. They are vital to the continuation of life on Earth because of their diversity and flexibility. Most of these microorganisms are found in soil, where they support ecosystem health and plant growth. As a matter of fact, microbes comprise a significant portion of Earth's living matter, and the soil is home to an enormous diversity of microbial species. By recycling nutrients and decomposing organic debris, these microscopic creatures make sure that energy is transferred from plants to the soil. Microorganisms play an increasingly important role in maintaining plant output and healthy ecosystems as human populations and food demands rise. The pH of the soil, the availability of nutrients, and temperature are some of the variables that affect the variety of soil microorganisms. The kinds of microorganisms present can be influenced, for example, by variations in the pH of the soil or the amount of nutrients. Another important factor is temperature; higher temperatures can lessen the variety of microbes, which makes it more difficult for them to survive. Because the microorganisms that inhabit soil are essential to the survival of ecosystems and human existence, maintaining soil health is crucial. Protecting soil health and microbial diversity is essential for maintaining ecosystems, guaranteeing food security, and reducing the wider effects of global warming as climate change progresses.

Keywords: Climate Change, Microbes, Fungi, Bacteria

AFTEFS/SKUAST-K/AG/2024/C

Determination of flavonoid contents of *Taraxacum officinale* in Tashkent Region

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Many different parts of medicinal lants including roots, leaves, fruits, flowers, seeds have been used for a large range of purposes. They are found to be potent sources of natural components. *Taraxacum officinale* is a medical plant used for many traditional and modern medicine. A leaf of *T. officinale* contains vitamins such as A, C, and K. It has been widely used for hepatitis, rheumatism, anti-inflammatory, antioxidative, anti-carcinogenic, analgesic, antihyperglycemic, anti-coagulatory, antioxidant, treat anemia, choleretic, diuretic, hepatoprotective and anti-inflammatory properties. There is an enhancing effort worldwide to explore the antioxidant properties of medicinal plants, which may be used to alleviate oxidative stress synonymous with the pathophysiology of many metabolic disorders as well as prevent oxidative deterioration of food products. In this study, flavonoid contents of *T. officinale* were determined in Tashkent Region, Uzbekistan. The data on flavonoids content of *T. officinale* collected from Tashkent Region. The results revealed presence of flavonoid contents such as apigenin, rutin, gallic asid and hyperoside shows the presence of 4 phytochemicals such as apigenin, rutin, gallic asid and hyperoside in *T. officinale*. The results of this study suggest that *T. officinale* whole plant parts such as root, shoot, flower is a good source of natural antioxidants and could be used in foods with the potential to delay the onset of diseases linked to metabolic derived reactive oxygen species.

Keywords: *Taraxacum officinale*, flavonoid, apigenin, rutin, gallic asid and hyperoside

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AFTEFS/SKUAST-K/AG/2024/D

Determination of photosynthetic pigments of lavender (*Lavandula angustifolia*) plant growing in in Surkhandaryo Region, Uzbekistan

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Lavender is one of the most important plants belonging to the Lamiaceae family. The lavandula genus has approximately 30 species grown around the world. The essential oil obtained from the flower of the plant is one of the 15 most important volatile oils. Lavender flowers, leaves, essential oils and other products can be used. It has been used to be antibacterial, antifungal, carminative, sedative, antidepressant, headache treatment and effective for diabetes. Lavender is used for a different of food flavorings such as ice cream, honey, herbal blends, jelly, cookies and tea. For the first time, a study on photosynthetic pigments found in lavender (*Lavandula angustifolia*) plant growing in Surkhandaryo Region, Uzbekistan is presented. Plant samples were collected from Termiz district, Surkhandaryo Region. The leaves for pigment analysis were collected at comparable times during the growing season of plants. Photosynthetic pigments of lavender plants including carotenoids, total chlorophyll, chlorophyll a, and chlorophyll b content were measured by using the method of Hiscox and Israelstam (1979). For this purpose, fresh leaf (50 mg) of lavender sample was cut in test tubes and dimethylsulfoxide (5 mL) was added. All tubes were incubated at 37 °C for 4 h. Then absorbance of the extract was taken at 470 nm, 645 nm, and 663 nm using a spectrophotometer. The results showed that lavender plant has high levels of chlorophyll a, chlorophyll b, total chlorophyll and carotenoids. It is therefore concluded that the plants should be harvested during summer season for procuring maximum quantity of plant pigments.

Keywords: lavender *(Lavandula angustifolia)*, carotenoids, total chlorophyll, chlorophyll a, chlorophyll b.

AFTEFS/SKUAST-K/AG/2024/E

Antibacterial activity of endophytic bacteria isolated from different organs of *Lycium barbarum*

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Lycium barbarum, also known as Gouqi in China, is a traditional herb in Chinese medicine with a history dating back over 2,000 years. It has been used to treat various conditions such as dizziness, abdominal pain, dry cough, headaches, and fatigue. Chemical analysis has identified several compounds in *L. barbarum*, including polysaccharides, alkaloids, carotenoids, flavonoids, and organic acids. Recent pharmacological research has shown that *L. barbarum* possesses numerous biological effects, including antioxidant, anti-inflammatory, anti-tumor, antimicrobial, immunomodulatory, and neuroprotective properties. In recent years, there has been a growing interest among scientists in studying the endophytic bacteria associated with medicinal plants. From these researches, strains with active properties are identified and utilized for various practical applications. In our research, we isolated endophytic bacteria from different parts of *Lycium barbarum*, cultivated them in pure culture, and analyzed certain characteristics. We focused on the antibacterial activity of 33 distinct bacterial isolates derived from various organs of *L. barbarum*. Pathogenic bacteria, including *S. aureus*, *B. subtilis*, and *E. coli*, were cultured using "agar well diffusion assay" method with a 100 µL volume. Four isolates were introduced into each dish containing the pathogenic bacteria using the agar well diffusion method, and the plates were incubated at 37°C for 36 hours in a thermostat. After this incubation period, the inhibition zones around the isolates were measured. The results revealed that isolates Lb ph12, Lb C7, Lb C8, Lb F3, Lb F6, Lb F8, and Lb F9 exhibited the highest antibacterial activity among all the isolates tested.

Keywords: Antioxidant, anti-inflammatory, anti-tumor, antimicrobial, immunomodulatory

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AFTEFS/SKUAST-K/AG/2024/F

Integrated Pest Management (IPM) In Horticulture

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India has a distinct edge in cultivating a broad range of fruits and vegetables due to its diversified environment. These crops are grown as part of horticulture, which is vital to providing the population with food and nutrition, jobs, and increased farmer incomes. The worldwide horticulture market was estimated to be worth USD 20.77 billion in 2021 and is projected to grow to USD 40.24 billion by 2026. In several Indian states, horticulture has emerged as a major engine of economic growth, accounting for 30.4% of agriculture's GDP today. India is the world's second-largest producer of fruits and vegetables, and it leads the world in the production of cashews, papayas, bananas, mangoes, papaya bananas, and pomegranates. However, diseases and pests (biotic stress) and climate-related issues (abiotic stress) also severely lower agricultural output globally. Pest insects pose a serious danger to the production of vegetables in India. These pests carry viral infections in addition to causing direct crop harm. Insect pests are thought to be responsible for 30 to 40 percent of crop losses in vegetables. It is important to address the issue of new pests in horticulture since these losses have a significant influence on productivity. Proper pest control strategies, management solutions, and sustainable practices are necessary to ensure continued growth and development in this sector. IPM is an integrated approach to controlling pests, which includes weeds, illnesses, and herbivores. It mixes preventive and therapeutic methods, using synthetic pesticides only when absolutely required. IPM is a strategy to guarantee environmental safety by using all possible pest management techniques in a balanced manner. It also ensures societal acceptability because food based on IPM is safe and affordable, and it is economically viable for both producers and consumers (a seller is always expected to turn a profit). Crop losses are substantial even with the use of pesticides because of disease and insect infestations.

Keywords: Horticulture, Pests, Management, IPM

AFTEFS/SKUAST-K/AG/2024/G

Assessment of Pesticide Residue in Conventional and Organic Vegetables Grown in the North Central Province of Sri Lanka

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Despite the heavy reliance on pesticides in Sri Lankan agriculture, limited research has focused on pesticide residues in locally grown fresh produce in recent years. This study aimed to identify the types of pesticides used by vegetable farmers and assess residue levels of five commonly applied pesticides: thiamethoxam, tebuconazole, profenofos, chlorpyrifos, and chlorantraniliprole. The investigation focused on three frequently consumed vegetables—bitter gourd, brinjal (eggplant), and angled-luffa grown in the North Central Province (NCP) of Sri Lanka (n = 40 per vegetable type), along with different organically certified vegetables (n = 42). Pesticide residues were analysed using a modified QuEChERS extraction method and GC-MS analysis. GC-MS analysis revealed that 22.5% of brinjal, 15% of angled luffa, and 5% of bitter gourd samples contained thiamethoxam (0.105-1.02 ppm) or tebuconazole (0.090-0.180 ppm). Importantly, 15% of brinjal samples exceeded the Codex Alimentarius Commission's maximum residue limit (MRL) for thiamethoxam (0.3 ppm). No detectable pesticide residues were found in the organic vegetables. These findings suggest that conventional vegetables grown in the NCP may contain harmful levels of pesticide residues, posing potential risks to consumers. This highlights the need for proper farmer education on safe pesticide practices and the implementation of routine pesticide residue monitoring to ensure food safety and protect public health.

Keywords: *Pesticides, Residues, Food safety, Vegetables, organic-vegetables*

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Organic Food Manufacturers in Sri Lanka; a Survey on Key Characteristics and Challenges

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This study aimed to explore the key characteristics and issues of Sri Lankan organic food manufacturers. Data were collected through an online survey conducted during November 2023 to February 2024 using 100 organic food manufacturing entities across Sri Lanka.
According to the survey results, 53% of organic food manufacturing companies were concentrated within the Western province, Sri Lanka. Most companies (86%) stated that increasing demand for organic foods in the international market was the main reason for them to enter the organic food industry. The majority of manufacturers were sole exporters (61%), while only 4% sell their products exclusively in the local market. Organic spices and coconut emerge as the most popular product categories with 58% and 54% of respondents engaged respectively. The data also revealed that 64% of organic food companies cultivate their own raw materials on their own farmlands. Approximately 74% of manufacturers reported outsourcing organic raw materials, with 32% of these manufacturers purchasing more than 75% of the materials they sell from other suppliers. About 13% respondents mentioned that they never inspect those external farm fields for their farming practices. Checking organic credentials reported to be the most frequently used method (62%) to confirm the quality of outsourced products. Pest control and access to approved pesticides were reported as the most challenging issues during organic farming.
In conclusion, this study offers insights that can aid in the advancement of the organic food industry in Sri Lanka.

Keywords: *organic food, manufacturers, challenges, survey, Sri Lanka*

AFTEFS/SKUAST-K/AG/2024/I

Two different agroecological conditions affects the vegetative growth of *Carica papaya* L. varieties in Sri Lanka

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Carica papaya L. belongs to family *Caricaceae* which holds substantial economic versatility for fruit and latex in various industries. Hence a notable gap could be perceived in morphological characterization of papaya varieties under different climatic conditions. This study focused on assessing the vegetative growth of papaya varieties under two different agroecological regions. Eight replicates of three papaya varieties of 'Horana', 'Red lady' and 'Tainung 1' were cultivated under the experimental design of Randomized Complete Block Design (RCBD) at the Faculty of Technology, University of Ruhuna, Karagoda-Uyangoda in Intermediate zone, Low country (IL1a) and at a private property at Kahathuduwa, Piliyandala in Wet zone, Low country (WL1b). The morphological characteristics of plant height, stem diameter, no. of leaves and leaf length were determined at the monthly intervals during vegetative growth of May to August. Weather records of monthly average temperature, humidity, rainfall, sunshine hours (sunrise, sunset), UV index, solar radiation and precipitation were observed at the respective agroecological regions. A significantly higher average temperature, humidity, rainfall and sunrise variation was observed in WL1b. Plant height of 'Tainung 1' was significantly higher in both conditions while plant height of 'Horana' was significantly higher in WL1b condition. The stem diameter of 'Tainung 1' was significantly higher in WL1b condition while stem diameter of 'Horana' was significantly higher in WL1b condition. The no. of leaves and length of leaves were significantly higher in WL1b condition in all three varieties during the observed period and they had a similar graphical pattern parallel to sunset variation. Investigating the best morphological characteristics in different varieties under different climatic conditions will be harnessed in commercial production and in future breeding programmes.

Key words: *agroclimatic regions*, *Carica papaya L., morphological variation*

Evaluation of Growth and Yield Performances of *Pleurotus ostreatus* on Corn Cob, Sawdust, Banana Leaves, Guinea Grass, and Coir.

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Oyster mushrooms (*Pleurotus ostreatus*) are popular edible fungi belonging to the Family Pleurotaceae, prized for their delicious flavor, ease of cultivation, and high nutritional value. They are typically grown on sawdust which is an expensive and inaccessible substrate in mass cultivation. The objective of this study was to determine alternative, low-cost substrates that are readily available. Four substrates [sawdust (100%; control), corn cob + sawdust (1:1), guinea grass + sawdust (1:1), banana leaves + sawdust (1:1), and coir + sawdust (1:1)] with ten replicates from each, were performed for ten weeks until termination of the harvesting. Ten quantitative parameters were recorded and analyzed using one way ANOVA in SPSS. The mycelium running rate of all treatments was higher than the control. The economic yield and the biological efficiency were greater in corn cob added treatment while substrates consisting with guinea grass and banana leaves are competitively similar to the control. The lowest time taken for primordia initiation and harvesting was observed in guinea grass treatment. Number of fruiting bodies, effective fruiting bodies, stalk length, pileus diameter, and the total harvesting weight were greater in corn cob substrate. Therefore, corn cob with sawdust in 1:1 ratio is recommended as a effective substrate for oyster mushroom cultivation. Further studies are needed to determine the effectiveness of utilizing lower percentage of sawdust with higher amount of corn cob.

Keywords: *Sawdust, corn cob, guinea grass, banana leaves, biological efficiency*

AFTEFS/SKUAST-K/AG/2024/K

Modeling the Future of Forests: Insights into Policies, Ecosystem Services, and Biodiversity

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Forest are complex and dynamic ecosystems providing important flow of various ecosystem services that are critical for the welfare of the society. Due to global pressures such as climate change, deforestation, and land-use changes intensify, the future of forests has become a focal point for policymakers and researchers. This paper reviews insights gained from recent modeling studies that explore the future of forests under various policy scenarios, with a particular focus on ecosystem services and biodiversity conservation. These models provide a valuable tool for simulating complex interactions between ecological, social, and economic factors that influence forest dynamics. They help to predict potential outcomes of different policy interventions, sustainable forest management, and conservation strategies.Our review reveals that policy-driven scenarios, and the promotion of improving forest management through sustainable forestry practices, can significantly enhance the provision of ecosystem services. Furthermore, the modeling studies underscore the importance of integrated approaches that consider the trade-offs between timber production, biodiversity conservation, and other ecosystem services. They suggest that policy measures promoting a balance between forest utilization and preservation can lead to more sustainable outcomes. This study demonstrates the potential of modeling studies to inform policy decisions aimed at securing the future of forests, emphasizing the need for adaptive, multi-scale strategies that account for the complexities of forest ecosystems and the diverse benefits they provide.

Key words: Ecosystem, Models, Society, Climate change, Sustainable, Trade-offs

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/01

Evaluation of the response of bio-fertilizers in enhancing mustard productivity under North-Eastern Coastal plain zone of Odisha

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Indian Mustard (*Brassica juncea*) is an important edible oilseed crop of India. India has 12-15% of the world's area under oilseed but account for less than 6-7 % of world's production to meet the need of about 17% of world population. Indian Mustard is a potential oilseed crop grown in the rice-based cropping system in the coastal agro-ecosystem of Odisha under late sown conditions resulting in poor yield. Therefore, strategies must be evolved for yield enhancement of mustard in Odisha. In the present investigation, an attempt has been made to evaluate the response of five different bio-fertilizers namely Azotobacter, Phosphate solubilizing microorganisms (PMSO), Potassium mobilizing biofertilizer (KMB), Zinc Solubilizing Biofertilizer (ZSB) and NPK consortia with control (No biofertilizer) under three fertility levels (F1-100% RDF, F2-75% RDF and F3-Control) in a split plot design with three replications during the *rabi* season of 2023-24. This experiment revealed that treatment combination of 100% RDF kg/ha+ Azotobacter recorded the maximum seed yield of (1180 kg/ha) which was statistically at par with treatment combination of 100% RDF + (NPK Consortia + ZSB) (1161 kg/ha) and showed significantly superior impact over all other treatment combinations with respect to growth factors (plant height, number of branches/plant), yield attributes and yield.

Keywords: *Brassica juncea, Nutrient, Biofertilizers*

AFTEFS/SKUAST-K/AG/2024/02

Economic Impact and Challenges of Sericulture: Sustaining Growth in Global Markets

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Sericulture, the practice of cultivating silkworms for silk production, holds substantial economic significance, particularly in major silk-producing nations such as China, India, and Japan. This industry is pivotal for job creation and rural development, providing livelihoods for millions. It fosters the growth of related sectors, including sericulture equipment manufacturing, dyeing, and textile industries, creating a robust economic ecosystem. Sericulture also generates significant export revenue, bolstering national economies. In regions where sericulture dominates, it enhances community infrastructure, education, and healthcare, driving broader socio-economic progress. The value chain is extensive, encompassing farmers, reelers, weavers, and traders. Despite its benefits, the industry faces challenges such as fluctuating silk prices, environmental concerns, and intense market competition, which can affect its economic stability and growth potential. Addressing these issues while leveraging sericulture's economic contributions is essential for sustaining its role in global and local economies.

Keywords*: Silk, Economy; Textile; Value chain; Export revenue; Socio-economic.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/03

Development of Dot Assay Based Colorimetric Aptasensor for Highly Selective and Sensitive Detection of Acetamiprid

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A novel colorimetric biosensor utilizing a single-stranded DNA (ssDNA) aptamer and a high-throughput dot assay was developed for the specific detection of acetamiprid, a widely used and hazardous insecticide known for its environmental and health risks. Aptamers, which are short, single-stranded nucleic acids that can specifically bind to target molecules, offer a promising alternative to traditional antibodies due to their high specificity, stability, and ease of synthesis. To identify an aptamer specific to acetamiprid, we employed a non-immobilized graphene oxide-based systematic evolution of ligands by exponential enrichment (SELEX). After 15 SELEX cycles, we isolated a 79-mer aptamer (Apt-SS5) with high specificity for acetamiprid. The binding affinity of Apt-SS5 was evaluated using a novel colorimetric dot assay, revealing a linear DNA folding with a melting temperature (Tm) of 53°C and a Gibbs free energy (ΔG) of -7.24 kcal/mol at 37°C. The aptamer's binding pocket, formed by bases C-16 to T-32, demonstrates a strong interaction with acetamiprid, particularly through bases C-10, C-16, G-25, A-26, G-27, G-28, and A-29. Apt-SS5 exhibited exceptional affinity for acetamiprid, with a limit of detection (LOD) of 0.039 ppb. The efficacy of the developed colorimetric assay was validated by testing with water samples spiked with various concentrations of acetamiprid, demonstrating its practical application for environmental monitoring and safety assessment.

***Keywords**: ssDNA, Acetamiprid, biosensor, SELEX, aptamer, colorimetric assay*

AFTEFS/SKUAST-K/AG/2024/04

Scavengers: A Special focus on Forensic Entomology

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Scavengers are animals that feed on dead organisms. Although scavenging is often associated with carnivores consuming carrion, it also applies to herbivores that consume decaying plant matter. They not only clean away the rotting flesh and vegetation and eliminate harmful substance from the environment but also help in mitigating the spread of diseases so scavengers are very important in balancing the ecosystem. A large number of organisms act on the carrion such as vertebrates, invertebrates, decomposers, vegetation etc. The vertebrates acting upon carrion may be facultative scavengers or obligate scavengers. Among invertebrate scavengers, insects are the most abundant group including insect orders coleoptera, diptera, isoptera, blattodea, hymenoptera etc. Mostly found insects on carcass are house fly, blow fly, flesh fly, rover beetle, carrion beetle, skin beetle. The volatile organic compounds (VOCs) play important role in attracting insects towards rotten materials. The decomposers *i.e*. bacteria start decaying the dead organisms which led to release of volatile organic compounds mainly dimethyl trisulfide (DMTS) and cadaverine which attract insects on to carrion. Indiscriminate use of insecticides and climate changes are the main threat to scavengers. Human activities further endanger these species, potentially weakening the vital ecological services they provide. Therefore, efforts should be made to conserve scavengers and recognize their importance in nutrient cycling and ecosystem stability.

Keywords: *Blow fly, Carnivores, Carrion, Scavenger, VOCs.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/05

Response of Moong bean to organic, inorganic sources of nutrients and Integrated Nutrient Management: A review

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Moong bean is a vital leguminous crop valued for its nutritional benefits and adaptability to diverse agro-ecological conditions. This review provides information regarding current research findings on comparative effects of manure, biofertilizers and fertilizers on plant growth parameters, such as plant height, number of branches, leaf area, leaf area index, biomass accumulation and yield components like number of pods, number of seeds per pod and test weight and quality parameters, such as nutrient, protein quality and antioxidant properties of moong bean seeds. Inorganic fertilizers are widely used for their rapid nutrient availability and precise nutrient application. Application of phosphorus up to 40 kg/ha in moong bean is known to yield higher total and effective number of nodules per plant, plant height, leaf area index, total chlorophyll content, grain yield and straw yield (Venkatarao *et al*., 2017). However, excessive use may lead to environmental pollution and soil degradation, necessitating careful management while using inorganic fertilizers. Properly balanced combination of inorganic and organic nutrients has been shown to synergistically improve growth, yield and quality of moong bean including resistance against insect pests and diseases. Application of vermicompost 6 t/ha + *Panchagavya* 3% at 30 and 45 days after sowing performed exceptionally in obtaining maximum seed yield of green gram (Singh *et al*., 2022). This study highlights that if fertilizers lead to higher yield, then organic sources contribute to long-term soil fertility and environmental sustainability.

Keywords: *Organic, Inorganic, Integrated Nutrient Mnagement, Moong Bean.*

AFTEFS/SKUAST-K/AG/2024/06

Digital Transformation in Indian Agriculture and Its Impact: A Review

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The Indian agriculture sector is undergoing a significant transformation, owing to the integration of digital technologies. This paper investigates the influence of digital transformation on modern agricultural practices, emphasizing the ways in which the Internet of Things (IoT), Artificial Intelligence (AI), Big Data, and precision farming technologies are revolutionizing conventional farming methods. The adoption of these technologies allows farmers to maximize input resource utilization, increase production, and make data-driven decisions that contribute to sustainable agricultural practices. The digitization of agriculture entails using linked devices and sensors to monitor crop health, soil conditions, and weather patterns in real time. The data is analysed by AI algorithms to provide actionable insights, enabling the precise application of inputs such as water, seed, fertilizers, and pesticides. Farmers are further empowered to predict yields, manage risks, and enhance supply chain efficiency through the use of Big Data analytics. The digital divide, data privacy, and the necessity of substantial investment in infrastructure and training must all be addressed, despite the potential of digital agriculture. Government regulations, corporate sector initiatives, and international collaborations can all help to drive a more inclusive and sustainable digital transformation in agriculture. Finally, the agricultural sector has the potential to experience substantial improvements in sustainability, productivity, and efficiency as a result of digital transformation. A comprehensive analysis of current trends, benefits and challenges offers insights into the future directions of agricultural digitalization.

Keywords: *Agricultural Digitalization, Artificial Intelligence (AI), Precision Farming, Sustainable Agriculture, Internet of Things (IoT)*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/07

Removal of pesticide residues using decontamination and modern approaches from fruits and vegetables: A review

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Fruits and vegetables are essential parts of the human diet, but they are vulnerable to pests and diseases which can affect food production. The excessive use of pesticides to protect them has resulted in higher pesticide residues in food, posing risks to human health and the environment. This has also impacted the economy due to restrictions on imports and exports. This review explores methods for extracting and detecting pesticide residues in fruits and vegetables, as well as decontamination techniques and modern approaches. Among the various decontamination techniques, washing of chilli fruits with NaCl has been reported to reduce the tetraniliprole residues by 61 % (Shrivastava et al., 2021). Among the modern approaches, treatment of strawberry with ozonated water has reduced the chlorpyriphos residues by 75.1% (Lozowicka et al., 2016). The importance of assessing dietary risks related to pesticide residues in food is also discussed to ensure they are within safe levels for consumers.

***Keywords**: Residues, Chronic toxicity, Decontamination, QuEChERS, Risk assessment*

AFTEFS/SKUAST-K/AG/2024/08

Impact of Resistance Inducers and Chemicals on Biochemical Parameters in Pomegranate Seedlings against bacterial blight (*Xanthomonas citri* pv. *punicae*)

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The research explores the potential of resistance inducers (salicylic acid, β-amino butyric acid (BABA)) and chemicals (streptocycline and bronopol) in mitigating bacterial blight in pomegranate cultivation. Bacterial blight poses a significant threat to pomegranate production, causing economic losses. The study investigates the impact of resistance inducers and chemicals at different concentrations alone or in combination for managing bacterial blight of pomegranate under pot and field conditions. The treatments include conjoint application of salicylic acid (300 ppm), β-amino butyric acid (300 ppm), streptocycline (500 ppm) and bronopal (500 ppm), achieved a disease control of 64.99 per cent in potted plants simultaneously improving plant health parameters such as seedling height (265.33 cm), stem girth (5.04 cm), leaf area (5.33 cm^2), shoot growth (33.33 cm), shoot diameter (1.90 cm), seedling spread (34.67 cm) and number of branches (4.67) as compared to other treatments. Similarly under field conditions, same treatment was found most effective in controlling the disease by 67.65 per cent and simultaneously improving plant health parameters such as plant height (4.53 m), stem girth (30.43 cm), leaf area (9.57 cm^2), shoot growth (34.73 cm), shoot diameter (3.00 cm), plant spread (3.77 m), number of branches (8.67) and maximum yield (5.49 kg/tree) as compared to other treatments. The findings suggest that the combinations of salicylic acid + β-amino butyric acid + streptocycline +

bronopal, exhibit promising results in enhancing plant resilience against bacterial blight as compared to individual treatment. Therefore, the current research has offered profound insights into the efficient control of bacterial blight of pomegranate using resistance inducers and chemicals.

Keywords: *Bacterial blight, Pomegranate, Resistance inducers, Chemicals*

AFTEFS/SKUAST-K/AG/2024/09

Biostimulants in Horticulture: A Key to Sustainable Crop Improvement

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The global population is projected to reach approximately 9 billion by 2050, representing a 34% increase compared to today's population. This growth will significantly raise the demand for food to accommodate the expanding population. Within the realm of horticulture, fruits have been identified as a valuable source of nutraceuticals. To achieve optimal production levels, biostimulants have emerged as a promising solution. Over the past decade, there has been a growing emphasis on utilizing natural plant biostimulants. These substances play a crucial role in enhancing the anatomical, morphological, and physiological aspects of fruit crops, ultimately improving fruit productivity and quality. Biostimulants promote various physiological processes, including photosynthesis, nutrient metabolism, enzymatic activities, chlorophyll synthesis, and carbohydrate content. Additionally, they help mitigate abiotic stressors such as water stress, salinity, temperature fluctuations, and oxidative reactions. By influencing stress signaling and hormonal pathways, biostimulants contribute to overall crop resilience. Like humic substances (humic and fulvic acid) which are derived from organic matter in soil, improve nutrient uptake, root development, and overall plant vigour. They enhance soil structure and microbial activity, leading to better crop yields and quality. Seaweed Extracts (SWE), rich in natural growth-promoting compounds, enhance plant growth, chlorophyll production, and stress tolerance. They contain essential micronutrients, amino acids, and plant hormones. Microbial biostimulants (e.g., mycorrhizal fungi, plant growth-promoting rhizobacteria) enhance nutrient uptake, improve soil health, and increase plant resilience to environmental stresses. Despite significant research on the effects of biostimulants, there remains a gap in understanding their impact on specific fruit traits. Therefore, further investigation and strategic approaches are needed to explore the full potential of biostimulants in fruit crop research.

***Keywords**: Biostimulants, Fruit crops, Abiotic stressors, Humic substances, Seaweed extracts*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/10

Introgressiomics: a new approach for using crop wild relatives in breeding for adaptation to climate change

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New methods for the breeding of new crop varieties that are more resilient and resource-efficient are needed in order to increase agricultural productivity in the upcoming decades in the climate change scenario. Crop wild relatives, or CWRs, produce variation for many desirable characteristics in breeding, specifically stress tolerance to biotic and abiotic factors. Pre-breeding activities to be initiated as a prerequisite for using CWRs as they cannot be directly incorporated into commercial breeding programs. A mass-scale, systematic development of plant materials and populations carrying genome fragments introgressed into the genetic background of crops from wild crop relatives is known as "introgresiomics". This process may enable the establishment of new generations of cultivars with enhanced qualities.

The Focused Identification of Germplasm Strategy (FIGS) was designed and developed to increase the effectiveness of identifying particular adaptive characteristics from genetic resource collections. The effective traits for drought adaptation were identified in two sets of Faba beans, Dry and Wet, which differed in terms of phenology, physiology, and leaf morphology. Advanced backcrosses (ABs) and introgression lines (ILs) of eggplant (*Solanum melongena*) were developed using *Solanum incanum*, a wild eggplant that has relatively high tolerance to drought, as a donor parent.

Introgression breeding from CWRs has the potential to significantly impact both the development of novel and enhanced crop generations as well as the adaptation of our crops to climate change. Increased and most effective use of CWRs in breeding is recommended by this new strategy known as "introgressiomics."

***Key words**: Introgressiomics, CWRs, Pre-Breeding, FIGS*

AFTEFS/SKUAST-K/AG/2024/11

Exploring the Role of Native Bacterial Antagonists Volatile Compounds in Suppressing Mycelial Growth of *Sclerotinia sclerotiorum* in Indian Mustard

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Sclerotinia sclerotiorum, a major pathogen responsible for Sclerotinia stem rot, poses a significant threat to Indian mustard (*Brassica juncea*) cultivation, leading to severe yield losses. Thus, keeping in view the importance of this disease, the present investigation was conducted in the Oilseeds section, Department of G&PB of CCS Haryana Agricultural University, Hisar, to study the role of volatile organic compounds (VOCs) from bacterial antagonists in suppressing the mycelial growth of two isolates, HSR and BWL of *S. sclerotiorum* of Indian mustard using the paired plate technique. In this study, eleven bacterial antagonists were isolated from soil samples collected from mustard fields and evaluated for their ability to produce VOCs that inhibit the mycelial growth of the pathogen under *in vitro* conditions. The paired plate technique, involving the physical separation of the bacterial antagonist and *S. sclerotiorum*, allowed for the assessment of volatile-mediated suppression without direct contact. The results demonstrated that bacterial antagonist HBBa-3 which was isolated from Bawal inhibited mycelial growth upto 53.29% and 59.79% of HSR and BWL isolates, respectively confirming the antifungal activity of their VOCs. These findings highlight the potential of bacterial volatiles as a sustainable and eco-friendly biocontrol strategy against *S. sclerotiorum* in Indian mustard, offering an alternative to conventional fungicides. Future research will focus on identifying the specific VOCs responsible for the inhibition and understanding their mechanisms of action.

Keywords: *Antagonist, Brassica juncea, Paired Plate Technique, Sclerotinia sclerotiorum, volatile organic compounds*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/12

Impact of Phosphate Rich Organic Manure (PROM) on plant health

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Phosphate Rich Organic Manure (PROM) plays a crucial role in enhancing plant health by providing a sustainable and efficient source of phosphorus, an essential macronutrient. This study investigates the impact of PROM on various physiological and biochemical aspects of plant health, focusing on its influence on chlorophyll content, fruit size, sweetness, nutrient content and overall yield compared to traditional chemical fertilizer i.e., di-ammonium phosphate (DAP). It has been observed that the organic nature of PROM also stimulates microbial activity in the soil, leading to better nutrient cycling and overall soil fertility. Additionally, plants treated with PROM exhibit improved resistance to pests and diseases due to the enhanced availability of phosphorus, which is crucial for metabolic processes such as energy transfer and photosynthesis. The results revealed that the combination with more PROM than DAP improved the plant health in all aspects. Hence we can determine that PROM not only contributes to better plant vigor but also supports sustainable agricultural practices by reducing dependence on chemical fertilizers. Overall, the application of PROM proves to be a beneficial strategy for improving plant health, productivity, and ecological balance.

Keywords: *PROM, DAP, Plant health, Sustainable agriculture.*

AFTEFS/SKUAST-K/AG/2024/13

Morphometric and Molecular Analysis of Orders; Hymenoptera and Diptera in Cherry Orchards of Kashmir Valley

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This study focuses on an integrated morphometric and molecular analysis of insect pollinators belonging to the orders Hymenoptera and Diptera, specifically within cherry orchards in the Kashmir Valley. A comprehensive approach was employed to investigate the diversity and identify species contributing to pollination services. Specimens were meticulously collected from four distinct districts, followed by detailed preparation and labeling. Morphometric analysis was conducted to assess physical characteristics, and identification keys were utilized to classify the specimens. Complementary to this, DNA barcoding was employed to enhance species identification accuracy. This involved DNA isolation, polymerase chain reaction (PCR) amplification, sequencing, and subsequent phylogenetic analysis. Through these combined methodologies, 11 species from the Order Hymenoptera viz; *Andrena fucata, Andrena pilipes, Andrena agillissima, Lassioglossum rugifrons, Lassioglossum matianense, Lassioglossum marginatum, Vespula vulgaris, Megascolia maculata, Bombus albopleuralis, Apis mellifera, Apis cerana* and 6 species from the Order Diptera *Eristalis abusive*, *Eristalis tenax*, *Syrphus ribesii*, *Episyrphus balteatus, Sphaerophoria scripta, Eristalis arbustorum* were accurately identified, highlighting the significant biodiversity and the pivotal role of these pollinators in the ecosystem. This integrative approach not only underscores the utility of combining morphometric and molecular techniques for insect identification but also provides valuable insights into the pollinator species composition in the Kashmir Valley, which is crucial for the conservation and management of these essential ecosystem services.

Keywords: *Morphometric analysis, Molecular analysis, Hymenoptera, Diptera, Cherry orchards*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/14

Impact of earthworm heavy metal pollution

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Heavy metal pollution poses a significant threat to soil ecosystems, with earthworms serving as a critical indicator species for soil health. This review synthesizes current research on the impact of heavy metals—such as lead (Pb), cadmium (Cd), arsenic (As), and mercury (Hg)—on earthworm physiology, behavior, and ecological functions. Elevated heavy metal concentrations disrupt earthworm health by impairing growth, reproduction, and survival rates. These metals accumulate in earthworm tissues, leading to oxidative stress, enzyme inhibition, and alterations in metabolic processes. Consequently, affected earthworms exhibit reduced burrowing activity, which negatively impacts soil aeration and nutrient cycling. The implications of these disruptions extend to broader soil ecosystem functions, affecting plant growth and microbial communities. This abstract highlights the urgent need for effective remediation strategies to mitigate heavy metal pollution and protect soil biodiversity.

Keywords: *Metal pollution, Earthworm, Agriculture*

AFTEFS/SKUAST-K/AG/2024/15

"Leveraging Farmer Producer Organizations (FPOs) for Enhancing Agricultural Productivity and Empowering Smallholder Farmers: An Exploratory Study from North Bihar"

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Farmer Producer Organizations (FPOs) have emerged as a transformative force in India's agricultural sector, empowering smallholder farmers to collectively address challenges and optimize productivity. This study investigates how FPOs can enhance agricultural production by facilitating improved access to essential resources, modern technology, and more efficient market linkages. Through economies of scale, FPOs enable farmers to achieve better price realization and drive entrepreneurial initiatives. The research examines FPO activities across multiple states, focusing on key areas such as value addition, access to quality inputs, financial services, and market connections. Utilizing primary data from 240 member farmers in North Bihar and employing Exploratory Factor Analysis (EFA), the study identifies five critical factors that significantly influence FPO performance, with 'Entrepreneurial Activities' and 'Value Addition' emerging as the most impactful. The findings suggest that strengthening FPO operations could play a pivotal role in boosting agricultural productivity, advancing sustainable development, and improving the socio-economic conditions of farmers. The paper underscores the necessity for stronger government support, institutional partnerships, and capacity-building programs to unlock the full potential of FPOs in transforming India's agricultural landscape.

Keywords: *FPOs, Agricultural Productivity, value addition, entrepreneurial activities, Sustainable growth.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/16

Comparative Profitability Analysis under Resource use efficiency of Sugarcane based Intercropping Systems in Yamunanagar district of Haryana

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The study was carried out in the Yamunanagar district of Haryana, specifically in the Jagadhari and Radaur blocks, which were selected for their significant area and high production of sugarcane-based intercropping systems. Out of 60 farmers surveyed, 30 were from Jagadhari and 30 from Radaur. Although agriculture is a vital sector for India's economy, its contribution to GDP has been steadily declining. This decline is largely attributed to reduced investment and inadequate irrigation. Inefficient use of resources also contributes significantly to this decline. The study aimed to assess the efficiency of resource use for major crops in the Yamunanagar district. The crops investigated included sugarcane as a sole crop (CS-I), sugarcane intercropped with wheat (CS-II), sugarcane with mustard (CS-III), and sugarcane with vegetables (CS-IV). A multistage random sampling method was used to select the respondents, and the Cobb-Douglas production function was applied for the analysis. The results revealed that the ratio of marginal value product (MVP) to marginal factor cost (MFC) was greater than one for human labor but less than one for irrigation in most cropping systems. This suggests that human labor was underutilized, while irrigation resources were overutilized. The findings indicate that optimizing returns from sugarcane-based intercropping systems could be achieved by more effectively balancing these inputs.

***Keywords*:** Resource use efficiency, marginal value product (MVP), marginal factor cost (MFC)

AFTEFS/SKUAST-K/AG/2024/17

Phytochemical Profiling and Morphological Characterization of *Hibiscus rosa-sinensis* and *Clitoria ternatea* Flowers

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Demand for more alternative and high-quality food is growing every day. the increasing interest in nutraceuticals food has exaggerated into new food that have positive effects on human wellbeing, even more we see edible flowers as a new way of nutritional health. They are potential sources of phytochemicals. various phytochemicals such as, Anthocyanin, carotenoids, flavonoids, saponin and phenols are responsible for health promoting effects of edible flowers. due to short blossoming period consumed by local people as food and medicine. the present research article works on Hibiscus rosa-sinensis and Clitoria ternatea and their phytochemical and morphological study. the objective of this research to analyse phytochemicals which are present in flower as well as morphological characterization by using scanning electron microscope. the identification of internal surface (amorphous and crystalline) of flowers by using XRD. this article helps to popularize the edible flowers among consumers and food industry which are very potent source of nutraceuticals food.

Keywords: *Edible flowers, Phytochemicals, Morphology, Hibiscus rosa-sinensis, Clitoria ternatea*

AFTEFS/SKUAST-K/AG/2024/18

Impact of Transient Flow and Solute Transport on Crop Yields in Jaipur: A Vulnerability Assessment

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Agriculture in Jaipur encounters challenges due to its semi-arid climate, unpredictable water accessibility, and soil salinity. This study assesses the vulnerability of crop yields to transient flow and solute transport, key factors influencing soil moisture and nutrient distribution. Using HYDRUS-1D modeling, the research simulates the spatial and temporal patterns of water and solute movement in Jaipur's agricultural landscape. Vulnerability indices, based on soil moisture deficit, solute accumulation, and crop stress, were calculated and correlated with observed crop yields. The results showed that approximately 35% of the study area was highly vulnerable, with a significant negative correlation ($r = -0.78$, $p < 0.01$) between vulnerability indices and crop productivity. A regression model explained 61% of the yield variability, confirming that higher vulnerability leads to lower productivity. Recommendations for sustainable agricultural practices include improving soil management, enhancement of irrigation techniques, and adopting salt-tolerant crops. This study provides critical insights into managing Jaipur's water and soil resources, contributing to developing more resilient agricultural systems.

Keywords: *Transient flow, Solute transport, Crop yields, Vulnerability assessment, HYDRUS-1D, Soil moisture deficit*

AFTEFS/SKUAST-K/AG/2024/19

Genetic enhancement for Brown planthopper resistance in Popular Basmati rice variety

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Pusa Basmati 1509 is one of the major foreign exchange earning varieties of Basmati rice. It is semi-dwarf, early maturing and has exceptional cooking quality. However, it is highly susceptible to various biotic stresses including the brown planthopper (BPH). The present study investigates the cross PB1509/ (PR122/*O. nivara* 104646) ^{*2}//PB1509^{*3}, leveraging PB1509's early maturity while addressing its known vulnerability to BPH. Phenotypic characterization for yield and attributing traits as well as BPH resistance of 21 advanced backcross Basmati breeding lines from this cross along with checks was carried out during *Kharif* 2022 using an augmented design. Six lines with BPH resistance and high yield potential were selected and reevaluated in *Kharif* 2023 using a randomized complete block design for yield traits and BPH resistance. Molecular marker analysis confirmed the presence of the *Bph34* gene in five lines. These lines also demonstrated intermediate amylose content validated by the presence of the *wx* gene and exhibited aroma which was confirmed by the absence of the *badh2* gene. Graphical genotyping with 145 SSR markers revealed that 27 markers were polymorphic underscoring diverse genetic contributions and highlighting the cross PB1509/ (PR122/*O. nivara* 104646) ^{*2}//PB1509^{*3} for achieving up to 90.1% genome recovery. This integrated approach combining phenotypic, molecular and genomic analyses represents a significant advancement in Basmati rice breeding, offering improved resistance to Brown Planthopper (BPH) without compromising Basmati quality.

Keywords: *Basmati rice, Brown plant hopper (BPH), molecular marker technology, amylose content, Bph34 gene, genome recovery.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/20

Effect of spacing and weed management practices on growth parameters of Finger millet varieties under *kandi* belt of Jammu region

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A field experiment was conducted at Advance Centre for Rainfed Agriculture, Dhiansar, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu during *kharif*, 2023. The experiment with twenty treatment combinations comprising two spacing (30cm × 10cm and 20cm × 5cm), two varieties (VL Mandua 382, VL Mandua 379) and five weed management practices (weedy check, weed free, pre-emergence herbicide, post-emergence herbicide and combination of pre and post emergence herbicide) which were laid out in factorial randomized block design which replicated thrice.

On the basis of one year study, it was revealed that among spacings, crop sown at wider spacing (30cm × 10cm) recorded significantly higher growth parameters viz., plant height, number of tillers and dry weight. Likewise, variety VL Mandua 382 recorded highest plant height and variety VL Mandua 379 recorded more number of tillers and dry weight. Among different weed management practices, the crop growth parameters were significantly higher in weed free treatment which is significantly at par with Oxyflourfen 80 g ha^{-1} (PE) *fb* Bispyribac-sodium 20 g ha^{-1} (PoE). From this one year study, it can be concluded that sowing of finger millet variety VL Mandua 379 at wider spacing alongwith the combination of pre and post emergence herbicide will improve the productivity of finger millet.

Keywords: *Finger Millet; spacing; varieties; weed management; growth parameters.*

AFTEFS/SKUAST-K/AG/2024/21

Variability studies in seedling growth parameters and biomass in half- sib progenies of *Ulmus villosa* Brandis seedlings in Kashmir valley of J&K UT.

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The present study was carried to assess source variation and biomass in *Ulmus villosa* Brandis seedlings grown from seeds of different sources. Nursery evaluation of various seed sources revealed significant differences in seedling growth and biomass parameters. The Bijbehara-Anantnag source exhibited superior performance in seedling height, collar diameter, total leaf area per plant, root length, number of branches, number of leaves, plant percent, and survival percentage. However, Mattan-Anantnag and Shalimar-Srinagar showed prominence in internodal length and root shoot ratio respectively. Sturdiness quotient and Dickson's quality index were highest in Bijbehara-Anantnag. Biomass analysis indicated that Bijbehara-Anantnag also yielded the highest fresh shoot weight and dry shoot weight and fresh root weight and dry root weight Phenotypic and genotypic variances, along with heritability estimates, varied significantly among traits, with root shoot ratio showing the highest coefficient of variation (64.24, 60.11, respectively). Survival percentage displayed the lowest coefficient of variation (6.29, 4.62). Seedling height, fresh shoot weight, and leaf area per plant exhibited the highest heritability (81%), while sturdiness quotient showed the least (62%). Genetic advance was notable in root vigor index (26.71), with Dickson's quality index showing the minimum value (1.5). Dry root weight demonstrated the highest genetic gain (75.67), while survival percentage displayed the lowest (12.92). Strong positive correlations were observed between seedling growth traits and biomass, underscoring the importance of these traits in selection programs. Overall, the study suggests the presence of considerable genetic control over the traits examined, providing opportunities for targeted improvement strategies in *Ulmus villosa* Brandis.

Key words: *Ulmus villosa, half-sib progeny, variability, Kashmir*

Harnessing Green Nanotechnology: Comparative Insights into the Biological and Toxicological Effects of Green and Chemically Synthesized Silver Nanoparticles on Silkworm, *Bombyx mori* L.

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Silver nanoparticles (AgNPs) are widely utilized across various industries due to their outstanding physical and chemical properties. However, the potential toxicity associated with AgNPs produced through chemical synthesis has raised significant environmental and health concerns. This study examines the toxicity and eco-friendliness of AgNPs synthesized via both chemical and green methods, with a focus on their biological effects on the silkworm, *Bombyx mori* L. AgNPs were chemically synthesized using trisodium citrate as a reducing agent and biologically synthesized using *Morus alba* leaf extract, which served as both a bio-reducing and capping agent. The successful synthesis of AgNPs was confirmed using UV-Vis spectrophotometry, with further characterization conducted through Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS), X-ray Diffraction (XRD) and Raman Spectroscop. Antioxidant properties were evaluated using the DPPH radical scavenging method, while cytotoxicity was assessed using *Bombyx mori* Bm5 cell lines and the MTT assay. The findings demonstrated successful synthesis of AgNPs through both methods. Chemically synthesized AgNPs had particle sizes ranging from 4-48 nm, while green-synthesized AgNPs, produced with *Morus* leaf extract, ranged from 43-60 nm and were predominantly spherical. Notably, the green-synthesized AgNPs exhibited significantly lower cytotoxicity against *Bombyx mori* Bm5 cell lines compared to their chemically synthesized counterparts. Additionally, the green-synthesized AgNPs displayed superior antioxidant activity, attributed to the functional groups present on their surfaces, as evidenced by the free radical scavenging assay. These results underscore the potential of green synthesis using *Morus* leaf extract as a non-toxic, eco-friendly, and cost-effective alternative to conventional chemical methods for producing AgNPs. This approach not only reduces environmental and health risks but also provides a sustainable and economically viable method for generating value-added products from mulberry. As nanotechnology continues to evolve, such green synthesis methods will be essential in minimizing environmental impact and ensuring the safe application of nanoparticles across various fields.

Keywords: *Green Synthesis, Silver nanoparticles, Bombyx mori, Morus alba, Cytotoxicity*

AFTEFS/SKUAST-K/AG/2024/23

Management practices for ameliorating growth and yield of bottle gourd

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Bottle gourd (*Lagenaria siceraria* (Mol.)Standl.) is one of the major fruit vegetable crop among cucurbits. The present investigation titled "Management practices for ameliorating growth and yield of bottle gourd" was conducted during *Kharif* season of 2021 at the experimental farm, Department of Vegetable Science, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, (Nauni) Solan (HP). The different integrated modules consisting of use of chemical and non-chemical were evaluated for their efficacy in enhancing the different growth, yield and seed parameters in bottle gourd. Analysis of variance revealed the significant varied response of different treatment modules on most of the growth, yield and seed parameters of bottle gourd. The combined application of fungicides, biocontrol agents and micronutrients were found more promising in enhancing growth, yield and seed quality parameters as well as reducing disease severity in bottle gourd as compared to the independent application of fungicides. Among different treatment modules, the treatment module consisting of seed treatment with carbendazim @ 0.25% followed by application of multi micronutrient mixture @ 5 kg/ha at the time of earthing up and four periodic sprays of azoxystrobin + chlorothalonil @ 0.25 % at 15 days interval started 30 days of crop emergence, proved most promising for enhancing growth, yield and seed parameters *viz.* vine length, numbers of primary branches/vine, number of male flowers/vine, number of female flowers/vine, per cent fruit set, number of fruits/plant, fruit length, fruit width, fruit weight, fruit yield, per plot and per hectare, marketable yield and per hectare, 100 seed weight, seed germination percentage, seedling length, seedling dry weight, Seed Vigour Index-I, Seed Vigour Index-II besides reducing the severity of economically important diseases (downy mildew and anthracnose) manifested highest net return of (₹8,14,633/ha) with B:C ratio of (3.12).

Keywords: *Biocontrol agents, fungicides, micronutrients, organic amendments*

AFTEFS/SKUAST-K/AG/2024/24

Phenotypic Evaluation and Defense-Related Biochemical Activities in Peduncles of Basmati Rice against Neck Blast Fungus, *Pyricularia oryzae*

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In a first, this study investigates the phenotypic responses and Defense-related enzymes in the infected peduncles against neck blast fungus, *Pyricularia oryzae*, across eight basmati rice genotypes in Punjab. The genotypes INGR 15001, INGR 15002, Pusa Basmati 1637, Pusa Basmati 1884, Pusa Basmati 1401, Pusa Basmati 1121, Punjab Basmati 7, and Tetep exhibited varying degrees of resistance. INGR 15001, INGR 15002, Pusa Basmati 1637, Tetep, and Pusa Basmati 1884 showed moderate resistance, with Susceptibility Index (*Sx*) values below 3.0, AUDPC values between 90.00 and 99.33, and lesion lengths ranging from 5.00 to 6.33 mm. In contrast, Pusa Basmati 1121 and Punjab Basmati 7 were susceptible, with *Sx* values of 8.00 and 6.33 to 6.83, respectively. Pusa Basmati 1401 displayed higher susceptibility, with *Sx* value of >9.00. Enzyme activity assays of peduncles conducted at 0, 3 and 9 days post-inoculation, revealed that moderately resistant genotypes had significantly higher activities of peroxidase, polyphenol oxidase, phenylalanine ammonia-lyase, catalase, and hydrogen peroxide compared to the susceptible genotypes. Understanding the mechanisms behind resistance to neck blast is crucial for developing more resilient rice varieties, and the current findings explore the potential of defense-related enzymes in contributing resistance to neck blast phase in basmati rice genotypes.

Keywords: *Defense enzymes, Magnaporthe grisea, Oryza sativa, Resistance*

AFTEFS/SKUAST-K/AG/2024/25

Effect of Different Locally Available Botanical Formulations on Cocoon and Post Cocoon Parameters of Silkworm, *Bombyx mori* L.

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The effect of dust formulations of different botanicals viz., walnut hull (*Juglans regia*), pine needles (*Pinus wallichiana*) and tree of heaven leaves (*Ailanthus altissima*) used for self-mounting and its effect on the cocoon and post cocoon parameters of silkworm double hybrid (CSR6×CSR26) × (CSR2×CSR27) were investigated. The results of the study showed that percentage of good cocoons was significantly improved in the treated batches compared to control. However, the worms treated with 100% *Ailanthus altissima* leaves powder recorded the highest value in most of the parameters with good cocoon percentage of 99.00%. There was no negative effect observed on cocoon and post cocoon parameters.

Key words: *Silkworm, botanicals, cocoon, parameter*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/26

Innovations in Food Processing and Preservation in Horticulture

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Innovations in food processing and preservation are revolutionizing horticulture by addressing the challenges of maintaining the quality, extending the shelf life, and enhancing the sustainability of fresh produce. Advanced technologies such as high-pressure processing (HPP) and pulsed electric fields (PEF) have emerged as significant methods for preserving fruits and vegetables. These techniques effectively inactivate microorganisms and enzymes without heat, thereby preserving the nutritional value and sensory qualities of produce. Controlled atmosphere storage and modified atmosphere packaging are also critical advancements, offering precise regulation of oxygen, carbon dioxide, and humidity levels to slow down the ripening process and reduce spoilage. The integration of smart packaging technologies further enhances food preservation by incorporating freshness indicators, active and intelligent packaging systems, and sensors that provide real-time data on the condition of the produce. These systems help manage the supply chain more efficiently by reducing waste and improving food safety. Nanotechnology is making strides in developing antimicrobial coatings and nanomaterials that improve barrier properties and extend shelf life. Additionally, advancements in dehydration techniques, such as freeze-drying and vacuum drying, are optimizing moisture removal while retaining the nutritional and flavor profiles of horticultural products. they promise to further enhance the resilience and sustainability of horticultural supply chains, ensuring a reliable and high-quality food supply for consumers worldwide.

Key words:-*high-pressure processing (HPP), pulsed electric fields (PEF), Nanotechnology, smart packaging, Controlled atmosphere storage.*

AFTEFS/SKUAST-K/AG/2024/27

Precision Farming with Hydroponic Cultivation of Horticultural Crops: A Paradigm Shift in Sustainable Cultivation of Horticultural Crops

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Precision farming, combined with hydroponic cultivation, offers a revolutionary approach to growing horticultural crops. This research explores the integration of precision horticulture and hydroponics to revolutionize the cultivation of horticultural crops. This method utilizes advanced technologies, such as sensors, drones, and data analytics, to optimize crop growth, reduce waste, and promote sustainability. By leveraging advanced technologies such as IoT sensors, AI, and data analytics, precision horticulture optimizes crop growth, reduces waste, and promotes sustainability. Hydroponics, a soilless cultivation method, provide precise control over nutrient delivery, watering, and climate conditions, resulting in increased crop yields, improved quality, and reduced environmental impact. This synergistic approach enables real-time monitoring and adaptive management of crop growth, allowing for precise control over environmental factors, nutrient delivery, and pest management. By adopting precision farming with hydroponic cultivation, horticultural crop production can become more efficient, productive, and environmentally friendly, meeting the increasing global demand for fresh produce while minimizing ecological footprint. Preliminary results show significant improvements in crop productivity, water efficiency, and reduced environmental impact. This research aims to establish a framework for precision horticulture empowered with hydroponics, paving the way for a sustainable and technologically advanced horticultural industry. Therefore, further investigation and strategic approaches are needed to explore the full potential of precision farming with hydroponics in horticultural crops research.

Keywords: *Precision farming, hydroponics, horticultural crops, sustainability, technology.*

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Effect of pre-harvest foliar application of different chemicals on quality and shelf life of ber (*Ziziphus mauritiana* Lamk.) cv. Gola

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Ber (*Ziziphus mauritiana* Lamk.) is a tropical native to South Asia, commonly found in arid and semi-arid regions. Vitamins A, B, C and essential minerals are major constituents of ber fruit pulp. Poor fruit quality and short shelf life are the major problems of this fruit. Pre-harvest spray of salicylic acid delays senescence, reduce ethylene production and alters the oxidative metabolism which helps in preserving the nutritional value of ber fruits during storage. Calcium also helps in maintaining the structural integrity of cell walls. Therefore, an experiment was designed to find out the effect of pre-harvest (15 days before harvest) foliar spray of different chemicals like calcium chloride (0.5, 1.0 and 1.5 per cent), calcium nitrate (0.5, 1.0 and 1.5 per cent), salicylic acid (1.0 and 2.0 mM) and boric acid (0.25 and 0.5 per cent) on quality and shelf life of ber (*Ziziphus mauritiana* Lamk.) cv. Gola. The foliar application of salicylic acid @ 1 mM proved better in retaining fruit color, maximum fruit firmness (9.46 kg/cm^2), maximum phenol content (270.08 mg GAE/ 100 g pulp), minimum decay loss (7.76 %), minimum physiological loss in weight (8.39 %) and overall increase in shelf life upto 8th day of storage at ambient temperature storage conditions and 14 days under low temperature (10^{0}C) storage conditions. Minimum fruit cracking (2.14 %) was recorded in treatment boric acid @ 0.5 per cent.

Keywords: *Ber, pre-harvest spray, salicylic acid, fruit quality, shelf life*

AFTEFS/SKUAST-K/AG/2024/29

Forest and Innovations: Pioneering for better World

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Forests are integral to global environmental systems, functioning as major carbon sinks, biodiversity reservoirs, and providers of essential ecosystem services. However, increasing pressures from climate change, deforestation, and ecosystem degradation necessitate innovative strategies to ensure the sustainability and resilience of forest ecosystems. This chapter examines key innovations in forest management, tree breeding, and the development of sustainable forest products. Technological advancements such as precision forestry, remote sensing, and Geographic Information Systems (GIS) enable more efficient monitoring and sustainable management of forest resources. In parallel, genetic innovations, including marker-assisted selection and biotechnological interventions, are accelerating the development of tree species with enhanced growth, pest resistance, and climate adaptability. The transition to a bio-based economy, exemplified by the production of biofuels, bioplastics, and engineered wood products like cross-laminated timber (CLT), highlights the forestry sector's growing contribution to climate change mitigation and reduced dependence on fossil resources. By integrating these innovations with climate-smart forestry practices, the sector is advancing solutions that foster ecological resilience and contribute to long-term environmental and economic sustainability.

Keywords: *Forest, Innovation, Sustainability, Ecosystem resilience, Technology*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/30

Climate-Induced Challenges in Rain-fed Farming Areas of Jammu District

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Climate change and increased climate variability present major challenges to agricultural production and rural livelihoods, especially where rain-fed agriculture is the primary source of food production. The heavy reliance of smallholder farmers on rain-fed agriculture makes them vulnerable to the severe impacts of climate change. The present study was therefore planned to assess the problems being encountered by farmers due to climate change. The study was carried out in the purposively selected Bhalwal block of Jammu district of Jammu & Kashmir. Data were collected from 300 respondents using semi-structured interview schedule to estimate the challenges being faced due to climate change. Problem Confrontation Index (PCI) tool was used to analyse farmers' problems w.r.t. climate variability. The application of PCI is appropriate because it helps to identify and analyze the most critical problems being confronted by the farmers of rain-fed area. The results of the study are presented in the form of challenges faced due to low/no or excessive rainfall and erratic weather conditions. Crop failure due to excessive rain (PCI: 618, rank I) followed by moisture stress due to continuous dry spell (PCI: 614, rank II), drying of seedlings after germination (PCI: 497, rank III) and water logging of farmland (PCI, rank IV) were the major problems under due to low/no or excessive rainfall. The challenges due to erratic weather conditions includes: change in rainfall pattern (PCI: 817, rank I) followed low yield of crop or complete crop failure (PCI: 599, rank II), reduction in farm income (PCI: 591, rank III) and stunted growth of crops (PCI: 586, rank IV). The other reasons includes increases pests/diseases infestation (PCI: 419, rank I), reduces feed intake of livestock (PCI: 215, rank II), poor quality of farm produce (PCI: 183, rank III) and increased vulnerability to soil erosion (PCI:139, rank IV). Thus, it is suggested that policy planners must design policy frameworks and interventions that addresses these constraints to help farmers adapt to climate change.

Key words: *Climate variability, smallholder farmers, Problem Confrontation Index (PCI)*

AFTEFS/SKUAST-K/AG/2024/31

Profitability Analysis of Vetiver *(Vetiveria zizanioides)* Cultivation in Gonda District of Uttar Pradesh

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Uttar Pradesh a leading state in commercial cultivation and trade of Vetiver grass. The production of this crop fluctuate year to year due the price fluctuations, lack of marketing facilities, absence of value addition by processing, lack of technical know-how of cultivation. The objectives of the study were calculation of cost and return and to find out the constraints faced by farmers on different size groups of farms in vetiver production in the study area. A four-stage multi-stage sampling technique was employed for constructing sampling plan of the study. CACP costs concepts were used for estimating of costs and returns and Grett Ranking technique was used for constraint analysis in vetiver cultivation.

The higher costs of inputs and less return as decreasing yield put extra burden on the farmers. The lack of market for selling vetiver root at the time of harvesting followed by lack of technical know-how of vetiver cultivation and huge investment for the cultivation of vetiver were the major problem in the study area.

Keywords: *Vetiver Grass, marketing, sampling, Cost, Constraints*

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Climate-smart Agriculture and Adaptation Strategies

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Climate-Smart Agriculture is an integrative approach that addresses the interlinked challenges of food security and climate change. It aims to enhance agricultural productivity, increase resilience (adaptation), reduce or remove greenhouse gases (mitigation), and enhance the achievement of national food security and development goals. Climate-Smart Agriculture practices are crucial in adapting to the impacts of climate change, such as unpredictable weather patterns, increasing temperatures, and shifting growing seasons, which threaten global food production. Adaptation strategies in climate-Smart Agriculture involve adopting innovative farming practices that improve the resilience of agricultural systems. These include the use of drought-resistant crop varieties, improved water management techniques like drip irrigation, agroforestry, and soil conservation methods. Additionally, diversification of crops and livestock can reduce vulnerability to climate-induced risks. Farmers are also encouraged to adopt climate-informed decision-making, which involves using weather forecasts and climate projections to guide planting and harvesting decisions. Moreover, climate-Smart Agriculture promotes sustainable land management practices that not only enhance soil fertility but also sequester carbon, thereby contributing to climate change mitigation. Policies and institutional support play a critical role in facilitating the adoption of climate-Smart Agriculture by providing farmers with access to knowledge, resources, and markets. Investing in research, extension services, and infrastructure is essential to scaling up climate-Smart Agriculture practices globally. Overall, Climate-Smart Agriculture represents a transformative approach to farming that aligns agricultural development with climate action, ensuring food security in the face of climate variability and change.

Key words: *Climate change, mitigation strategies, sustainability, food security.*

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Response of Organic and inorganic fertilizers on the growth and yields of Green gram (*Vigna radiata* l.) in Namsai, Arunachal Pradesh

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The present investigation entitled "Response of organic fertilizers and inorganic fertilizers on the growth and yield of the Green Gram (*Vigna radiata* L.) under Namsai condition was carried out during the Kharif season in the year 2023-2024 at Instructional Research Farm at Arunachal University of Studies, Namsai district, Arunachal Pradesh. The main objective of this research was to study the effect of organic fertilizers and inorganic fertilizers on the growth and yield of the Green Gram **(***Vigna radiata* L.). The experiment was laid out in Randomized Block Design (RBD) with 6 treatments and 4 replications. The treatments were T_0 (Control), T_1 [100 % RDF (20:40:20 kg ha^{-1} N, P_2O_5, K_2O)], T_2 (FYM @ 8.5t ha^{-1}), T_3 (Vermicompost @ 7 ha^{-1}), T_4 [50 % RDF + 50 % FYM (Farm Yard Manure)] and T_5 [50 % RDF + 50 % Vermicompost]. The growth and yield parameters like plant height (cm), number of leaves, number of branches, pod length (cm), number of pods per plant, number of seeds per pod and yield per plot (g) has been observed and evaluated. On evaluation it was noted that green gram with the application of Farm Yard Manure @ 8.5 t ha^{-1} gave the tallest plant height of 34.24 cm, maximum number of 35.75 leaves, maximum number of 26.23 branches, highest pod length of 12.80 cm, maximum number of pods 17.25 per plant, highest number of seeds 15.75 per pod and highest yield 1325.50 g per plot when compared to all other treatments. Thus, application with Farm Yard Manure @ 8.5 t ha^{-1} has paramount effect on the production on green gram (*Vigna radiata* L.) in Namsai condition. The findings of this study can be useful for farmers and agricultural practitioners who are looking for sustainable and eco-friendly ways to improve crop productivity.

Keywords:-*Green gram (Vigna radiata), Farm Yard Manure (FYM), Vermicompost (VC) and recommended dose of inorganic fertilizer (RDF) and Yields.*

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Agricultural Technology and Innovative Ideas in Hindi Literature

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Indian society is basically an agricultural society and a large part of the population depend on it. Farming was not a livelihood but a way of life and litterateurs, poets and saints have described it well in their literature. Among these, various works of Kalidas and the great collection written by Varahamihir have a special contribution. There are clear mentions of growing wheat, barley, pulses, oilseed crops like sesame, mustard, various types of paddy, ginger, reed, vegetables, medicinal crops and trees. Varahamihir has also mentioned the preparation of the land, planting of cuttings of one tree on another, irrigating the trees in the right season, distance of plantation of trees, treatment of diseases occurring in trees, method of sowing seeds by digging holes in the ground and also given detailed description about rainfall according to constellations on the basis of astrology. Even at that time, a special standard scale was in use to measure rainfall. Before independence, most of the population of India used to live in villages, today this figure has reduced, but villages are still in abundance in our country and main occupation of the rural society is agriculture. Premchand, Sharat Chandra, Maithili Sharan Gupt, Mahadevi Verma and many great writers have expressed their deep sympathy and concern for the pitiful condition of the Indian farmer. Premchand had made the first attempt to give literary expression to the Indian farmer and his problems. His 'Premashram' is the first Hindi novel, in which the struggles and problems of the farmers have been widely expressed. Apart from this, authentic and realistic pictures of exploitation, plight and struggle of farmers can be seen everywhere in his literature. In this way, there is a realistic picture of the life of a farmer in the works of writers.

Even in today's changed environment, the problems of farmers have not reduced. The important thing to understand is that the poems written about farmers never became a part of the main discussion. Through poetry and literature, human feelings can be touched, their thought stream and sensitivity can be awakened, therefore if scientists and agriculture students are made aware of this through literature, then they will be able to understand not only

the mind but also the heart of the farmers in the interest of agriculture. Literature is the best tool which brings us from outside to inside. When we look at the disparities in environment and agriculture inspired by the sympathies of the heart, the entire working style will change. Therefore, literature has a unique contribution in the awakening of consciousness. Today, it would be difficult to find a more accessible and simple guide than literature to encourage students towards the environment and its protection.

Key words: *Agricultural, Environment, Literature, Scientific, Occupation.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/35

Insights into seed transmission of *Pseudoperonospora cubensis* infecting cucumber

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Cucumber downy mildew caused by *Pseudoperonospora cubensis* is known to be a soil-borne pathogen causing considerable economic losses. To understand the rapid spread this study was conducted to determine whether *P. cubensis* is seed-transmitted. Fruits were collected from downy mildew-infected vines of different districts of Punjab. Microscopic studies revealed the presence of sporangia and oospores in the seeds of cucumber. To investigate seed transmission, seed grow-out tests were performed and propagules of *P. cubensis* were observed to be highest in the seedlings of district Sangrur (33.33%) followed by district Ludhiana (20.00%), district Hoshiarpur (13.33%), district Moga (6.67%) and no transmission was observed from district Bathinda collected seeds. Seed infectivity assays were conducted in laboratory conditions by artificially inoculating healthy seeds and fruits with sporangial and oospore suspension. When healthy seeds and fruits of cucumber observed under microscope, presence of sporangia and oospores were seen in seed coat as well as embryo. Seed to seedling transmission of *P. cubensis* of artificially inoculated seeds and seeds from artificially inoculated fruits was determined through grow-out test. Seedling infection observed in artificially inoculated seeds by sporangial and oospore inoculum was 40% and 26.66% respectively. Seedling infection observed in artificially inoculated fruits by sporangial and oospore inoculum was 46.66% and 20.00% respectively. Cross-pathogenicity tests conducted also confirmed the infectivity of fruit pulp and infected crushed seeds when placed onto healthy detached leaves by producing downy mildew symptoms. This study proposes that downy mildew of cucumber is seed transmitted under natural and laboratory conditions.

Keywords: *downy mildew, cucumber seeds, grow-out test, seed transmission*

AFTEFS/SKUAST-K/AG/2024/36

Sustainability of Soil Fertility and Income of the Farmers Through Soil Health Card

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Indian soils are deficient in many macro and micro nutrients. There is no doubt the use of chemical fertilizer has transformed India as a food deficit country into a food surplus country. But, the use of chemical fertilizer has become hazardous in the long run by deteriorating the soil health and the quality of the agricultural produces. This chemical fertilizer is also polluting soil and irrigation water. Soil testing will help to recommend dose of chemicals fertilizers with organic manures and bio fertilizers. Government of India launched Soil Health Card Scheme on 19 February, 2015 to avoid deterioration of Indian soil health and visualizing the importance of balance nutrient in crop production. It contains corrective measures that a farmer should adopt to obtain a better yield and increase their incomes with increasing productivity. The soil health card helps the farmers to get a well-monitored report about the soil, crop-wise recommendations of nutrients and fertilizer required in each type of soil. It can help to increase crop yield and income of farmers.

Key Words: *Soil, nutrient, fertilizer, yield and income*

AFTEFS/SKUAST-K/AG/2024/37

Title: Sustainable Farming in a Changing Climate: The Impact of Climate-Smart Agriculture

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Climate change presents a growing threat to global agriculture, affecting food security, livelihoods and ecosystems. As temperatures rise, weather patterns become increasingly erratic and extreme events such as floods and droughts occur more frequently, putting pressure on agricultural production. To meet the challenge of feeding a growing global population under these conditions, the agricultural sector must adapt. Climate-smart agriculture (CSA) offers a holistic solution by integrating sustainable farming practices that improve productivity, resilience and reduce greenhouse gas emissions. Key strategies of CSA include adopting drought-tolerant crop varieties, precision farming, agroforestry and improved water management. Precision farming, for instance, utilizes technology to optimize the use of resources like water and fertilizers, potentially boosting yields by up to 30% while cutting resource consumption by 15%. Agroforestry, which integrates trees into farming systems, enhances soil health, sequesters carbon and provides farmers with additional income streams, further promoting sustainability. CSA's impact on food security is notable, with sustainable intensification practices showing crop yield increases of up to 50%. These methods also support smallholder farmers by reducing their vulnerability to climate shocks and increasing their economic resilience. CSA contributes to environmental conservation by preserving biodiversity, reducing deforestation and enhancing ecosystem services. In the face of ongoing climate change, adopting climate-smart practices is crucial for ensuring the long-term sustainability of food systems. CSA not only benefits individual farmers but also strengthens entire communities and economies, advancing both agricultural productivity and environmental sustainability.

Keywords: *Smart agriculture, Sustainable, Climate, farmers, practices, Farming*

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Transcriptome and Genome-Wide Association Study for identification of key genes involved in flowering time regulation in linseed (*Linum usitatissimum* L.)

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Flowering time is one of the crucial traits in linseed (*Linum usitatissimum*) for rainfed agriculture, to fit in rice fallows, and for economically viable cultivation. Here a combination of genome wide association study and transcriptome sequencing approach was used to identify key genes involved in flowering time regulation in linseed. Multi-Locus Genome-Wide Association analysis (ML-GWAS) was performed flowering time in an association mapping panel of 131 accessions, genotyped using 68,925 SNPs identified by genotyping by sequencing approach and phenotypic evaluation data of five environments comprising 3 years and two locations. For the three flowering time traits (days to 5%, 50% and 95% flowering), total 53 stable QTNs (≥2 methods and/or environments) have been identified. A total 79 genes around the stable QTNs have been selected as potential candidate genes. Simultaneously, transcriptome sequencing of reproductive tissues, floral bud at two developmental stages (bud 1 & bud 2), flower, and two vegetative tissues (leaf and stem) in two early flowering linseed accessions, IC0523807 and IC0525939 was performed. A total of 47.4 GB of filtered data was obtained from 20 datasets, resulting in 43,484 transcripts. Differential expression analysis between vegetative tissues vs reproductive tissues in different combinations revealed a total of 14,244 differentially expressed genes (8159 upregulated and 6085 downregulated), with 40 GO and 161 KEGG enriched terms. 79 potential candidate genes selected from GWAS, 56 candidate genes were among the DEGs common to bud1, bud2, and flower. Overall, based on candidate genes identified from GWAS study, DEGs and earlier known QTLs/QTNs, 2 genes, flowering locus T (*LusFT, Lus10013532*) and a flowering repressor Apetalla-2 (AP2) like transcription factor SCHLAFMUTZE (SMZ) (*LusSMZ, Lus10039650*) was identified as promising candidate genes.

Keywords: *Flaxseed, Linum usitatissimum, GWAS, transcriptome, flowering time, candidate genes*

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Enhancing Agricultural Price Forecasting: A Hybrid ARIMA-GARCH-Copula Approach

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Agricultural commodities price frequently exhibit inherent noise and volatility, attributable to market dynamics. This paper undertakes a comprehensive analysis of price volatility concerning key oilseed crops (Safflower, Mustard, Groundnut) and pulses (Lentil, Chickpea, Green gram) across two markets for each commodity in the Indian agricultural sector. The present study aims to improve the accuracy of price forecasting by utilizing the Bivariate AutoRegressive Integrated Moving Average (ARIMA)-Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) type-Copula model. Monthly agricultural commodity price datasets for key oil seed crops and pulse crops spanning January 2010 to December 2022 have been used to evaluate the predictive performance of this model. Comparative evaluations are carried out against conventional statistical time series models, namely Multivariate GARCH (MGARCH)-Dynamic Conditional Correlation (DCC) model and the Univariate ARIMA-GARCH model. Empirical findings demonstrate that the Bivariate ARIMA-GARCH type-Copula model outperformed the conventional statistical time series models considered in forecasting performance. This superiority is evidenced by evaluation metrics, including Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE). Moreover, this study utilized the Diebold–Mariano test to highlight the predictive accuracy of the Bivariate ARIMA-GARCH type-Copula model for the dataset under consideration, surpassing conventional statistical time series models. The integration of Copulas with the ARIMA-GARCH type model shows promise for enhancing price forecasting accuracy, offering valuable insights for researchers and policymakers navigating the dynamic agricultural market landscape in India.

Key words: *Agricultural commodities price series;ARIMA; Copula; GARCH; Volatility.*

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Evaluation of *Bt* hybrid and non *Bt* cultivars of cotton for organic farming

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An Experiment was conducted at Cotton Research Farm, Sirsa, CCS Haryana Agricultural University, Hisar to evaluate the *Bt* hybrid and non *Bt* cultivars of cotton for organic farming during Kharif 20-21. A total of eight variety/cultivars of cotton *i.e.* V1: RCH-773; V2: RCH-776; V3: Shriram 6588; V4: US71; V5: H 1098i; V6: H-1226; V7: H-1236; V8: H1117 were taken for evaluation. The experimental area was added with farm yard manure. Observations were recorded on yield attributing characters, seed cotton yield and data on plant diseases and insect pests. Among *Bt* hybrids, US-71 (1092 kg/ha) and among non *Bt* cultivars, H-1117 (1029 kg/ha) were recorded with maximum seed cotton yield under organic farming, which was statistically at par with *Bt* hybrid RCH 776 (1036.4 kg/ha), non *Bt* cultivars H-1098i (1004.7 kg/ha) and H-1117 (1029.3 kg/ha). Similarly, dry matter accumulation, number of sympods and weight of 5 bolls were recorded maximum in US-71. The population of whiteflies and thrips were observed minimum in non *Bt* cultivars H-1236 and H-1226, respectively. While, minimum PDI of CLCuD was recorded with RCH 773 and H-1098i among *Bt* hybrids and non *Bt* cultivars, respectively.

Keywords- *Organic, Cotton, Hybrid, Cultivars*

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Wastes to worth: Value-added products from horticultural waste

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The concept of "Wastes to Worth" focuses on converting horticultural waste into valuable products, offering both environmental and economic benefits. Horticultural activities generate substantial organic waste, including plant trimmings, overripe fruits, and discarded vegetables. Rather than discarding these materials, they can be processed into useful products through methods such as composting, biogas production, and chemical extraction.

Composting and biochar production improve soil health and fertility, closing the nutrient loop in agriculture. Compost can increase soil carbon content by up to 25%, enhancing soil structure and plant growth. Biochar not only enriches soil but also sequesters carbon, potentially mitigating climate change. Biogas production from horticultural waste generates renewable energy and reduces greenhouse gas emissions. It is estimated that biogas could meet up to 20% of India's rural energy needs while cutting methane emissions by over 50% compared to conventional waste management methods. Moreover, valuable chemicals such as antioxidants and essential oils can be extracted from horticultural waste for use in medicines, cosmetics, and health products. For instance, flavonoids extracted from fruit peels are being explored for their anti-inflammatory properties, with the market for such natural compounds projected to reach $5 billion by 2026.Repurposing horticultural waste not only enhances waste management but also creates economic opportunities. As technology advances, the potential to convert waste into profitable and eco-friendly products expands, supporting a more sustainable and circular economy. This abstract explores these processes and their impacts on environmental and economic growth.

Keywords: *Wastes to Worth, Organic waste, Composting, Biogas production, Biochar*

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Designing CRISPR/CAS9 based Genome Editing in Crop Plants

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CRISPR/Cas9 has emerged as a breakthrough site-specific genome-editing technique due to its ease of use, simplicity, and high efficiency that has revolutionized the field of genome editing. It allows scientists to create transgene-free genome-edited plants by allowing them to target and modify specific DNA sequences. The foremost step designing this system in plants is to identify the target gene followed by designing the construct which includes identification of appropriate Cas proteins, design and selection gRNAs, and selection of regulatory elements to express gRNAs and Cas proteins. It complexes with sgRNA for DNA targeting and requires PAM site downstream of its target sequence for DNA recognition. Once Cas9 recognizes its PAM sequence, the Cas9-sgRNA complex binds to the target sequence and generates a DSB at the target site. DNA cleavage activity of Cas9 is achieved by the combined effort of two parts of the protein (RuvC and HNH). In most genome editing experiments, the gRNA as well as the Cas9 and selectable marker genes, have been delivered into plant cells using either T-DNA (Agrobacterium infection) or plasmid DNA (particle bombardment). For most purposes, validation and characterization of edits on both the molecular and phenotypic level, will be required to assess their biological relevance. The CRISPR/Cas9 system has been successfully applied in various plant species. These include not only model plants, such as *Arabidopsis*, but also crops, such as rice, tobacco, sorghum, wheat, maize, soybean, tomato, potato, poplar, apple and banana.

Keywords: *CRISPR, CAS9, PAM site, Target Gene, guideRNA*

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AFTEFS/SKUAST-K/AG/2024/43

Site-Specific Nutrient Optimization Strategies- The Path to Precision Agriculture

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In the past, blanket fertilizer recommendations prescribed to farmer's that did not take into account the variations in the indigenous nutrient supply from the specific fields have led to higher production costs, diminishing yield and factor productivity, and increasing greenhouse gas emissions. Soil test based nutrient management recommendations have improved food grain production but have not improved the nutrient use efficiency beyond a certain limit. Therefore, precision fertilizer recommendations that address the need-based crop requirements have been urgently needed. Site-specific nutrient management along with modern agronomic management practices may increase yields and nutrient use efficiency by optimizing the balance between nutrient supply and demand. Precision nutrient management is one of the key components of the precision agriculture governing all the major problems of improving productivity, profitability and sustainability. Assessment of plant nutrient demand from plants is more effective strategy as plant growth at any given time is an integration of effect of nutrient supply from all the sources and is thus a reliable measure of its availability. The affordable and environment friendly tools like leaf color chart, SPAD, green seeker and several decision support tools like nutrient expert or crop manager are gaining popularity among farmers. Precision agriculture is the management of the right source at the right rate on right time and in the right place is best accomplished with the right tools or we can say it is an integrated information and production-based farming system that is designed in order to increase long term, site-specific and farm production efficiency, productivity and profitability while reducing unintended impacts on soil and environment.

Keywords: *Precision agriculture, Site specific nutrient management, Leaf color chart, Green seeker, Yield*

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Site-Specific Nutrient Optimization Strategies- The Path to Precision Agriculture

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In the past, blanket fertilizer recommendations prescribed to farmer's that did not take into account the variations in the indigenous nutrient supply from the specific fields have led to higher production costs, diminishing yield and factor productivity, and increasing greenhouse gas emissions. Soil test based nutrient management recommendations have improved food grain production but have not improved the nutrient use efficiency beyond a certain limit. Therefore, precision fertilizer recommendations that address the need-based crop requirements have been urgently needed. Site-specific nutrient management along with modern agronomic management practices may increase yields and nutrient use efficiency by optimizing the balance between nutrient supply and demand. Precision nutrient management is one of the key components of the precision agriculture governing all the major problems of improving productivity, profitability and sustainability. Assessment of plant nutrient demand from plants is more effective strategy as plant growth at any given time is an integration of effect of nutrient supply from all the sources and is thus a reliable measure of its availability. The affordable and environment friendly tools like leaf color chart, SPAD, green seeker and several decision support tools like nutrient expert or crop manager are gaining popularity among farmers. Precision agriculture is the management of the right source at the right rate on right time and in the right place is best accomplished with the right tools or we can say it is an integrated information and production-based farming system that is designed in order to increase long term, site-specific and farm production efficiency, productivity and profitability while reducing unintended impacts on soil and environment.

Keywords: *Precision agriculture, Site specific nutrient management, Leaf color chart, Green seeker, Yield*

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AFTEFS/SKUAST-K/AG/2024/45

Vegetation ecology and forest soil dynamics in Northern Chhattisgarh, India

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The present investigation showcases the vegetation ecology of tree, sapling, seedlings, shrub, climbers and herbs in terms of their structure, regeneration status, diversity and soil attributes in various forest stands *viz.,* regenerated forest, degraded forest, dense forest, moderately dense, and teak plantation in the northern hills of Chhattisgarh. Random sampling was used to assess the various stratum in selected sites. Soil samples were analyzed for macro and micronutrients at two different depths (0-10 cm and 10-20 cm). The tree layer comprises 21 species representing 16 families in different forest land use. The total tree density and basal area ranged from 350-910 individuals ha^{-1} and 3.12-19.57 m^2ha^{-1} among different forest stands. A total of 25 species representing 18 families, the total density and basal area of saplings ranged from 630-3150 individuals ha^{-1} and 1.46-7.46 m^2ha^{-1}, respectively. A total of 23 seedling species were distributed into 16 families as well as total seedling density ranged from 3240-14280 individuals ha^{-1} in different forest stands. A total of 14 shrubs, 17 climbers, and 30 herb species representing 9, 8, and 12 families, respectively were recorded from various forest stands. The total density value of shrubs, climbers, and herbs ranged between 600-1760 individuals ha^{-1}, 320-5240 individuals $ha^{-1,}$ and 356000-684000 individuals ha^{-1}, respectively for different forest stands. The Shannon index for the tree layer varied from 0.50-1.92, the concentration of dominance from 0.36-0.84, and evenness from 0.46-1.09. Total forest litter biomass in different forest stands ranged from 3.56-6.61 t ha^{-1} being higher in dense forest sites and lowest at the teak stand. Shannon index values for shrub, climber, and herb ranged between 0.78-2.88, 1.68-2.45, and 2.57-3.59, respectively. The soil of the study area was found to be acidic in nature with moderate levels of organic carbon (%), macro, and micronutrient status. Considering the total density value of various forests stands highest number of shrubs, climbers, and herbs were recorded in degraded forests which indicates the process of degradation facilitates the growth of understory vegetation in comparison to tree species. The forest has

substantial diversity which needs to be protected, conserved, and managed judiciously for sustainable forest resource utilization. In most cases, the soil attributes were higher in dense forests. This, therefore, indicates that sustainable management of the soil is essential for the restoration of degraded forests to a natural condition.

Keywords: *Ecology, forest stand, diversity, littermass, regeneration, soil attributes*

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Disease management and agriculture sustainability through diversity of plant species

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Crop diseases can affect yield and quality, causing significant damage to the entire food industry worldwide. In this study, we created a series of host populations by mixing different numbers of soybean varieties showing different phytophthora stem rot resistance levels in different proportions. The naturally occurring phytophthora stem rot disease in the mixture populations was recorded weekly during the soybean growing seasons. Percent disease reduction in mixed populations was calculated by comparing observed levels of stem rot with those expected when planted in sterile areas. We found that percent disease reduction increased in mixtures with increasing number of cultivars and differences in host resistance between cultivars. In mixtures containing two different types, the optimal ratio of the different components for the best percent disease reduction depended on their variation in host resistance, and the increasing addition of one of the different components increases the variation in host resistance which is different between different categories. These results show that mixing different crops can reduce epidemics in the field. To achieve the best disease reduction, farmers should include as many species as possible in mixtures, or if only two-component mixtures are possible, increase the variation of host resistance between the various components.

Keywords: *Phytophthora sojae, disease resistance, sustainable agriculture, disease management, mix cultivars.*

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Smart Irrigation System: Precision Water Management for Horticulture Crops

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Smart irrigation technologies are providing effective, long-term solutions for maximizing water utilization, revolutionizing precise water management in horticulture. To supply water exactly where and when it is required, these systems incorporate cutting-edge technologies like soil moisture sensors, weather predictions and remote monitoring. Smart irrigation systems may modify watering schedules in real-time to minimize water wastage and guarantee that crops receive the appropriate quantity of water at each development stage by continually monitoring soil moisture levels and weather variables. This accuracy prevents both under- and over-irrigation, which can stress plants and lower yields. It also prevents waterlogging and nutrient leaching. Growers may remotely administer and monitor irrigation with automated systems, which may be accessed through cellphones or cloud-based platforms. This reduces labour expenses and saves time. Further improving water-use efficiency is the incorporation of artificial intelligence (AI) and machine learning algorithms to forecast future water requirements based on crop variety, weather patterns and previous data. By consuming less water and energy, smart irrigation systems not only increase crop health and output but also result in considerable cost savings. These systems promote environmental conservation efforts and encourage sustainable agricultural methods, which are especially helpful in locations where water is scarce. Smart irrigation systems are a crucial component of contemporary horticultural techniques since they help producers get greater yields, increase resource efficiency and guarantee more sustainable water management.

Keywords: *Smart irrigation, sustainable water management, artificial intelligence, precise water management*

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Studies on growth and production of *Clarias magur* (Hamilton, 1822) integrated with *Spinacia oleracea* in an aquaponics system

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Aquaponics, a sustainable farming method that combines aquaculture and hydroponics, offers a promising solution for efficient and environmentally friendly food production. *Clarias magur* (Indian magur) and *Spinacia oleracea* (Spinach) were chosen for this study due to their high nutritional value, strong market demand, and suitability for growth in aquaponics systems. In this study, three different setups, one aquaponics system system (T1) for the combination of magur and spinach, one monoculture system (T2) for magur, and one monoculture system (T3) for spinach were evaluated to assess the combined growth and production compared to monoculture. The study was conducted for a duration of 45 days using fish tanks with a water volume of 165.65 liters (5.85 ft^3) for each of the two fish tanks (T1 & T2), on the other side T1, T3 incorporated Deep Water Culture (DWC) systems with each of 100 liters (3.6 ft^3) water holding capacity. Magur species of nearly equal size and age were collected from natural environments like beels, and wetlands and randomly assigned at a rate of 30 individuals per T1 and T2 fish tank. Similarly, spinach plants of uniform size were planted 50 nos on thermocol plant container beds in each of the T1 and T3 systems. Regular monitoring of water quality parameters, including DO, temperature, salinity, pH, and ammonia, revealed no significant variations ($p>0.05$). The specific growth rate (SGR) of magur was T1 (3.57%), and T2 (3.29%), respectively, while survival rates were 90%, and 80% respectively. In the case of spinach, the final total leaf area (21 ± 3.82 cm^2) and biomass (6.57 ± 1.05 g) in the aquaponic system were

significantly higher than those in the monoculture system (19 ± 2.92 cm^2 and 5.95 ± 1.07 g). According to the findings, Indian magur and spinach can be effectively combined in an aquaponic system to provide sustainable fish and plant food.

Keywords*: Aquaponics, Clarias magur, Spinacia oleracea, growth, production*

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AFTEFS/SKUAST-K/AG/2024/49

BIOFUMIGATION FOR THE MANAGEMENT OF ROOT-KNOT NEMATODES IN VEGETABLE CROPS

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Vegetable farming plays an important role in the country's agricultural economy. One of the main causes of vegetable output reductions globally, particularly in subtropical and tropical regions, is nematodes. Root-knot nematodes are the most widespread and economically important of all plant-parasitic nematodes because of their rapid reproduction and wide host range. *Meloidogyne. incognita, M. javanica, M. arenaria,* and *M. hapla* are thought to be the main species of root knot nematodes that infect the majority of crops that are grown. Integrated nematode management is a useful strategy that integrates biological, cultural, physical, and chemical management methods. Non-chemical methods such as biofumigation, which suppresses soil-borne diseases and pests by incorporating new plant biomass into the soil and covering it with polythene for two to three weeks. The biofumigant effect is mainly caused by the volatile and toxic isothiocynates originated from the hydrolysis of secondary metabolite glucosinolate present in the Brassica tissues. The scope of biofumigation has been expanded to other non-brassica plants that produce volatile pathogen-suppressing molecules. The graminaceous plants such as sorghum and sudangrass are known to produce nematicidal cyanides via enzymatic hydrolysis of precursor cyanogenic glycoside/dhurrin. The allelopathic plant marigold is known to produce α-terthienyl, which has shown potential biofumigation effects against PPNs. Biofumigation is reported to effectively control fungal pathogens and weeds, improve soil properties, and enhance beneficial soil microorganisms. However, the approach has some limitations, like the unavailability of plant biomass in off-seasons and poor efficacy in dry soil and deeper layers of the soil.

Keywords*: Root-knot nematodes, Biofumigation, Isothiocyanate, Glucosinolates, Dhurrin, and α-terthienyl*

AFTEFS/SKUAST-K/AG/2024/50

Climate – smart Agriculture and Adaptation Strategies

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Climate-smart agriculture (CSA) is an integrated approach to managing landscapes—cropland, livestock, forests, and fisheries—that addresses the interlinked challenges of food security and climate change. CSA aims to achieve three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions where possible. Adaptation strategies within CSA include the development and adoption of drought-resistant crop varieties, improved water management techniques, and the diversification of farming systems to reduce vulnerability to climate shocks. These strategies are crucial for maintaining productivity in the face of changing climate conditions. Additionally, CSA promotes practices such as agroforestry, conservation agriculture, and integrated pest management, which enhance ecosystem services and biodiversity, contributing to greater resilience. Mitigation efforts focus on reducing emissions through practices like improved livestock management, efficient use of fertilizers, and the restoration of degraded lands. These practices not only help in sequestering carbon but also improve soil health and productivity. The successful implementation of CSA requires supportive policies, access to climate information, and investment in research and development. Collaboration among farmers, researchers, policymakers, and the private sector is essential to scale up CSA practices. By integrating adaptation and mitigation strategies, CSA provides a pathway to sustainable agricultural development that can withstand the impacts of climate change while contributing to global food security.

Keywords: *Climate- Smart Agriculture, Sustainability, Resilience, Biodiversity, Mitigation*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/51

Recent advancements in food preservation techniques

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Food preservation entails a variety of food processing operations to maintain the appropriate degree of food quality so that maximum benefits and nutritional values can be achieved. Growing, harvesting, processing, packaging and distribution of food are all examples of food preservation techniques. Innovative preservation techniques are being developed to meet consumer needs and to prevent food spoilage by microorganisms (bacteria, yeast and moulds), as well as enzymes, temperature and biochemical changes and impart a keeping quality or shelf-life of foods. Packaging being an integral part of the processing and preservation of foods, can influence physical and chemical changes, including migration of chemicals into foods. Plasma is a partially or wholly ionized gas or a mixture of ionized gases that can be produced by the exposure of a gas mixture under different pressure conditions using different electrical discharge sources. Plasma play important role in agriculture as the treatment reduces the germination time and enhancing the rate of seed germination. Several age-old traditional methods of preservation of food exist, such as the familiar sun drying and storage in vinegar, to name a few. There are also other indigenous methods which are used currently by new inventions. Based on the obtained knowledge, further technological interventions for improvement can be suggested as well as suggestions for extending the preservation concept to other food stuffs.

Keywords: *Food processing, preservation, packaging, traditional methods, environment.*

AFTEFS/SKUAST-K/AG/2024/52

Early Detection and Diagnosis of Peach Diseases Using Deep Learning Architect VGG-16 Convolutional Neural Network

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Early detection and accurate diagnosis of diseases in fruit crops are critical for promoting the sustainable development of a healthy fruit industry. This study presents a deep learning-based methodology for automatically identifying diseases in peach crops. The proposed system has the potential to significantly reduce the time and resources required by farmers while providing a precise classification of the most prevalent peach diseases. In this investigation, we developed a proprietary dataset with complex backgrounds and varying illumination, angles, and distances to simulate real-world conditions. Initially, we converted images to jpeg format to accelerate the convergence, and also data augmentation techniques such as resizing, rotating, flipping, and scaling were employed to reduce the chances of overfitting. The model trained on a dataset with VGG-16 architecture was used to perform transfer learning. The system was fine-tuned for the architecture to have greater processing time and low memory consumption. The architecture was evaluated using different network parameters. Furthermore, we used training loss function, accuracy, sensitivity, and specificity to assess the system performance. The proposed model applies to classify major diseases of peach crops such as leaf curl, shot hole, and rust. As per our insight, this is the first time to use a VGG-16-based model to recognize peach crop diseases The complexity of the collected images was designed by the taxonomic characteristics of peach diseases. Subsequently, the network's parameters were refined using techniques such as progressive

resizing, cyclical learning rates, and the application of a focal loss function to enhance performance. Our model achieved an overall accuracy of 92.04 per cent on a test set of images that were not included in the training process. We propose that such systems when deployed on aerial or ground-based platforms, could facilitate automated high-throughput plant phenotyping, precision breeding for disease resistance, and reduced pesticide use through targeted application, applicable across a diverse range of plant species and disease categories.

Keywords— *Convolution neural networks; Deep Learning; Image recognition; Leaf diseases; Visual Geometry Group (VGG).*

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Early Detection and Diagnosis of Peach Diseases Using Deep Learning Architect VGG-16 Convolutional Neural Network

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Early detection and accurate diagnosis of diseases in fruit crops are critical for promoting the sustainable development of a healthy fruit industry. This study presents a deep learning-based methodology for automatically identifying diseases in peach crops. The proposed system has the potential to significantly reduce the time and resources required by farmers while providing a precise classification of the most prevalent peach diseases. In this investigation, we developed a proprietary dataset with complex backgrounds and varying illumination, angles, and distances to simulate real-world conditions. Initially, we converted images to jpeg format to accelerate the convergence, and also data augmentation techniques such as resizing, rotating, flipping, and scaling were employed to reduce the chances of overfitting. The model trained on a dataset with VGG-16 architecture was used to perform transfer learning. The system was fine-tuned for the architecture to have greater processing time and low memory consumption. The architecture was evaluated using different network parameters. Furthermore, we used training loss function, accuracy, sensitivity, and specificity to assess the system performance. The proposed model applies to classify major diseases of peach crops such as leaf curl, shot hole, and rust. As per our insight, this is the first time to use a VGG-16-based model to recognize peach crop diseases The complexity of the collected images was designed by the taxonomic characteristics of peach diseases. Subsequently, the network's parameters were refined using techniques such as progressive

resizing, cyclical learning rates, and the application of a focal loss function to enhance performance. Our model achieved an overall accuracy of 92.04 per cent on a test set of images that were not included in the training process. We propose that such systems when deployed on aerial or ground-based platforms, could facilitate automated high-throughput plant phenotyping, precision breeding for disease resistance, and reduced pesticide use through targeted application, applicable across a diverse range of plant species and disease categories.

Keywords— *Convolution neural networks; Deep Learning; Image recognition; Leaf diseases; Visual Geometry Group (VGG).*

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Response Surface Methodology for optimization of process parameters for Chironji nut

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Buchanania lanzan (Chironji) a member of family *Anacardiaceae* consist of a hard nut that on decortication yields kernel containing 52% of oil and this oil is used as a substitute for olive and almond oil. Also, kernel is used for sweet meals, medicinal purpose, cosmatics etc. Optimization of process parameters using response surface methodology (RSM) greatly overcomes the numbers of experimental trials generally undertaken for decorticating study of chironji nuts apart from maximizing the output of the system. The independent parameters for chironji nut decortication viz., drying temperature, drying time and clearance between discs were optimized using RSM. The drying temperature of 69.610 °C, drying time 163.87 min and clearance between disc 12 mm were found optimal. The whole kernel recovery, decorticating efficiency, unshelled nut, broken kernel and capacity of machine at optimized independent parameters were 27.72% (fraction of chironji kernel to shell 30.01% to 69.99%), 85.299 %, 11.50 %, 3.687 % and 6.232 kg/h respectively.The investigation is most useful to the small farmers, small entrepreneurs, Self-help group, Organic farming groups, Tribal group, A rural youth, Ladies bachat group who are involved in decortication of chironji nut.

Keywords: *Chironji nut, optimization, Response Surface Methodology process*

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AFTEFS/SKUAST-K/AG/2024/55

Nutraceuticals and Functional Foods

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Basically, health and nutrition promoting foods are described by two terms as nutraceuticals and functional foods. Nutraceuticals are the isolated, purified and formulated healthful products which are taken in capsules, tinctures, or pills/tablets forms and available in market as medicinal forms and usually not integrated with foods. Whereas as, functional foods are taken as regular foods as a part of uncommon diet and not in the form of dose which provides physiological benefits beyond basic nutrition function. Nutraceuticals are related to medical claims which prevent as well as cure the disease which involves dietary supplements and other kinds of foods, however, functional foods are involved ordinary foods which only decline the disease not prevent and cure the disease. Essential nutrient (vitamins, proteins, fats, carbohydrates, etc.) Required by body for its healthy survival is called as functional foods.

Emerging area of research namely 'nutrigenomics' has attracted the food nutritionists worldwide. Nutrigenomics establish a relationship between specific nutrients and specific nutrient diets based on an individual's genotype which have greater impact on future research and development in functional foods. It modifies the diet plant according to genetic profile of individual. Food biotechnology is another emerging field that will have a great impact on the future of nutraceutical and functional foods.

Keywords:- *Nutraceuticals, Functional foods, Essential nutrient, Nutrogenomics, Food biotechnology.*

AFTEFS/SKUAST-K/AG/2024/56

Photosynthetically active radiation absorption of wheat cultivars in different growing environments

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The Photosynthetically active radiation (PAR) absorption measured by Line Quantum sensor (Model L1-1500) was used to measure PAR (400 nm-700 nm) diurnally during above said important phenophases at top, middle and bottom of canopy. To measure reflected the radiation sensor kept inverted above 1m of the crop canopy. The absorbed Photosynthetically active radiation (PAR) was higher at heading phase, on crop sown under 1st week of November (D1) *i.e.* 95.80 % and 92.15 % during 2018-19 and 2019-20, respectively. Among, cultivars V1 (WH-1105) absorbed maximum PAR *i.e.* 94.50 % and 90.99 % during 2018-19 and 2019-20, respectively. Highest reflected radiation was observed at physiological maturity under all treatments due to decrease in chlorophyll content and senescence of leaves. Transmitted radiation was higher at heading in both the crop season under all treatments due to less LAI during the phase.

Key words: *PAR, Phenophases, Chlorophyll, Absorption*

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Dissecting genetic variability and interrelationships among growth, yield and quality traits in tomato (*Lycopersicon esculentum* L.) genotypes

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Tomato (*Solanum lycopersicon* L.) productivity is currently encountering challenges due to declining genetic traits and imbalanced agronomic practices. Addressing these issues involves exploring the qualitative characteristics of specific crops to enhance their yield and quality. Despite the long history of tomato cultivation, Indian tomatoes have consistently demonstrated stable productivity. The present study was carried out at the Regional Research and Technology Transfer Station, Bhawanipatna, Kalahandi, Odisha during the *Rabi*, 2022-23, to explore the genetic variability and relationships among the growth, yield and quality traits in different tomato genotypes. The field experiment included six tomato genotypes: BT-116-3-2, BT-10, BT-02, BT-20-2-1, BT-422-2 and BT-19-1-1-1 planted in a Randomized Block Design and replicated four times. The experiment results indicate that all the studied traits exhibit significantly higher phenotypic coefficient variation (PCV) than genotypic coefficient variation (GCV), suggesting a strong environmental influence on their expression. Furthermore, the cluster analysis of the six tomato genotypes displays a high degree of diversity among themselves, while genotypes BT-02 and BT-422-2 show a certain degree of similarity forming a different cluster. Moreover, the rotated components matrix demonstrates that PC_1 explains the highest variability (41.50%). This component is significantly correlated with factors *viz.* days to initial fruiting (0.928), fruits bunch^{-1} (0.911), fruit bunches plant^{-1} (0.909) and average fruit weight (0.900), days to initial flowering (0.749), flower cluster^{-1} (0.680), flower cluster plant^{-1} (0.619) all of which contribute positively to yield. Conversely, fruit diameter (-0.440) and locules

per fruit (-0.510) show a negative correlation with yield. Based on the individual principal component analysis of six tomato genotypes, genotypes BT-02, BT-10, BT-19-1-1, and BT-202-1 are found to be promising for the fifteen morphological traits studied. In conclusion, it is important to consider the involvement of BT-02 and BT-20-2-1 as parents from different clusters in hierarchical cluster analysis, with more diversity as indicated in individual principal component analysis.

Keywords: *Genetic Variability, Genotypic Coefficient Variation, Genotypic Correlations PCA, Phenotypic Coefficient Variation, Phenotypic Correlations*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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Comparative Analysis of Yield and Fruit Quality Parameters among Different Mandarin and Sweet Orange Cultivars under Sub tropical conditions of Haryana

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The assessment of yield and quality in mandarin and sweet orange cultivars is crucial for optimizing production and meeting market demands. Thus, keeping in view the importance of this crop, the present investigation was conducted in Department of Horticulture of CCS Haryana Agricultural University, Hisar, by using seven years old plants of mandarin and sweet orange on Rough Lemon rootstock. This study evaluates various cultivars of mandarin (*Citrus reticulata*) and sweet orange (*Citrus sinensis*) to determine their yield performance and fruit quality attributes. Key parameters assessed include average fruit weight, Peel content, Juice content, TSS, Acidity, Fruits per plant and yield. The results revealed considerable variation among cultivars in terms of both yield and quality parameters. Specifically, the Olinda cultivar of sweet orange demonstrated the highest yield, achieving 21.8 kg per plant, outperforming other cultivars in this regard. Conversely, among mandarin cultivars, the Daisy cultivar exhibited superior performance, yielding 59 kg per plant and achieving the highest Total Soluble Solids (TSS) to acidity ratio of 13.59, compared to the other mandarin cultivars evaluated. The findings provide valuable insights for growers and stakeholders in selecting the most suitable cultivars for their agricultural practices and market preferences.

Keywords: *Mandarin, Sweet Orange, Total Soluble Solids, Yield*

AFTEFS/SKUAST-K/AG/2024/59

Osmotic Dehydration a technology for adding value to Radish

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The study was proposed for preparing value added product from radish so as to increase its overall consumer acceptability and storability. Minimal processing technique i.e., osmotic dehydration of radish was carried out for preparing radish cubes. Response surface methodology (RSM) and Box-Behnken design was used for optimizing input parameters. The fresh white radish was used for this investigation.The Box- Behnken design of three variables and three levels including 17 experiments formed by 5 central points was used for optimizing input parameters. The effect of sugar concentration (40, 50 and 60°B), osmotic temperature (40, 50 and 60 °C), fruit to syrup ratio (1:5) and duration of osmosis (120, 180 and 240 min) were studied during osmotic dehydration. With respect to water loss, solid gain, mass reduction and colour (L) the linear, quadratic and interaction effects of three variables were analysed. For each response, second order polynomial models were developed using multiple regression analysis. Analysis of variance (ANOVA) was performed to check the adequacy and accuracy of the fitted models.The superimposed graph recorded the optimum process parameters i.e., syrup temperature 52.47°C, sugar concentration 40°B and duration or time 238.57 min for determined the various responses i.e., 53.34% water loss, 8.45% sugar gain and 80.66 colour (L). Results of validation tests were highly acceptable since the coefficient of Regression Coefficient (R greater than 0.98) and coefficient of variation (CV<5%) of the responses.

KEYWORDS: *Osmotic dehydration, Radish cubes, Water loss and sugar gain, Optimization, Response surface methodology.*

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Carbon dynamics and pools of tropical forest of Chhattisgarh

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Global climate change due to emission of greenhouse gases in addition of increase in the forest fire incidence, deforestation and non-judicious utilization of natural resources has puts the pressure on the scientific community towards natural resource conservation and their management. Forest fire is a common phenomenon and more severe in the tropics of the world. The present work explores the vegetation ecology, carbon (C) stock, carbon sequestration (C_{seq}), CO_2 mitigation potential, C pools and flux of dry tropical forest of Chhattisgarh under different fire regimes (*viz.*, high fire zone (HFZ), medium fire zone (MFZ), low fire zone (LFZ), and non-fire zone (NFZ). The stratified sampling technique was used within a permanent plot of 1 hectare. The forest stands on each site were analyzed using random sampling techniques. The higher tree density was recorded at NFZ and the lowest in HFZ among different sites. Total number of species, family, density, biomass and NPP values varied between 11-28, 8-20, 380-880 individuals ha^{-1}, 116.03-358.36 t ha^{-1}, and 9.06-24.08 t $ha^{-1}yr^{-1}$, respectively. The C mitigation and C_{seq} potential ranged from 186.2-575.3 t ha^{-1} and 7.1-15.9 t ha^{-1}, respectively being highest in NFZ and lowest in HFZ. Species such as *Shorea robusta*, *Terminalia tomentosa*, *Ougeinia oojeinensis*, *Madhuca latifolia*, *Lannea coromandelica*, *Anogeissus latifolia* reflected significant adaptation or performance under the forest fire and hence can be effectively utilized for afforestation purpose in fire affected areas.

Keywords: *Biomass, CO_2 mitigation, Carbon sequestration Forest fire; Productivity; Tropical Forest*

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Innovative idea for utilization of Dal mill by-product

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Animal Feed Mill (AFM) was developed to process 100 kg of byproduct per day. The commercialized technology, PKV mini dal mill gives the recovery of nearly 72 to 75% and 25 to 28 % byproduct (brokens+husk+powder). Amongs the byproduct, the brokens are used for human consumption where as remaining 15-16 % is husk and powder. This remaining 15-16 % byproduct (husk + powder) contains nearly 18 to 20 % of proteins and hence can be used for preparing Animal feed pellets.The developed Animal feed mill consist of hopper, mixing chamber, compaction chamber, outlet /die, motor and frame. The developed AFM is having capacity nearly 100 kg per day and is operating on 3 HP single phase motor. By pelleting the byproduct the volume is reduced and it becomes easier to handle and store the original material. Optimum proportion of ingredients for making animal feed pellet were by-product (husk + powder) 1kg, 1/2 lit of water, 50 g (5% of byproduct) of jaggery (binder) and 20g (2%) salt. At optimum condition of 50% water content (% byproduct) , 5% binder (% byproduct) and 30 rpm of Animal feed mill, the capacity of AFM is 15.6 kg/hr , the efficiency of AFM is 95.9 % and firmness/ hardness of pellets is 7.69 kg.

Keywords: *Pulse dal, dal mill, by-product, feed, pellets*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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Unmanned Aerial Vehicle (UAV) as a tool for Smart Livestock farming

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Unmanned Aerial Vehicle (UAV) as a tool of farming has attracted the interests of an increasing number of researchers. The incredible technology of drone has played a significant role in agriculture sector, Livestock management is an essential part of agriculture, which deals with the issue of managing livestock, both inside the farmhouse, or outside while grazing in high land dense alpine pastures. Although the livestock industry has been slow in adopting new technologies, they have come along and used machinery for better management with time. Drones for livestock management are going to be on the rise. Here are some outdoor aspect of livestock farming can be eased and modernized mainly with drones, livestock management has become easier and more cost-efficient than ever before. It has enhanced quality production and precision livestock farm management. It has made livestock monitoring, diagnosis, and security less demanding. With time, more efficient, affordable, and automatic drones which require no human controller and just a set of instructions will come into play and make livestock management much more scalable. In this research article, an effort was made to synthesize available information on uses of drones and to understand new technologies that will impact the future of smart livestock farming, where drone technology to ensure animal health, safety, counting tracking animals and welfare monitor farm animals via detection.

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"Genetic Foundations of *Moringa oleifera:* Hereditary Patterns and Variability"

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Moringa oleifera Lam. (Moringaceae) commonly known as the 'Drumstick', is an agroforestry species native of the Himalayan tract in north-western part of India. Understanding its genetic makeup is crucial for effective breeding and conservation strategies. This study investigates the hereditary patterns and genetic variability within 14 genotypes of drumstick populations by using 34 characters. The estimates of genetic variability in the population were estimated using the coefficient of variation.

Every characteristic included in the study had a higher phenotypic coefficient of variation (PCV) than genotypic coefficient of variation (GCV), suggesting that the environment continues to be in the process of determining the traits. Highest degree of GCV and PCV were recorded for character crown spread (38.74 % and 39.10 % respectively).

In the present study, a high degree of heritability was recorded for most of the characters. The highest heritability was recorded for number of leaves (89.60 % and 98.59 % at 45 days and 90 DAS), total flavniods (98.55 %), crude fibre content (98.54 %), crown spread (98.17 %), SVI (89.65 % and 97.79% at 45 days and 90 DAS), shoot length at 90 DAS (97.71%), length of pod (97.05 %), plant height (96.95 %), 100 seed weight (95.48 %), diameter at breast height (DBH) (93.63 %). Genetic advance is another important factor in finding out improvement in the current population by selection method after continuous breeding, the character i.e. diameter at breast height (DBH) shows a maximum advance of 77.85% followed by crown spread (56.65 %). Thus, successful characteristic selection is aided by both genetic advance and heritability. This research provides foundational insights into the genetic architecture of *Moringa oleifera*, offering valuable information for future breeding efforts and conservation strategies.

Keywords: *Moringa oleifera, GCV, PCV, Genetic advance and heritability*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/64

Disease management in horticultural crops

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Disease management in horticultural crops is crucial for sustaining crop health, productivity, and quality. Effective management strategies integrate multiple approaches to mitigate the impact of pathogens and minimize losses. Key strategies include genetic resistance, cultural practices, and chemical control.Genetic resistance involves breeding or selecting cultivars that possess inherent resistance to specific diseases. This method reduces the need for chemical interventions and can offer long-term solutions to disease problems. Cultural practices, such as crop rotation, proper spacing, and sanitation, play a significant role in preventing disease outbreaks by disrupting pathogen life cycles and reducing pathogen loads in the environment. For example, rotating crops can break the cycle of soil-borne diseases, while removing infected plant debris can minimize sources of infection.Chemical control remains a crucial component of disease management but should be used judiciously to prevent resistance development and minimize environmental impact. Integrated Pest Management (IPM) practices advocate for the strategic use of fungicides and bactericides based on monitoring and forecasting systems that predict disease outbreaks.Recent advancements include the use of biological controls, such as beneficial microbes that outcompete or inhibit pathogens, and precision agriculture technologies that allow for targeted application of treatments. Emerging research into disease-resistant gene-editing techniques and climate adaptation strategies also holds promise for future management practices.Overall, an integrated approach combining genetic, cultural, chemical, and biological methods tailored to specific crops and pathogens offers the most effective strategy for managing diseases in horticultural crops, ensuring sustainable production and high-quality yields.

***Keywords**: Genetic Resistance, Cultural Practices, Chemical Control, Integrated Pest Management (IPM)*

AFTEFS/SKUAST-K/AG/2024/65

Effect of hydrogel on soil moisture under *Kinnow* plantation at the arid region of Haryana

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The increasing need for sustainable and efficient agricultural practices has spurred interest in developing novel soil conditioning materials. Hydrogels, water-absorbing polymers, have emerged as promising tools for improving soil properties and water use efficiency. The present study was formulated to evaluate the effect of hydrogel on soil moisture under *Kinnow* plantation. To carried out this experiment, 30 gram of hydrogel per *Kinnow* plant at different soil depth *i. e.* 0-5 cm, 5-10 cm, 10-15 cm were applied and control (without hydrogel) were maintained simultaneously. The observations were recorded at different soil depth *i. e.* 0-15 cm, 15-30 cm, 30-45 cm in different months. The result revealed that among all the treatments, higher moisture content (9.12%) was observed in hydrogel applied at 10-15 cm soil depth during the month of January, 2024 followed by treatment applied at 5-10 cm soil depth and lowest were observed in control treatment. Hence, the study suggested that treatment hydrogel applied at 10-15 cm soil depth is the best option to get the high moisture content under *Kinnow* plantation.

Key words: *Hydrogel, Moisture, Soil, Kinnow*

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Hydroponics: A pathway for sustainable smart Urban Horticulture Farming

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With the rapid urbanization and shrinking agricultural land, smart urban farming is key strategy for nutritional security and combating climate change and water scarcity . According to FAO reports, projections indicate that by 2050, the global urban population will exceed 9.7 billion, nearly doubling the current 3.5 billion. In the case of India, UN World Population Prospects foresee that by 2050, 40.76% of the country' population will inhabit urban areas. Besides smart Urban horticulture, also empowers people who are unemployed, underemployed ultimately helps in generation of agri entrepreneurship. Smart urban horticulture farming deals with growing high value horticultural crops in peri -urban and urban areas with the help of modern technologies such as hydroponics. Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite. A number of horticulture crops such tomato, cucumber, leafy vegetables, fruits such as strawberries and blue berries, aromatic and medicinal plants and few flower crops. Hydroponics can contribute to enhance farming activities in limited space and scare water availability. Hydroponics has immense potential of transforming urban farming into sustainable horticulture crop production model. Hydroponics can be used in Vertical farms, indoor farms, roof top gardening. Hydroponic farms offer a pathway towards a more sustainable food ethic that prioritizes the health of our food, bodies and environment without the heavy use of chemicals. Hydroponics is becoming the game changer for the future of urban farming.

Key words: *Hydroponics, smart Urban farming, Climate change, food ethics, indoor farms*

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Impact of climate change on fruit crops in Himachal Pradesh

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Climate change refers to the variation in the Earth's global climate or in regional climates over time. During the last three decade, the Himalayan region has warmed faster than most places in the world. The climatic variable includes temperature, relative humidity, rainfall, snowfall, wind and hail. An analysis of data of last two decades of major apple growing areas indicates that minimum temperature is decreasing per year from November to April, rainfall has dropped by about 7 cm, snowfall has increased by about 12 cm, and the mean minimum and maximum temperatures have increased by 0.25°C and 1°C, respectively. In dry temperate regions of the state, increased temperature and early melting of snow since 1995 has shifted apple cultivation to higher reaches. Climate change has a serious impact on crops and influences its phenology and also lead to increase in occurrence of pests and diseases and decrease in abundance of plants and pollinators. It also decreases the fruit quality and fluctuate the timing of fruit ripening. Increasing temperatures, in particular, heavily affect the flower production, flower size, timing of anthesis, floral scent, nector and pollen production of different crops. Due to heavy industrialization, rapid fossil fuel utilisation, and deforestation, climate systems may change more quickly than in the past. Thus, we have to learn how to adapt or tackle the rapid increasing rate of climate change in Himachal Pradesh through various adaptation strategies.

Key words: *Climate change, Apple cultivation, Phenology, Industrialization, Deforestation, Adaptation strategies.*

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Impact of Triphala Extract on Growth and Hematological Health of *Catla catla* (Hamilton, 1822)

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This study investigates the impact of Triphala extract, a traditional Ayurvedic herbal formulation on the growth performance and hematological health of *Catla catla* (Hamilton, 1822), a widely farmed freshwater fish species in South Asia. Triphala, composed of three medicinal plants: *Phyllanthus emblica* (amla), *Terminalia chebula* (haritaki), and *Terminalia bellirica* (bibhitaki), has been recognized for its potent antioxidant, antimicrobial and immunomodulatory properties. These attributes make it a potential natural growth promoter and health enhancer in aquaculture. In this experiment, *Catla catla* fingerlings were fed diets supplemented with varying concentrations of Triphala extract over a specified period of 150 days. The fish were divided into five groups: a control group without supplementation and four experimental groups receiving 0.125%, 0.25%, 0.5% and 1% Triphala extract supplemented feed, respectively. The fish were regularly monitored for growth performance, including weight gain, feed conversion ratio (FCR) and specific growth rate (SGR). Hematological parameters, such as hemoglobin content, red blood cell count, and total leukocyte count, were also assessed to evaluate the health status of the fish. The results revealed significant ($P < 0.05$) improvements in growth performance in fish fed with Triphala-supplemented diets, particularly in the groups receiving 1% extract, with lower FCR and higher SGR compared to the control group. Hematological analysis showed enhanced immune responses ($P < 0.05$), with increased red and white blood cell counts, suggesting improved health and disease resistance in Triphala-treated fish. These findings suggest that Triphala extract can be a promising natural supplement in aquaculture, promoting both growth and health in *Catla catla*. Its application could potentially reduce the reliance on synthetic growth enhancers and antibiotics, contributing to more sustainable and eco-friendly aquaculture practices.

Keywords: *Triphala extract, growth, Catla, weight gain, immune response, health*

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"Influence of Medicinal Plant Extract Fortified Mulberry Leaves on the Cocoon Traits of Silkworm *Bombyx mori* L."

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Nutrition plays a crucial role in the sericulture industry, significantly affecting the growth, development, and silk production of silkworms. This study examines the influence of fortifying mulberry leaves with medicinal plant extracts *Aloe vera*, *Ocimum sanctum*, and *Withania somnifera* on the cocoon parameters of silkworm *Bombyx mori* L. The experiment, conducted over two seasons, utilized various concentrations (1%, 2%, and 3%) of these extracts to enhance mulberry leaves. A Completely Randomized Design (CRD) was employed, involving 200 silkworm larvae per treatment to evaluate cocoon weight, shell weight and shell percentage. Results demonstrated significant improvements in these parameters, particularly with 3% Ocimum sanctum, which achieved the highest cocoon and shell weights during both the seasons. The findings suggest that plant extract fortified mulberry leaves offer a promising approach to optimizing silkworm diets and enhancing silk production, potentially transforming sericulture practices by addressing nutritional deficiencies. Further research is recommended to refine and standardize these fortification methods for broader applications in sericulture.

Keywords: *Silkworm Nutrition, Cocoon Traits, Mulberry Fortification, Aloe vera, Ocimum sanctum, Withania somnifera, Silk Productivity*

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APPLICATION OF INFORMATICS IN AGRICULTURAL RESEARCH AND EXTENSION MANAGEMENT

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The application of informatics in agricultural research is applied for the development of information systems, data mining, bioinformatics, remote sensing, geographical information system, precision agriculture, decision support system and expert system. The application of informatics in agriculture is also known as agri-informatics. The agri-informatics has been enhancing the ability to identify solving problem concern to present and future agricultural research and extension possibilities. The agri-informatics is basically the branch of bioinformatics. Bioinformatics is one of the most tool arisen in agricultural research for the advancement of genetic pool of crops and livestock germplasm advancement. The application of computer in agriculture is basically applied for advancement of agricultural research and their standardization. The field research generalization and trend analysis are the key component of agricultural research need smart representation in the form of agri-informatics. The collective approach of agri-informatics for agricultural research and extension management is also known as e- agriculture. The present study was conducted on the reported literature to review the recent advances of computer applications in agricultural research and extension management. The e-agriculture, geographic information system, and software packages for statistical analysis have been playing frontier role in agricultural research and extension management.

Keywords: *Informatics, Agriculture, Research, Extension, Management.*

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Evaluation of forage sorghum varieties under different fertility levels during summer season

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Sorghum [*Sorghum bicolor* (L.) Moench] is a versatile crop that can thrive in different conditions and provide green fodder from May to November in Indian conditions. To improve the fodder in terms of quantity and quality, it is important to choose a good variety and using balanced nutrient doses. A field experiment was conducted at Hisar (Haryana), India during summer season of 2023 to evaluate the performance of different sorghum varieties *viz.,* CSV 53F, HJ 541, HJ 513 and HC 308 with four fertility levels (control, 75, 100 and 125% of recommended dose of fertiliser) in factorial RBD with three replications. Variety CSV 53F performed best in terms of growth parameters: plant height (261.3 cm), LAI (6.34), L:S (0.36) and resulted in highest green and dry fodder yield (52.44 and 13.46 t/ha) as well as crude protein yield (11.24 q/ha) and was statistically at par with HJ 541. Also, CSV 53F recorded the maximum B:C of 2.05, being at par with HJ 541. Application of 125% RDF was at par with 100% RDF (75:30:30 N:P:K kg/ha) gave significantly higher yields among other fertiliser levels. In conclusion, use of CSV 53F or HJ 541 along with 100% RDF was promising as it performed better in terms of growth, yield and productivity.

Keywords: *Fertility levels, fodder yield, leaf area index, leaf stem ratio, benefit cost ratio*

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Evaluation of antibacterial effects of Indian herbs against white faeces causing agents in *Litopenaeus vannamei*

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The global economic and political stability strongly depends on access to nutritious, affordable and safe food for the rapidly growing populations. India is cashing on demand by increasing the area under shrimp aquaculture. The total shrimp production in India was 6,39,896 tons. Due to lacking an adaptive immune system, shrimp are prone various diseases. White faeces syndrome (WFS) is reported to be a severe problem in *Litopenaeus vannamei* culture ponds. The study aimed to evaluate the antibacterial effects of Indian herbs against white faeces disease-causing agents. This study surveyed shrimp ponds to isolate, identify, and characterize bacterial pathogens in shrimps and evaluate herbal extracts' effects on potential probiotics. The study recorded the effectiveness of herbal extracts (*Curcuma longa*, *Phyllanthus amarus*, and *Tinospora cordifolia*) against different strains of *Shewanella algae* and *Vibrio panuliri*. Water quality in Hisar shrimp farms was crucial, with parameters within permissible limits. Bacterial isolates were identified through by 16S rRNA sequencing, revealing five strains of *S. algae* and *V. panuliri*. The antimicrobial susceptibility of these isolates was tested against 20 antibiotics, and revealing significant antibiotic resistance. Herbal extracts showed promising antibacterial activity, with minimum inhibitory and bactericidal concentrations ranging from 0.39 to 7.19 mg/100µl and 0.80 to 12.88 mg/100µl, respectively. *P. amarus* extract, *T. cordifolia* and *C. longa* extract proved effective. The rise of MDR strains highlights the need for improved biosecurity measures, regular bacterial monitoring, and the development of novel treatments such as bacteriophages, probiotics, and vaccines.

Keywords- *Bacterial isolates, White Faeces, Litopenaeus vannamei, MDR, Herbs*

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Robotics and automation in agriculture

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The agricultural industry is experiencing a paradigm shift, marked by the integration of advanced technologies. Robotics and automation have emerged as pivotal drivers of this transformation, offering innovative solutions to enhance efficiency, sustainability, and productivity. Autonomous ground vehicles, such as robotic tractors and harvesters, are equipped with sophisticated sensors, GPS systems, and artificial intelligence algorithms to navigate fields autonomously and perform tasks with precision. Robotic harvesters can be equipped with sensitive grippers and advanced computer vision systems to identify ripe produce and harvest it efficiently. These machines can work alongside human workers, complementing their skills and reducing the physical strain associated with manual harvesting. Aerial robotics, including drones and unmanned aerial vehicles (UAVs), are employed for tasks such as crop monitoring, pest detection, and spraying, leveraging advanced imaging and data analysis techniques. The integration of Internet of Things (IoT) devices and sensors enables real-time data collection and analysis, providing valuable insights into crop health, soil conditions, and environmental factors. This data-driven approach facilitates precision agriculture practices, optimizing resource allocation and reducing waste. Advancements in machine learning algorithms are enabling the development of intelligent systems capable of adapting to varying field conditions and improving task performance over time. Challenges such as high initial costs, technical complexities, and regulatory hurdles must be addressed to ensure their widespread adoption. Future research and development efforts should focus on improving the reliability, affordability, and adaptability of these technologies to meet the evolving needs of the agricultural sector.

Keywords: *Artificial Intelligence; GPS Detection; Internet of Things; Machine Learning;*

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In order to assess the farmers' income through quality seed production of onion and beet leaf crops, an experiment was conducted during 2018-19 and 2019-20 at the vegetable research farm CCS HAU, Hisar. Onion was grown as the main seed crop with spacing 60×30 cm. Beet leaf was introduced as an intercrop with various arrangements (T1-T9) having two row numbers (1row & 2 rows) and three cutting treatments (3,4,5 cuttings), planted between onion crop spacing. The data revealed that the number of rows and cutting frequency influenced both crop's parameters significantly. The onion seed crop, grown as a sole crop, generated the maximum net returns (Rs. 403,922 and Rs. 412,945/ha) as well as gross returns (Rs. 573,000 and Rs. 589,000/ha) and benefit-cost ratio (3.39 and 3.35). Among the intercropping treatments, the highest net returns (Rs. 252,806 and Rs. 262,109/ha) as well as gross returns (Rs. 552,800 and Rs. 569,080/ha), onion equivalent yield (631.8 and 648.5 kg/ha) and area-time equivalent ratio (1.65 and 1.65) were achieved in T9: onion + beet leaf (2 rows) with 5 cuttings and left for seed crop. However, T6: onion + beet leaf (1 row) with 5 cuttings and left for seed crop showed the highest benefit-cost ratio (2.05 and 2.05), and T8: onion + beet leaf (2 rows) with 4 cuttings and left for seed crop showed the highest land equivalent ratio (1.76 and 1.76) and income equivalent ratio (1.76 and 1.76) among the intercropping treatments during both seasons, respectively. On the other hand, the lowest net returns (Rs. 181,919 and Rs. 196,062/ha) as well as gross returns (Rs. 403,280 and Rs. 424,400/ha), onion equivalent yield (493.9 and 521.2 kg/ha), land equivalent ratio (1.30 and 1.36) and area-time equivalent ratio (1.12 and 1.14) were observed in T4: onion + beet leaf (1 row) 3 cuttings and left for seed crop, among intercropping treatments. Hence, it could be concluded that growing onion as a sole crop for seed production was more profitable than intercropping with beet leaf. However, intercropping with beet leaf provided intermittent income.

Keywords: *Economical Assessment, Beet Leaf Seed, Leaf Cuttings, Intercropping, Number of Row, Onion Seed Crop*

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Benefits and Challenges of Hydroponics in Horticulture
Or
The Advantages and Difficulties of Hydroponics in the Field of Horticulture

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Hydroponics is a method of plants cultivating that eliminates the need for soil and replaces it with a specialized water solution. This approach is gaining popularity since it offers several advantages, including the fact that plants grow more quickly, produce more, and make more effective use of water and nutrients in comparison to conventional farming practices. Hydroponics gives us the ability to manage the growth conditions with a high degree of precision, which enables us to cultivate crops throughout the whole year while maintaining a consistent level of quality. In urban locations, where space is restricted, it is especially excellent for producing a variety of crops, including leafy greens, herbs, and some fruits. It is also effective for growing some fruits. Because there is no soil, there are less issues with illnesses and pests that are transmitted through the soil, which results in plants that are healthier on the other hand, there are a few obstacles to overcome, such as the high cost of establishing hydroponic systems and the requirement of specialized knowledge in order to monitor and manage them. These systems are becoming more user-friendly and efficient as a result of the introduction of new technologies such as industrial automation and sensors. The purpose of this abstract is to examine the present application of hydroponics in the cultivation of horticultural crops, focusing on its advantages, diverse applications, and recent advancements. The article demonstrates how hydroponics may enhance agriculture by making crop production more environmentally friendly and adaptive to the requirements of modern society.

Keywords: *Hydroponics, cultivation, horticultural crops, environmentally friendly and automation*

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Role of Medical 4.0 in Agriculture: A Response to AI-Based Treatment

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The use of Industry 4.0 ideas in farming, which is sometimes called "Agriculture 4.0," is similar to the progress made in healthcare under "Medical 4.0." This study examines the implementation of Medical 4.0 norms, including artificial intelligence (AI), Internet of Things (IoT), big data analytics, and precision technologies, in the field of agriculture. The goal is to improve production, sustainability, and food safety, while also reducing the environmental effect and decreasing the need for medicinal interventions. The study explores the similarities between personalized medicine and precision agriculture, focusing on how the use of AI and IoT might enhance farming techniques. This includes the accurate application of inputs using real-time data and the use of predictive analytics for disease and insect control. The role of genomic tools in the development of resilient crops and the reduction of chemical utilization is emphasized, similar to the role of personalized treatments in medicine. Additionally, the paper investigates the advantages of remote monitoring and automation in agriculture, which enable the early detection and targeted response to crop health issues without the need for broad-spectrum chemical remedies in agriculture. Incorporating Medical 4.0 ideas into agriculture offers a sustainable and efficient method for producing food, while also reducing the negative environmental and health impacts of conventional farming operations.

Keywords: *AI, medical, agriculture, genomic tools, IoT, automation*

AFTEFS/SKUAST-K/AG/2024/77

Nano-enabled functional chitosan bioconjugates on physico-chemical responses of bread wheat under the shadow of climate change

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In the realm of periodic climate swings, global agriculture is compelled to develop long-term solutions to the expanding challenges of rising food consumption. Furthermore, poor use of commercially available chemical fertilizers has produced significant obstacles to soil and ecosystem health, resulting in reduced agricultural productivity. In this context, nano-enabled slow-release fertilizers are thought to be the most effective solution for both nutritional security and environmental sustainability. Since a few years ago, the use of biogenic nanomaterials (NMs) such as chitosan in terms of next-generation fertilizers at optimal doses has been recognized as a way to improve nutrient utilization efficiency through a more controlled and slower nutrient release phenomenon that can better match the sustained nutrient needs of crops across the time. Chitosan is a linear biopolymer composed of randomly dispersed β-(1→4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit) produced from sea-food industry waste. Aside from its biodegradability, biocompatibility, and non-toxicity, it is a rich source of C (54.4-47.9 wt%), O (42.3-30.19 wt%), N (7.6-5.8 wt%), and P (6.1-3.4 wt%) for plants. Presence of functional groups (-NH_2 at C2 and -OH at C3 and C6), surface modification capabilities, and focused delivery of nutrients to plant organelles have demonstrated chitosan to be an extraordinary biopolymer for increasing crop output. In the current investigation, chitosan was primarily processed with weak acids to achieve a super-charged cognizant nano-structure, which further underwent to the process of meticulous surface-functionalization with nitrogen sources (ammonium and nitrate). In-field evaluation of nitrogenated chitosan bioconjugates confirmed their bio-efficacy attributing elevated physico-chemical aspects of wheat as compared to the control set up and its counterparts (bulk chitosan and conventional nitrogen sources). Nano-toxicological study is in progress which may divulge many

more insights regarding the relevance and acceptability of the crafted bioconjugates in a bigger platform of climate-resilient agriculture throughout the world.

Keywords: *Nanomaterials, next-generation fertilizers, chitosan, nutrient utilization efficiency*

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Recent Advances in improvement of self-pollinated vegetable crops

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Self-pollinated vegetable crops, including tomatoes, beans, peas, and peppers, possess unique breeding challenges and opportunities due to their inherent reproductive mechanisms. Historically, breeding efforts in these crops have focused on improving yield, disease resistance, and quality traits. However, recent advances in biotechnology, genomics, and marker-assisted selection (MAS) have accelerated progress, enabling more precise and efficient breeding approaches. Traditional breeding techniques such as mass selection, pure line selection, and pedigree breeding have been effective in improving desirable traits. However, these methods are often time-consuming and labor-intensive. The advent of modern molecular tools, including single nucleotide polymorphisms (SNPs) and quantitative trait loci (QTL) mapping, has revolutionized the breeding of self-pollinated vegetables. These tools allow breeders to identify genes controlling key traits such as yield, resistance to biotic and abiotic stresses, and quality, thus enabling faster development of improved cultivars. CRISPR/Cas9 gene editing and transgenic technologies have further expanded the possibilities for crop improvement by enabling precise modifications in plant genomes. These technologies offer the potential to enhance specific traits such as pest resistance, drought tolerance, and nutrient use efficiency without the need for traditional hybridization techniques. Additionally, advances in genomic selection (GS) and speed breeding are reducing breeding cycles and hastening the release of superior cultivars. The integration of traditional breeding methods with cutting-edge biotechnological tools is transforming the improvement of self-pollinated vegetable crops. These innovations are providing breeders with powerful tools to address global food security challenges by developing high-yielding, resilient, and quality-improved vegetable varieties. Continued research in this field is essential to fully exploit the potential of these crops and meet the growing demands of the agricultural sector.

Key words- *Vegetables, Geitonogamy, Self pollination, biotechnology, conventional and nonconventional breeding.*

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Enhancing the Value of Medicinal Crops in India

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Post-harvest technology and value addition are key to making the most of medicinal crops in India. After harvesting, it's important to process and handle these crops properly to maintain their quality and effectiveness. This abstract looks at how modern techniques can improve the value of medicinal plants by enhancing drying, extraction, and storage methods. Good processing helps keep the plants' useful compounds intact.Value addition means turning raw medicinal crops into more valuable products like essential oils, herbal extracts, and health supplements. These products can bring in more money and meet the growing demand for natural health remedies. Better packaging and quality control also help keep these products effective and appealing.In India, where medicinal crops are important in traditional medicine and farming, using up-to-date post-harvest technologies and value addition practices can increase the sector's economic value and competitiveness. This abstract shows how these practices are important for improving the quality and profitability of medicinal crops in India.

Keywords: *Post-Harvest Technology, Value Addition, Medicinal Crops*

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Effect of different types of mulching materials on growth development and grain yield of Maize under conservation agriculture system in Namsai district, Arunachal Pradesh Namsai district, Arunachal Pradesh

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The study on effect of different types of mulching materials on growth development and grain yield of Maize under conservation agriculture system in Namsai district was conducted in the instructional and research farm, Arunachal University of studies Namsai during the periods of kharif season 2023. The experiment was laid out in Randomized Block Design (RBD) with 7 (seven) treatment and 3 (Three) Replication. The growth parameter like germination %, Number of leaves per plant, plant height, Leaf area index, and yield are observed and evaluated in the experiments. On evaluation it was noted that Maize plant with the application of semi liquid grasses mulching gave the highest germination with 95.87%, it also observed that the highest plant height was observed in T_6 i.e., Water hyacinth mulching with 155.00 cm. The maximum yield was found in T_5 i.e., semi liquid grasses with 23.86 kg and lowest yield was found in T_0 i.e., control. Thus, application with the semi-liquid mulching materials has paramount effect on growth development and yield of Maize (Zea mays), in Namsai condition. The findings of this study can be useful for farmers and agricultural practitioners who are looking for sustainable ways to improve crop productivity.

Key words*: Maize (Zea mays), different types of mulching materials (paddy straw, rice husk, plastics & water hyacinth etc.) growth development and Yields.*

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Organic farming and its future prospects in India

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Organic farming is not a new concept in India and it is been practiced since ancient times. It entails farming or cultivation without the use of chemical fertilizers, pesticides, GMO, (genetically modified organisms), growth hormones etc. The developing countries' agricultural development policy ought to focus on enhancing land productivity while reducing costs and maximising efficiency, with the goal of minimising damages to both the health of human and the ecosystem. Organic farming plays an important role in fostering food security, especially among small farmers who use indigenous or low-input techniques. It accomplishes this by increasing yields and revenues, expanding food supply through diversification and mixed farming, and lowering the risk of crop loss during extreme weather events. Growing public awareness of environmental and health issues has led to a rise in the popularity of organic farming in recent years. In order to safeguard our ecosystem from hazardous pesticides and fertilizers, we ought to practice organic farming that uses natural cropping techniques. Furthermore, inorganic foods are significantly less beneficial for our bodies and have a very low energy level. Furthermore, organic farming promotes cultural diversity by reviving traditional crop varieties and reintroducing traditional foods into farming communities' diets. In addition to producing food that is healthier and higher in nutrients, organic farming supports a stable and sustainable ecosystem. The challenges involved in organic farming can be solved with the right information, instruction, and resources. We can improve agriculture, protect the environment, and improve our own well-being by supporting organic farming practices.

Keywords: *Health, Farming, Food, Organic*

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Role of Organic Farming in Climate Change Mitigation

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Organic farming is increasingly acknowledged for its role in climate change mitigation through its adherence to sustainable practices. By employing techniques such as crop rotation, composting, and reduced tillage, organic farming significantly enhances soil health and boosts soil carbon sequestration, thereby lowering atmospheric carbon dioxide levels. The exclusion of synthetic fertilizers and pesticides in organic systems also curtails the release of nitrous oxide and methane, two potent greenhouse gases. In addition, organic farming fosters biodiversity and strengthens ecosystem resilience, which improves the capacity of agricultural systems to adapt to climate variability. However, the widespread adoption of organic farming is challenged by lower yields and higher labor costs compared to conventional methods. Addressing these limitations requires ongoing research into improving organic farming techniques, advancements in technology, and supportive policy frameworks. By integrating organic farming practices into comprehensive climate strategies, it is possible to enhance their contribution to greenhouse gas reduction and environmental sustainability. This abstract provides an overview of the mechanisms through which organic farming mitigates climate change and highlights the need for continued innovation and policy support to scale its benefits effectively.

Keywords: *Organic Farming, Sustainable Practices, Soil Health, Carbon Sequestration*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/83

Effects of different substrates on growth and yield of hydroponically grown strawberry under vertical growing system

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The experiment on "Effects of different substrates on growth and yield of hydroponically grown strawberry under vertical growing system" was conducted during 2018-19 in PFDC, Department of Horticulture, CCS HAU, Hisar. In the present study, Six substrate combination S_1 (Cocopeat), S_2 (Cocopeat + Perlite + Vermiculite (2:1:1), S_3 (Cocopeat + Perlite (2:1), S_4 (Cocopeat + Perlite (3:1), S_5 (Cocopeat + Perlite + Vermiculite (3:1:1), S_6 (Cocopeat + Perlite + Vermicompost (3:1:1), were used with variety Winter dawn. The experiment comprised of eighteen treatments, each having three replications under greenhouse (with fan pad cooling/ ventilation) in complete randomized design. The study revealed that substrate combination S_5 (Cocopeat + Perlite + Vermiculite (3:1:1) resulted maximum number of leaves (18.7) and plant height (21.7 cm), which is statistically at par with S_6 (Cocopeat + perlite + vermiculite, 3:1:1). The highest plant spread (35.0 cm), crown diameter (21.3 mm), number of flower / plant (24.7) and yield/ plant (234.7 g) was observed from the plants grown in S_5 (Cocopeat + perlite + vermicompost, 2:1:1) followed by S_6. The earliest flowering (68 days) was recorded from S1 (cocopeat), which is statistically at par with S_5 and S_6.

Keywords*: substrate, greenhouse, yield, flowering, plant spread*

AFTEFS/SKUAST-K/AG/2024/84

Phytochemical Trait Diversity in Tomato (Solanum lycopersicum L.) Genotypes grown under Protected Cultivation

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A study was conducted on 36 genotypes, evaluating 6 phytochemical traits in tomato. The genotypes were grown under protected cultivation at Centre for Protected Cultivation and Technology, ICAR-IARI, New Delhi for two consecutive years during 2019 and 2020. The variance analysis revealed notable genetic variations among genotypes, indicating a substantial level of genetic diversity. Cherry group tomatoes, specifically genotypes 305 and 220, displayed the highest total soluble solids (T.S.S.) content with a measurement of 9.1 ^{0}brix. Additionally, genotype 264 exhibited the highest levels of β-Carotene (41.03 ug/g) and Lycopene (16.01 mg/100g) among all the studied genotypes. Lycopene showed a positive correlation with Acidity, Total carotene, and β-Carotene.

Key words: *Tomato, Protected Cultivation, Phytochemical trait Diversity, bio-chemical*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/85

Qualitative and quantitative estimation of plant parasitic nematodes in two districts of Haryana

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About nine genera of plant parasitic nematodes can infect and damage the wheat crop in which cereal cyst nematodes (CCNs) are the major plant parasitic nematode (PPNs) which can cause huge economic yield losses alone or in combination with other biotic and abiotic factors causing plant disease. Among three species of CCNs infecting cereals, *H. avenae* is the major problem under Indian condition, causing *Molya* disease. To assess the damage potential and diversities of PPNs associated with wheat and barley, a survey was planned to determine the status of PPNs associated with these crops in Haryana during two consecutive years, 2020-21 and 2021-22 in Hisar and Fatehabad districts for qualitative and quantitative estimation of major PPNs. A total of 232 soil and roots samples were collected from both the districts during two years. In which, 168 samples were reported to be infested with *H. avenae* and almost all samples were found infested with other significant PPNs. About six genera of PPNs and five genera of free-living nematodes were identified on the basis of morphology. *H. avenae* was observed in 54.4% of the surveyed samples during 2020-21 and 43.0% during 2021-22. The *Pratylenchus* sp. was the second most abundant genera which was found associated with wheat and barley during both the years with 38.4% frequency of occurrence during 2021 and 35.5% in 2022.

Keywords: *Haryana, Heteroderids, Samples, Survey, wheat*

AFTEFS/SKUAST-K/AG/2024/86

Sensor Technologies for Crop Monitoring

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Smart farming is the integration of advanced technologies such as sensors, wireless communication, Internet of Things (IOT), artificial intelligence (AI), and robots, with traditional farming practices. The goal is to increase the yield and quality of the crops or other agricultural products, as well as to reduce the cost and improve efficiency. Sensors play a critical role in smart farming as they provide the most important information related to varied aspects of agriculture, namely soil conditions, plant growth, and environmental conditions. With the emergence of printed electronics technologies, printed sensors have gained much attention in recent years. Printed sensors are fabricated through the additive manufacturing and are extremely versatile. They can be made on any solid substrate and be conformable, flexible, stretchable, low-cost, and/or bio-degradable. These unique features have made the printed sensors attractive for a variety of applications. This article aims to review the potential applications of printed sensors in smart farming. First, the state of the art of printed sensor fabrication is presented with a discussion on their advantages and disadvantages. Then, the measurement and monitoring applications of printed sensors in the key aspects of smart farming, are reviewed, including measurement of chemicals, soil monitoring, and microclimate monitoring in greenhouses. The article also pinpoints the limitations and potentials of printed sensors for farming applications. This article will benefit the researchers and practitioners in the field to advance the printed sensor technologies to mitigate the current issues in smart farming.

Key words: *Internet of Things (IOT), artificial intelligence (AI), and robots;*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/87

Effect of crop residue mulch and cultural practices along with herbicides on growth, yield and yield attributing parameters of garlic (*Allium sativum* L.)

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The experiment was carried out in the *rabi* season of 2022–2023 at the Research Farm of the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar, Haryana. The objective of this study was to evaluate the effects of crop residue mulch and herbicide-based cultural practices on growth, yield, and yield-attributing parameters for garlic cv. HG-17. With three replications, the experiment was set up using a Randomized Block Design (RBD) with a net plot size of 2.70 m × 2.70 m and plant spacing of 15 cm × 10 cm. This study consisted of 15 treatments. The research results showed the significant highest growth, yield, and yield-attributing parameters *viz.,* number of leaves per plant (10.13), leaf length (41.99 cm), equatorial diameter of bulb (4.88 cm), number of cloves per bulb (31.21), clove length (2.91 cm), average clove weight (1.12 g), and bulb yield (127.45 q/ha) was obtained with the treatment of three hoeings at 30, 60, and 90 DAP (T_{14}) which was found to be at par with the treatment (T_3)of pendimethalin application as pre-emergence along with two hoeings at 30 and 60 DAP.

Keywords: *Garlic, yield, pendimethalin, hoeing, crop residue mulch*

AFTEFS/SKUAST-K/AG/2024/88

Effect of N-Scheduling and herbicidal application on Growth and Productivity of Wheat (*Triticum aestivum* L.)

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A field experiment was conducted during the winter (*rabi*) seasons of 2018-19 and 2019-20 at the Research Farm of Mata Gujri College, Shri Fatehgarh Sahib, to study the effect of nitrogen scheduling and weed management on growth and yield of wheat. The experiment was laid in a split plot design replicated thrice with nitrogen scheduling (N_1: ½ Basal + ¼ at 4 WAS + ¼ at 8 WAS, N_2: ⅓ at 4 WAS + ⅓ at 8 WAS + ⅓ at 10 WAS, and N_3: ¼ at 4 WAS + ¼ at 6 WAS + ¼ at 8 WAS + ¼ at 10 WAS) as main plot and weed management (W_0: Weedy check, W_1: Weed free, W_2: clodinafop @ 60 g ha^{-1}, W_3: sulfosulfuron @ 25 g ha^{-1}, and W_4: carfentrazone @ 20 g ha^{-1}) as a sub plot with 15 treatment combinations. Results revealed that the higher dry matter accumulation (g m^{-1}) and crop yield (q ha^{-1}) were recorded with the application of N_3: ¼ at 4 WAS + ¼ at 6 WAS + ¼ at 8 WAS + ¼ at 10 WAS) which was statistically at par with the N_2: ⅓ at 4 WAS + ⅓ at 8 WAS + ⅓ at 10 WAS. Application of W_3: sulfosulfuron @ 25 g ha^{-1} observed considerably maximum dry matter accumulation (g m^{-1}) and crop yield (q ha^{-1}), which was statistically at par with W_4: carfentrazone @ 20 g ha^{-1}.

Keywords: *Nitrogen, Splitting, Herbicide, Dry Matter, Yield*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/89

STUDIES ON PROCESSING AND STORAGE STABILITY OF JACKFRUIT READY TO SERVE DRINKS FOR NUTITIONAL SECURITY

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A trial was conducted on Jackfruit to study the physical properties and chemical composition, to find out the suitable recipes for preparation of ideal RTS, also storage stability of Nectar prepared from suitable recipes. Physical and chemical properties revealed that average weight (g)-11500, Juice content(%)-35.70,TSS(%)-19.45, Total tritable acidity(%)-0.18, Ascorbic acid (mg/100g)-21.08 indicated the proper maturity stage of Jackfruit for RTS preparation.

In this study different recipes of Jackfruit RTS was standardized to explore the processing potential of Jackfruit, a minor fruit. There were five different possibilities of recipes. The RTS prepared from the recipes 12% pulp, 11% TSS and 0.25% Acidity gave highest organoleptic quality score ,grater consumer accept abilities and retain good nutritional qualities followed by RTS prepared from 10% pulp, 13% TSS and 0.30% Acidity and the quality of the prepared Nectar was maintained up to 5th months at ambient temperature.

AFTEFS/SKUAST-K/AG/2024/90

Innovative farming techniques- Modern and sustainable methods

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The quest for sustainable agriculture has driven the development of innovative farming techniques that enhance productivity while minimizing environmental impact. This abstract explores a range of cutting-edge practices designed to foster agricultural sustainability. Key innovations include precision farming, which utilizes GPS and data analytics to optimize field management and resource use; vertical farming, which maximizes space and reduces land use; and agroecological approaches that integrate ecological principles into farming practices to enhance biodiversity and ecosystem services. Additionally, advancements in soil health management, such as regenerative agriculture and cover cropping, improve soil fertility and carbon sequestration. The use of renewable energy sources and smart irrigation systems further supports sustainable practices by reducing reliance on fossil fuels and conserving water. Despite these advances, challenges such as high initial costs and technological accessibility remain. Addressing these barriers through research, policy support, and education is crucial for widespread adoption. This abstract provides an overview of innovative farming techniques and sustainable methods, highlighting their potential to transform agriculture and contribute to environmental sustainability.

Keywords: *GPS Technology, Data Analytics, Vertical Farming, Agroecology*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/91

Introducing neck blast resistance into the high-yielding variety Punjab Basmati 7 for trouble-free export

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Among the rich diversity of rice cultivars, the Indian subcontinent is bestowed with specialty rice called Basmati rice which is renowned for its distinct aroma, long grains, and delicate texture that makes it unique in many South Asian cuisines. Like other crops, the sustained production of Basmati crop is hampered by various biotic and abiotic stresses which can result in losses of up to 40-60%. Among biotic stresses, Blast caused by *Pyricularia oryza* poses a serious threat and has affected Basmati exports in the global market due to the detection of pesticide residues used to control this disease. To develop an elite germplasm possessing inbuilt durable resistance against blast disease the MCF_3 population developed from the cross Punjab Basmati 7/RYT 3998//Punjab Basmati 7/ Pusa Basmati 1884 was evaluated for its reaction towards neck blast resistance. Pusa Basmati 1884 possesses two genes viz *Pi2* and *Pi54* for neck blast resistance. A total of 5000 seeds of MCF_3 population were sown which were initially screened for broad-spectrum herbicide tolerance followed by screening of the surviving plants against neck blast disease. A total of 249 agronomically superior-looking plants were screened for neck blast tolerance under artificial inoculation conditions using Bit Wrap Technique. From these 64 plants were found to possess tolerance to neck blast disease. In molecular characterization, 31 plants possessed both *Pi2* and *Pi54* genes while 59 plants had *Pi54* and 32 plants had the *Pi2* gene. Also, these resistant plants had extra-long slender grains with grain lengths of more than 7.35mm and the L/B ratio was at par. The elite line(s) from the material thus developed can be directly released as a commercial variety or can be used as potential donors for the above traits in the Basmati breeding program.

Keywords: *Basmati rice, Neck blast, Herbicide tolerance*

AFTEFS/SKUAST-K/AG/2024/92

Biochemical Adaptation and Economic Potential of Silkworm Races: A Study on Seasonal Performance in Kashmir

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The present investigation analyzed the larval performance, economic traits, and biochemical aspects of eleven silkworm (Bombyx mori L.) races, including oval types SH-6, SKAU-R-6, SKUAST-31, DUNE-6, Yakwei, CSR-5, and peanut types NB4D2, SKAU-R-1, SKUAST-13, SKUAST-28, and CSR-4. The study focused on their performance across seasons and cocoon productivity, with NB4D2 and SH-6 as controls. Biochemical changes in haemolymph, particularly protein and free amino acids, were monitored during the 4th moult, 5th instar, and pupal stages. Results showed that haemolymph protein levels increased until the 6th day of the 5th instar, followed by a decline during the pupal stage. Free amino acid levels were highest during the 4th moult and decreased progressively until spinning, but rose again towards the end of the pupal period. SKAU-R-6 and SKAU-R-1 had higher protein and free amino acid levels among oval and peanut races, respectively. Glucose and carbohydrate levels decreased in the 5th instar, with SKAU-R-6 and SKAU-R-1 displaying the highest carbohydrate content. Lipid levels increased during the 5th instar after feeding resumed but were lower in the pupal stage, with male pupae exhibiting higher lipid levels than females. In terms of economic traits, SKAU-R-6 and NB4D2 exhibited higher larval weights, effective rearing rates (ERR), and cocoon weights across seasons, while SKAU-R-1 led among peanut types. Cocoon shell weight and filament length were highest in DUNE-6 and SKAU-R-1, respectively. In conclusion, SH-6, SKAU-R-6, SKUAST-31, NB4D2, SKAU-R-1, and SKUAST-28 demonstrated superior adaptation to higher temperatures, making them ideal for both spring and summer rearing in Kashmir, whereas CSR-4, CSR-5, DUNE-6, and Yakwei showed limited acclimatization to high temperatures.

Keywords: *Silkworm Races, Bombyx mori, Haemolymph, Economic Traits, Seasonal Variation*

AFTEFS/SKUAST-K/AG/2024/93

Effect of leaf and seed powder based edible coating with beeswax and Clove essential oil on the shelf life of guava (*Psidium guajava*) *cv*. Allahabad Safeda

The guava is thought to be India's most significant commercial fruit crop. Due to their high respiration rate, vulnerability to different pathogens, and mechanical damage that can quickly deteriorate the quality and concise its shelf life. Nonetheless, the purpose of the experiment was to investigate how guava's edible coatings affected its postharvest quality and shelf life. Guava fruits were treated by seven treatments of different concentrations of beeswax, guava leaf powder, neem leaf powder, tamarind seed powder, and clove oil with different combinations were used as edible coating. Various treatments were used to examine the impact of edible coating materials on the physical and chemical properties. Under ambient conditions, the variations in physiological and chemical parameters were seen. The findings of present study showed maximum fruit weight (120.29 g), highest vitamin C (163.19 mg/100g), maximum acidity (0.49%) and antioxidant activity (35.43%) obtained from T4 [Neem leaves powder (2%) + Beeswax (1%)+ clove oil (1%)] compared with untreated fruits. The result suggested that the applications of [Neem leaves powder @ 2%) + Beeswax @ 1% + clove oil @1%] as an edible coating material in guava fruit is more effective than other treatments to improve the shelf life of Guava.

Keywords*: edible powder, beeswax, clove oil, storage*

AFTEFS/SKUAST-K/AG/2024/94

Digital Technologies in Precision Agriculture for Sustainable Management of Fungal Diseases in Horticultural Plants

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Fungal infections, which significantly reduce a plant's aesthetic value, can result in significant financial and agricultural losses in the ornamental plant production sector, which is a significant part of the global horticultural business. New sustainable approaches to pathogen management must be developed in order to lessen the usage of pesticides in the suppression of fungal outbreaks. To meet the challenging task of precise, energy-efficient, and successful illness treatment, early and accurate large-scale detection of emerging symptoms is especially important. Here, recent developments in digitally based detection and accessible treatment techniques for fungal infections are discussed and compared with traditional methods. Examined are recent developments in fungal risk models based on environmental patterns, spectroscopic and imaging technologies, and tools for molecular biology. A case study on rose plants displaying significant fungal infections was used to test the updated spectroscopic and imaging technologies. The ultimate goal was to compare modern e-tools with traditional methods in order to identify early plant disease detection, determine the best time and spacing for managing these diseases, and reduce crop losses by using sustainable and ecologically friendly production methods. Furthermore, prospects for improving the integration of all these approaches in the future are discussed.

Keywords: *Agronomic practices, fungicides, thermal imaging sensors, spectroscopy.*

AFTEFS/SKUAST-K/AG/2024/95

Precision Agriculture, Smart Farming, Sustainable Environmental Management, Food Security, Nutrition, Digital Agriculture and Agri-Tech Solutions

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Cucumis sativus L. popularly known as 'Cucumber' (Khira) belongs to family cucurbitaceae with diploid chromosomes 2n=2x=14. In India, there is lots of variation in cucumber, but there has been relatively little work done for the improvement of local types. So, analysing locally adopted genotypes is priority research objective for enhancing productivity. Therefore, present investigation entitled "Genetic variability studies in cucumber (*Cucumis sativus* L.) under low hill region of Himachal Pradesh" was conducted during rainy season, 2021 at the Experimental Farm of Department of Vegetable Science, College of Horticulture & Forestry, Neri, Hamirpur, HP. Twenty genotypes of cucumber comprising of local genotypes including standard check Solan Srijan were evaluated in Randomized Complete Block Design with three replications to assess the nature and the extent of various genetic variability parameters and the association among the traits for yield and its component characters. Analysis of variance showed highly significant differences among all genotypes for all the characters. On the basis of overall mean performance of the genotypes, LC-C-4-21, LC-C-14-21 and LC-C-1-21 were found superior for total yield per plot and other important horticultural traits. They could be the promising parents for utilization in further breeding programmes. Higher estimates of genotypic (GCV) and phenotypic coefficient of variation (PCV) were observed for PDI of downy mildew followed by number of fruits per plant, total yield per plot and PDI of powdery mildew. High heritability accompanied with high or moderate genetic advance as per cent of mean was recorded for flesh to seed cavity ratio, total yield per plot, ascorbic acid, PDI of downy mildew, number of fruits per plant, fruit length, PDI of powdery mildew and total soluble solids.

Keywords: *Genetic variability, heritability, cucumber, PCV, GCV*

AFTEFS/SKUAST-K/AG/2024/96

Response of pinching and nitrogen on growth, flowering and yield of African marigold (*Tagetes erecta* L.) c.v. Pusa Narangi Gainda

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Marigold is one of the most important commercially grown loose flower crops in India. It is used as loose flower for making garlands, which are extensively used in the religious and social function. Botanical name of African marigold is *Tagetes erecta* L. and belongs to Asteraceae family. According to Ayurvedic and Unani medicine, the flowers and leaves of marigold have anti-inflammatory, anti-pyretic, antimicrobial and antiepileptic effect. An experiment was conducted on farmer's field at Deoria, Uttar Pradesh to find out the response of pinching and nitrogen on vegetative growth, flowering and yield of African marigold. The experiment consisted of 10 treatments which were replicated thrice in a randomized block design (RBD). The treatments are T_1 (Single Pinching),T_2 (Double Pinching),T_3 (Single Pinching+ 1% Nitrogen),T_4 (Single Pinching+2% Nitrogen),T_5 (Single Pinching +3% Nitrogen),T_6 (Single Pinching+4% Nitrogen), T_7 (Double Pinching+ 1% Nitrogen),T_8 (Double Pinching+2% Nitrogen),T_9 (Double Pinching+3% Nitrogen) and T_{10} (Double Pinching+4% Nitrogen). Result showed significant effect on plant height (64.40 cm), girth of stem (1.35 cm), number of branches plant^{-1} (15.10), plant spread along the row (36.30 cm), plant spread across the row (36.32 cm), days to start flowering (66.10 days), flowering duration (22.40 days), number of flower plant^{-1} (20.50), circumferences of flower (23.20 cm), fresh weight of flower (11.25 g) and fresh yield plant^{-1} (260.08 g) was observed in T_{10}. T_{10} treatment is superior to other treatments.

Keywords: *Marigold, Pinching, Nitrogen, Growth, Flowering and yield*

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AFTEFS/SKUAST-K/AG/2024/97

Response of pinching and nitrogen on growth, flowering and yield of African marigold (*Tagetes erecta* L.) c.v. Pusa Narangi Gainda

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Marigold is one of the most important commercially grown loose flower crops in India. It is used as loose flower for making garlands, which are extensively used in the religious and social function. Botanical name of African marigold is *Tagetes erecta* L. and belongs to Asteraceae family. According to Ayurvedic and Unani medicine, the flowers and leaves of marigold have anti-inflammatory, anti-pyretic, antimicrobial and antiepileptic effect. An experiment was conducted on farmer's field at Deoria, Uttar Pradesh to find out the response of pinching and nitrogen on vegetative growth, flowering and yield of African marigold. The experiment consisted of 10 treatments which were replicated thrice in a randomized block design (RBD). The treatments are T_1 (Single Pinching),T_2 (Double Pinching),T_3 (Single Pinching+ 1% Nitrogen),T_4 (Single Pinching+2% Nitrogen),T_5 (Single Pinching +3% Nitrogen),T_6 (Single Pinching+4% Nitrogen), T_7 (Double Pinching+ 1% Nitrogen),T_8 (Double Pinching+2% Nitrogen),T_9 (Double Pinching+3% Nitrogen) and T_{10} (Double Pinching+4% Nitrogen). Result showed significant effect on plant height (64.40 cm), girth of stem (1.35 cm), number of branches plant^{-1} (15.10), plant spread along the row (36.30 cm), plant spread across the row (36.32 cm), days to start flowering (66.10 days), flowering duration (22.40 days), number of flower plant^{-1} (20.50), circumferences of flower (23.20 cm), fresh weight of flower (11.25 g) and fresh yield plant^{-1} (260.08 g) was observed in T_{10}. T_{10} treatment is superior to other treatments.

Keywords: *Marigold, Pinching, Nitrogen, Growth, Flowering and yield*

AFTEFS/SKUAST-K/AG/2024/98

Organic Farming: Bridging Tradition and Innovation for Sustainable Agriculture

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Organic horticulture represents a dynamic and evolving approach to sustainable agriculture, emphasizing the use of natural inputs and ecological processes to cultivate plants. Recent interventions in organic horticulture have focused on improving soil health through advanced composting techniques, biochar application, and the integration of cover crops, which enhance soil fertility and microbial diversity. Innovations in pest management, such as the use of biopesticides, pheromone traps, and beneficial insect habitats, have further reduced the reliance on synthetic chemicals while promoting biodiversity. The adoption of precision agriculture tools, including soil sensors and drone technology, has enabled organic horticulturists to optimize water use, monitor crop health, and improve yield outcomes. Additionally, the development of new organic fertilizers derived from waste materials and algae-based products has provided sustainable alternatives to conventional inputs. These advancements are complemented by the growing interest in regenerative practices, which aim to restore ecosystems and sequester carbon through techniques like agroforestry and no-till farming. Despite challenges such as labor intensity and lower yields compared to conventional methods, organic horticulture continues to expand, driven by consumer demand for healthier, environmentally-friendly produce. The integration of traditional knowledge with modern science has positioned organic horticulture as a key player in the global movement towards sustainable food systems, offering promising solutions for future agricultural resilience. Continued research and innovation are critical to overcoming existing limitations and enhancing the productivity and sustainability of organic horticultural practices.

Keywords: *Sustainable agriculture, Biopesticides, No-till farming*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/99

Extent of soil chemical properties amelioration by poplar tree planted at different spacings

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Effect of poplar spacing on soil chemical properties in semi-arid region of north-western India was studied. Study was conducted at Department of Forestry Research field, CCS Haryana Agricultural University, Hisar. The experiment was carried out to evaluate soil chemical properties amelioration by poplar tree planted at different spacings (February, 2017 – Date of plantation) and onion was taken as intercrop during 2022-23 and 2023-24 in rabi season. Factorial randomized block design was used. Different plant geometry viz., 4 x 3m, 5 x 3m, 6 x 3m, 7 x 3m and control (crop without trees) were taken for observations to be recorded. The recommended package of practices by CCS HAU for onion crop was followed in both *Poplar deltoids* based agroforestry system as well as in control condition. Soil pH, Electrical conductivity, organic carbon, macronutrients (N,P,K) and micronutrients (Fe, Mn, Zn, Cu) were studied to evaluate their impact on spacing. Soil chemical properties BT (Before transplanting) and AH (After harvest) were compared. The improvement followed the order of poplar spacing: 4x3 m > 5x3 m >6x3 m >7x3 m. In control plot no significant change was observed in soil chemical properties.

Keywords: *Poplar spacing, onion, agroforestry, soil and chemical properties*

AFTEFS/SKUAST-K/AG/2024/100

Extent of soil chemical properties amelioration by poplar tree planted at different spacings

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Keywords: *Poplar spacing, onion, agroforestry, soil and chemical properties*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/101

Effect of nano urea on quality of fodder Sorghum

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Sorghum (*Sorghum bicolor* L.) which is known as camel crop is among one of the five most imperative crop species grown in the world. Sorghum produces HCN, a poisonous and anti-nutritional substance, which can be reduced by proper management of water and fertilizer along with appropriate harvesting time. This experiment was conducted at Forage Research Farm of Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar to study the effect of nano urea on sorghum for sustainable fodder production. The experiment consisting of 11 different nitrogen fertilizer combinations i.e. T1: Control (No RDN), T2: 100% RDN by urea fertilizer (75 kg), T3: 100% RDN (100% through nano-urea in three sprays at 15, 30 and 45 DAS), T4: 100% RDN (50% as basal by urea fertilizer + 50% through nano-urea in one spray at 30 DAS), T5: 100% RDN (50% as basal by urea fertilizer + 50% through nano-urea in two sprays at 30 and 45 DAS), T6: 75% RDN (Through nano-urea in three sprays at 15, 30 and 45 DAS), T7: 75% RDN (50% as basal by urea fertilizer + 50% through nano-urea in one spray at 30 DAS), T8: 75% RDN (50% as basal by urea fertilizer + 50% through nano-urea in two sprays at 30 and 45 DAS), T9: 50% RDN (Through nano-urea in three sprays at 15, 30 and 45 DAS), T10: 50% RDN (50% as basal by urea fertilizer + 50% through nano-urea in one spray at 30 DAS), T11: 50% RDN (50% as basal by urea fertilizer + 50% through nano-urea in two sprays at 30 and 45 DAS). HCN and crude protein content were influenced significantly by different treatments and HCN content was found below critical limit (200 µg/g) in all the treatments. Although, the highest HCN (72.5 µg/g) at 30 DAS and crude protein (9.23%) at harvest were recorded in T2 treatment. Furthermore, HCN content was found statistically at par with T4 and T5, while crude protein content with T5 treatment.

***Keywords**: Nano, Sustainable, Fodder, Accumulation*

AFTEFS/SKUAST-K/AG/2024/102

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The extensive use of chemical fertilizers and pesticides in modern agriculture has led to significant environmental issues, including soil degradation, loss of biodiversity, and health risks. While organic farming is a sustainable alternative, meeting global food demands remains challenging. Panchstar Farming, inspired by Subhash Palekar's principles, offers a promising solution by integrating a five-layer cropping system that optimizes resource use and promotes ecological balance. This system includes light intensity, tree canopies, shrubs, herbs, ground covers, and root crops, each contributing to overall productivity and sustainability. Tree canopies reduce soil moisture loss, while shrubs and herbs aid in nutrient cycling and pest management. Ground covers prevent erosion and improve soil fertility, and root crops enhance deeper soil health. By fostering biodiversity, Panchstar Farming improves fruit yield, quality, and resilience to pests, diseases, and environmental stresses. The use of locally sourced organic inputs in this system reduces reliance on synthetic fertilizers and pesticides, leading to better soil health and more sustainable farming practices. Demonstrational models at some local farmer's farm show that fruit crops grown using Panchstar Farming exhibit higher yields and superior nutritional quality compared to conventional monocropping. Thus, Panchstar Farming provides a practical approach to sustainable fruit production, addressing environmental concerns and the need for increased food production.

Keywords: *Panchstar Farming, organic practices, sustainable agriculture, biodiversity, soil health, fruit crop production.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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Effect of floral preservatives and growth regulators on physiological parameters of tuberose cut spikes

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The investigation entitled, "Effect of floral preservatives and growth regulators on physiological parameters of tuberose cut spikes" was carried out at laboratory of Department of Horticulture, CCS Haryana Agricultural University, Hisar during the year of 2022. It comprises of fifteen treatments having different combinations of seven chemicals viz; sucrose (2% and 4%), citric acid (250 mg/l and 350 mg/l), silver nitrate (25 mg/l and 50 mg/l), aluminium sulfate (150 mg/l and 300 mg/l), gibberellic acid (100 mg/l and 150 mg/l), benzyal adenine (100 mg/l and 150 mg/l) and salicylic acid (100 mg/l and 150 mg/l) along with control (distilled water). In this experiment Completely Randomized Design was used with three replications. Results revealed that maximum water uptake (46.60 g) was recorded significant in treatment 4% sucrose+150 mg/l salicylic acid. Minimum water loss/water uptake ratio (0.94%) and physiological loss in weight (18.15 %) was recorded significant in 4% sucrose + 150 mg/l salicylic acid. From this investigation; it may be concluded that treatment consisting of 4% sucrose + 150 mg/l salicylic acid was found promising in improving physiological parameters of tuberose spikes.

Keywords: *Tuberose, floral preservatives, growth regulators, physiological parameters*

AFTEFS/SKUAST-K/AG/2024/104

In vitro evaluation of *Geopora arenicola extract* and virtual screening of constituent biomolecules with the target proteins of *Alternaria mali* via molecular docking

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The extensive utilization of synthetic fungicides in agricultural practices over recent decades has raised significant concerns regarding the presence of toxic chemical residues in food and the broader environment. In response to these concerns, there is a growing advocacy for the adoption of biocontrol strategies utilizing preparations derived from naturally occurring compounds, specifically secondary metabolites from plants or microorganisms, including macrofungi. This study aims to elucidate the antifungal properties of the macrofungal extract from *Geopora arenicola*, conducted at the Agrochemical Evaluation Laboratory, Division of Plant Pathology, SKUAST-K, Shalimar. For the experimental procedures, the fruiting bodies of *Geopora arenicola* were subjected to lyophilization followed by grinding into a fine powder which was then processed through ultrasound-assisted extraction in three solvents: methanol, ethanol, and water. The antifungal efficacy of these extracts against *Alternaria mali* was assessed *in vitro* via mycelial growth inhibition assay. The results indicated complete inhibition of mycelial growth for the methanolic extract across all tested concentrations (0.2%, 0.4%, and 0.6%). Phytochemical analysis of *Geopora arenicola* through gas chromatography-mass spectrometry (GC-MS) identified several bioactive compounds, including Tropine N-oxide, Glycopyrrolate, and 1-Ethyl-3-(3-dimethylaminopropyl) carbodiimide. A molecular docking study was employed to discern key inhibitory molecules

against *A. mali,* revealing that Glycopyrrolate exhibited significant binding affinity, as indicated by its low binding energy values. This suggests a stable ligand-protein interaction that may influence the functionality of Calmodulin and Endopolygalacturonase, both of which are critical for the pathogenicity of *A. mali*. The inhibition of these proteins presents a novel strategy for managing *A. mali* infections in agricultural contexts. Furthermore, similar methodologies targeting polygalacturonases have been investigated for addressing fungal infections reinforcing the potential application of Glycopyrrolate within plant protection frameworks.

Keywords: *Calmodulin, Endopolygalactouronase, macrofungi, mycelial inhibition, solvent extract*

AFTEFS/SKUAST-K/AG/2024/105

"Technological Advancements in Organic Farming: A Boon to Agricultural Production"

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In order to meet sustainability objectives as well as productivity issues, technological developments in organic farming are proving to be a major benefit to agricultural output. As organic farming practices continue to adhere to the fundamentals of organic agriculture, the incorporation of state-of-the-art technologies is improving their efficacy and efficiency.Organic farming is being revolutionised by recent technological breakthroughs, which are improving its production, efficiency, and sustainability. Technological advancements in crop management, data analytics, and precision agriculture are meeting the particular difficulties faced by organic farmers while adhering to the fundamentals of organic farming. Real-time monitoring of crop health, soil conditions, and insect populations is made possible by precision agricultural technologies, such as drones and remote sensing. This enables focused treatments and resource optimisation. By examining intricate facts pertaining to weather trends, soil conditions, and agricultural yield, data analytics and machine learning enable well-informed decision-making. Advances in the management of soil health, like sophisticated composting methods and bio-based fertilisers, are enhancing soil fertility and structure without the need for artificial inputs. Furthermore, water consumption efficiency is being improved by technology developments in irrigation, such as rainwater gathering and drip systems. Along with increasing the adaptability and output of organic farms, these advances also help achieve more general environmental sustainability objectives like greenhouse gas mitigation, reduced chemical use, and soil conservation. Technology has the power to further change organic farming methods, making them more flexible and in line with the increasing emphasis on sustainable agriculture and food security throughout the world.

Keywords- *organic farming, crop management, precision agriculture, agricultural yield*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/106

Quantifying the Carbon Footprint of Paddy and Cotton: Role of RCTs in reducing emissions in Punjab agriculture

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This study quantifies the carbon footprint of Resource Conservation Technologies (RCTs) in Punjab's agriculture using both primary and secondary data. A sample of 120 farmers, 60 cultivating paddy and 60 cotton was selected from the districts of Mansa and Sri Muktsar Sahib using a multi-stage sampling method. Data was collected through personal interviews with farmers, while emission factors for various inputs have been sourced from secondary published data. For paddy, RCTs adopters identified were direct-seeded rice (DSR) adopters and DSR adopters along with practising crop residue management (CRM) practices in paddy. For cotton crop, integrated pest management (IPM) adopters were compared with non-adopters. The results indicate that paddy cultivation is a significant contributor to carbon emissions, with emissions five times higher than cotton cultivation. Adoption of DSR in paddy reduced carbon emissions from 11.9 t CO_2 eq/ha to 9.5 t CO_2 eq/ha, a reduction of 20%. GHG emissions dropped by 70%, when DSR was practised along with residue management practices. In the case of cotton, IPM adoption reduced the emissions from 1.9 t CO_2 eq/ha to 1.8 t CO_2 eq/ha compared to non-adopters. The study emphasizes financial incentives, timely access to CRM machines, and farmer awareness to promote RCTs. These findings offer valuable insights into promoting sustainable agriculture in Punjab and reducing its agricultural carbon footprint.

Key words: *cotton, emissions, paddy, Punjab, resource conservation technologies*

AFTEFS/SKUAST-K/AG/2024/107

"The Role of Phosphate Solubilizing Bacteria and Fungi in Agriculture: Evaluating the Phosphate Solubilization Index through Quantitative Estimation Methods"

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A wide group of soil bacteria and fungi known as phosphate solubilizing microorganisms (PSMs) play a critical role in the dynamics of nutrient availability in ecosystems. These microbes possess the amazing capacity to change phosphate from insoluble forms that are inaccessible to plants into easily absorbed soluble forms. Enhancing soil fertility and encouraging plant development require this procedure. In the present study, bacteria and fungi were isolated from different rhizosphere soil. Solid and liquid Pikovskaya's (PVK) and National Botanical Research Institute's (NBRIP) media containing insoluble tricalcium phosphate were used for the evaluation of the phosphate solubilization ability of the bacterial isolates by two methods: visual evaluation of the solubilization zone around colonies (halo) and determination of solubilized phosphates in liquid medium by the colorimetric method of the Fisky and Subbarao's method. Based on the results of the halo zone formation, the isolates that showed the higher phosphate solubilization index was selected for evaluation of phosphate solubilization by the colorimetric method. Phosphate solubilization by the isolates were estimated by measuring the optical density at 660nm. Phosphate solubilizing microorganisms (PSMs) has various applications in the field of agriculture like by lowering the need for costly and sometimes dangerous chemical phosphorus fertilizers, the integration of PSMs into agricultural methods promotes sustainable farming. This strategy lowers the danger of water pollution, minimizes nutrient runoff, and maintains the health of the soil. As research continues to expand, the potential uses of these microorganisms are likely to grow, offering new solutions for agriculture and environmental management.

Key words: *Phosphate solubilizing microorganisms, Pikovskaya's medium, National Botanical Research Institute's (NBRIP) medium, halo zone, Phosphate solubilization index, Fisky Subbarao's method.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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Enhancing Sericulture Through Organic Farming: A Sustainable Path To Better Yields and Quality

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Growing silkworms for silk production is a wholesome practice known as sericulture. Employment, economic growth, and health are all aided by the sericulture sector. The mulberry silkworm, *Bombyx mori* L., produces the majority of the silk. It feeds on mulberry to obtain the nutrients it needs for growth and development. A silkworm's health, growth, and the commercial qualities of the silk are all determined by the nutritional quality of the mulberry leaves. Utilising organic resources to increase mulberry productivity and leaf quality includes green Manuring, bio composting, vermicomposting, vermiwash, oil cakes, press mud etc. An environmentally beneficial substitute for chemical fertilisers is the use of organic matter in disease and pest management, soil fertility management, and reduced chemical input. In sericulture, organic farming has shown to be economical, environmentally friendly, and safe for silkworms.

Keywords: *organic farming; sericulture; composts; eco-friendly approach*

AFTEFS/SKUAST-K/AG/2024/109

Title: Navigating the Intersection of Panchayat Development Societies and Human Rights in Rural Governance: Challenges and Recommendations for Sustainable Development.

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Panchayat Development Societies (PDSs) play a crucial role in rural governance and development, but their functioning often intersects with complex sociological factors affecting human rights. This study explores the multifaceted issues and challenges surrounding PDSs and human rights within the context of rural governance. It examines the operational challenges faced by PDSs, including financial transparency, accountability, and resource allocation, and investigates their effectiveness in promoting grassroots development. The study also assesses the human rights situation in rural areas, emphasizing access to healthcare, education, clean water, and livelihood opportunities, and analyses the role of PDSs in safeguarding and promoting these rights. It identifies the challenges that arise when PDSs aim to balance developmental goals with human rights concerns, such as resource constraints, bureaucratic hurdles, and societal attitudes. The study explores community participation in decision-making processes and its impact on local development. Based on the findings, the study offers practical recommendations to address the identified challenges. These recommendations may include policy changes, capacity-building initiatives, and community engagement strategies. The abstract concludes by emphasizing the need for a holistic approach to rural development that integrates PDSs and human rights considerations. It underlines the interdependence of these aspects and the potential for synergy in achieving sustainable development and human rights protection in rural areas.

Keywords- *Rural, Human Right, Local development, Sustainable Development*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/110

Evaluation of Physico-Chemical Characteristics of Ber Cultivars for Optimal Candy Production

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Indian jujube, commonly known as ber (*Ziziphus mauritiana Lam.*), holds a significant place in traditional Indian cuisine due to its unique flavour and nutritional properties. Recognized for its versatility, ber has become more than just a popular fruit—it is now a valuable crop with potential applications beyond conventional consumption. This study aimed to assess the physico-chemical characteristics of four ber cultivars—Gola, Umran, Kaithali, and Apple Ber—to determine their suitability for candy production. The main physico-chemical parameters such as Total Soluble Solids (TSS), acidity, ascorbic acid, total chlorophyll, carotenoids, phenols, browning, and antioxidant activity were analysed. Umran showed the highest TSS (18.40%) and phenolic content (90.17 mg/100g), indicating its potential for sweeter, antioxidant-rich candy. Kaithali had the highest ascorbic acid content (92.30 mg/100g) and strong antioxidant activity (31.10%), making it ideal for nutrient-rich candy. Apple Ber had the highest chlorophyll content (14.19 µg/g), while Gola showed balanced results. Umran exhibited the lowest browning (0.18 OD), ensuring better color stability. Overall, Kaithali and Umran were found to be the most suitable cultivars for candy production, offering optimal sweetness, color stability, and nutritional benefits.

Keywords: *Ber Fruit, Candy, Cultivars, Nutritional, Physico-chemical, Value addition*

AFTEFS/SKUAST-K/AG/2024/111

Osmotic dehydration of Aloe vera using response surface methodology

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The process parameters for osmotic dehydration of aloe vera gel were optimized using response surface methodology. Sugar syrup temperature (30-50 °C), syrup concentration (10-40 °Brix) and duration of osmosis (60-240 min) were the factors investigated with respect to water loss (WL) and sugar gain (SG). The Box- Behnken design of three variables and three levels including 17 experiments formed by 5 central points was used. The solution to sample ratio of 5/1 (w/w) was used. With respect to water loss and solid gain, the linear, quadratic and interaction effects of three variables were analysed. For each response, second order polynomial models were developed using multiple linear regression analysis. Analysis of variance (ANOVA) was performed to check the adequacy and accuracy of the fitted models. The response surfaces and contour maps showing the interaction of process variables were constructed. The optimum operating conditions were found to be syrup temperature of 31.44 °C, syrup concentration of 25.35°Brix and osmosis time of 128.73 min. At this optimum point, water loss and solid gain were peadicted to be 39.69 % and 4.45 % respectively.

Keywords*: Osmotic dehydration, Aloe vera, RSM, Brix*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/112

Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and AlliedSciences

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A field experiment conducted during the Kharif season of 2020-2021 assessed the effectiveness of intercropping mung bean (Vigna radiata) with different crops to manage the whitefly (Bemisiatabaci) population. The results revealed that mung bean + sunnhemp (9.32) exhibited the most significant reduction in whitefly infestation, followed by mung bean + bajra (10.51). This approach also provided substantial economic benefits. The cost-benefit analysis emphasized that intercropping effectively curbs pest pressure, reduces the dependency on chemical pesticides, and enhances crop yield and quality. These strategies are not only environmentally sustainable but also economically advantageous, especially for farmers in arid regions like Rajasthan. Moreover, intercropping integrates natural pest management techniques, improving plant health by fostering a diverse crop ecosystem. The reduction in chemical input costs, combined with improved crop performance, results in higher profitability for farmers. This method proves to be a sustainable and adaptive farming practice, offering resilience to climate variability in dryland agriculture. Intercropping thus represents a holistic solution that balances environmental health with economic viability.

Key words: *Intercropping, Whitefly, Cost-benefit analysis, Pest management and Sustainable agriculture*

AFTEFS/SKUAST-K/AG/2024/113(A)

Phytochemical Screening, Quantification, FT-IR Analysis, and *In Silico* Characterization of Potential Bio-active Compounds Identified in HR- LC/MS Analysis of the Polyherbal Formulation from Northeast India

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Diabetes is a group of metabolic disorders characterized by elevated blood sugar levels, leading to many undesirable health consequences. There are many herbal formulations, traditionally used by the Northeast Indian population for disease management. These formulations require scientific validations to optimize their efficacy and increase their popularity. In this study, we attempt to scientifically validate a polyherbal formulation traditionally used for the management of diabetes through preliminary phytochemicals investigation, characterization of potential phytochemicals using Fourier transform infrared (FT-IR) spectroscopy, high-resolution liquid chromatography mass spectrometry (HR- LC/MS) analysis, and *in silico* characterization of physiochemical, drug-likeness, and pharmacokinetic properties of identified phytochemical compounds. Qualitative phytochemical screening of various extracts of the formulation confirmed the presence of alkaloids, phenols and tannins, flavonoids, fats, and oils. Phytochemical quantification of the various extracts showed that the highest total phenolic content is present in the ethanolic extract (35.61 ± 0.15 mg GAE/g), while the highest total flavonoid content is present in the chloroform extract (76.33 ± 2.96 mg QE/g) of the formulation. FT-IR spectroscopic analysis revealed various characteristic band values with various functional groups in the formulation extract such as amines, alcohol, fluoro compounds, phenol, alkane, alkene, and conjugated acid groups. HR-LC/MS analyses identified nearly 51 compounds including 9 small peptides and 42 potential phytochemical compounds. *In silico* SwissADME analysis of identified compounds revealed 25 potential compounds following Lipinski's rule and showing drug-like characteristics, and out of them, 16 compounds exhibited good oral bioavailability, as revealed in the bioavailability radar. The overall study showed that the presented polyherbal formulation is enriched with bio-active phytochemical compounds with good pharmaceutical values.

Keywords:- *Aromatic Compounds; Flavonoids; Hydrocarbons; Organic Compounds; Photochemistry*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/113(B)

Role of Proline in *in vitro* Regeneration and Agrobacterium mediated transformation of Japonica rice cultivars

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The present study was conducted to optimize a protocol for high efficiency embryogenic callus induction and regeneration in *japonica* rice. The dehusked seeds of two varieties namely Duggu and K 332 were subjected to treatment with mercuric chloride (0.1%) and sodium hypochloride (4%) for different durations and it was found that seed explants treated with 0.1 % $HgCl_2$ for 8 minutes resulted in least contamination with maximum survival percent of cultures of K 332 and Duggu. The sterilized seeds were inoculated on MS medium with 2,4-D (2.0-4.0 mg/l) and BAP (0.5-1.0 mg/l) for callus induction and regeneration was attempted on MS medium supplemented with NAA (0.2-0.5mg/l) and BAP (2.0-4.5 mg/l) in presence or absence of proline (50mg/l). Maximum callus induction (96.07 %) ofK 332 was obtained in MS medium supplemented with 2,4-D (2.5 mg/l) and BAP (1.0 mg/l) while in Duggu maximum callus induction (83.37 %) was achieved in presence of 2,4-D (3.5 mg/l) and BAP (1.0 mg/l). Maximum callus regeneration frequency (67.7 %) was obtained in K 332 in MS medium having BAP (2.5 mg/l) and NAA (0.4mg/l) while maximum callus regeneration frequency (47.7 %)was obtained in varietyDuggu in presence of BAP (2.5 mg/l) and NAA (0.4mg/l). Further, it was observed that presence of proline (50mg/l) was beneficial for regeneration.

Keywords: *Rice, Japonica, callus, induction, regeneration, 2,4-D, Proline.*

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Role of Proline in *in vitro* Regeneration and Agrobacterium mediated transformation ofJaponica rice cultivars

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The present study was conducted to optimize a protocol for high efficiency embryogenic callus induction and regeneration in *japonica* rice. The dehusked seeds of two varieties namely Duggu and K 332 were subjected to treatment with mercuric chloride (0.1%) and sodium hypochloride (4%) for different durations and it was found that seed explants treated with 0.1 % $HgCl_2$ for 8 minutes resulted in least contamination with maximum survival percent of cultures of K 332 and Duggu. The sterilized seeds were inoculated on MS medium with 2,4-D (2.0-4.0 mg/l) and BAP (0.5-1.0 mg/l) for callus induction and regeneration was attempted on MS medium supplemented with NAA (0.2-0.5mg/l) and BAP (2.0-4.5 mg/l) in presence or absence of proline (50mg/l). Maximum callus induction (96.07 %) ofK 332 was obtained in MS medium supplemented with 2,4-D (2.5 mg/l) and BAP (1.0 mg/l) while in Duggu maximum callus induction (83.37 %) was achieved in presence of 2,4-D (3.5 mg/l) and BAP (1.0 mg/l). Maximum callus regeneration frequency (67.7 %) was obtained in K 332in MS medium having BAP (2.5 mg/l) and NAA (0.4mg/l) while maximum callus regeneration frequency (47.7 %)was obtained in varietyDuggu in presence of BAP (2.5 mg/l) and NAA (0.4mg/l). Further, it was observed that presence of proline (50mg/l) was beneficialfor regeneration.

Keywords: *Rice, Japonica, callus, induction, regeneration, 2,4-D, Proline.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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Progress and prospects in plant genome editing

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Genome editing/engineering is a novel approach in which nucleotides of specific genes controlling desired traits can be edited using artificially engineered nucleases. Currently four families of engineered nucleases are being utilised *viz*., Zinc Finger Nucleases (ZFNs), Transcription Activator-Like Effector Nucleases (TALENs), Mega nucleases, clustered regularly interspersed short palindromic repeats (CRISPR) and CRISPR associated protein 9 (Cas9) system. TALENs, CRISPR/Cas9 and ZFN can be easily designed to bind any specific sequence of DNA. These nucleases create specific Double- Stranded Break (DSBs) at desired locations in genome and harness cell's endogenous mechanisms to repair the induced break by natural process of Homologous Recombination (HR) and Non Homologous End Joining (NHEJ). Genome editing has been extensively utilized to knock out gene function, tag genes, induce specific mutation and study promoters in plants.

TALENs and CRISPR-Cas9 technologies were exploited in bread wheat to introduce targeted mutations in the three homoeoalleles AABBDD, which encode Mildew-resistance Locus (MLO) proteins. Using Cas9/sub genomic RNA (sgRNA) technology, a viral resistance in cucumbers (*Cucumis sativus* L.) was developed through the disruption of the recessive eIF4E (eukaryotic translation initiation factor 4E) gene.

Discovery of additional site specific nucleases, coupled with availability of genomesequence of crops, effective transformation systems could accelerate the process of developing non-transgenic crop varieties with pre-determined traits. Innovations such as prime and base editing are intended to improve the precision and effectiveness of genetic engineering even more. Gene editing technologies has made remarkable progress and continue to evolve, promising transformative impacts on agriculture.

Key words*: Genome editing, Zinc Finger Nucleases (ZFNs), Transcription Activator-Like Effector Nucleases (TALENs), clustered regularly interspersed short palindromic repeats(CRISPR).*

AFTEFS/SKUAST-K/AG/2024/116

Impact of Pretilachlor and Bispyribac-sodium on growth and reproduction on *Eisenia fetida*

Earthworms are an essential part of soil ecosystems and the emblematic species of soil animalswith the largest terrestrial faunal biomass. The primary organisms responsible for decomposingorganic materials and converting major and minor mineral nutrients are earthworms. Earthworms are sometimes referred to as ecosystem engineers because they comprise the majority of soil animal biomass in agricultural environments. Manure worms, such as *Eisenia fetida*, are utilized commercially to create compost that is used in farming. This worm's resilient nature enables it to withstand significant variations in humidity and temperature. Unrestrained application of pesticides and herbicides contaminates soil habitats, affecting the population ofearthworms. Pretilachlor is a chloroacetanilide herbicide that is commonly used in transplantedand direct seeded rice to control a variety of grasses, broad-leaved weeds, and sedges. Its chemical formula is 2-chloro-2,6-diethyl-N-(2-propoxyethyl) acetanilide. A systematic post- emergence herbicide called Bispyribac-Sodium 2,6-bis [(4,6-dimethoxy-2- pyrimidinyl) oxy] benzoate is used in rice fields to effectively suppress broad leaf weeds like Echinochloa species and annual and perennial grasses. Herbicides can affect earthworm function, growth and reproduction. In this the red wiggler worm (Eisenia fetida) were used. Pretilachlor and Bispyribac-Sodium were tested on earthworms to check the effects on growth and reproduction on Eisenia fetida. The growth and the survival rate, the earthworm samples were checked at interval of 15, 30, 45, 60 days The population of earthworms and the number of cocoons produced by them were recorded by counting the number. When determining the harmful effects of pretilachlor, the weight of the earthworms was a more sensitive indicator than the mortality. Earthworm toxicity to pretilachlor and bispyribac-sodium can be assessed using sensitive criteria, such as the number of juveniles per cocoon. When compared to the control earthworms, the treated earthworms' growth rates decreased as a result of Pretilachlor. On increasing the dose of Bispyribac-sodium caused decline in number of juveniles.

Keywords: *Earthworms, Pretilachlor, Bispyribac-sodium, Growth, Eisenia fetida.*

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AFTEFS/SKUAST-K/AG/2024/117

Evaluation on Lethal concenteration (LC50) of insecticides Pymetrozine and Cartap on *Pheretima posthuma*

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India traditionally has an agricultural-based economy and it is considered to be the backbone of the Indian economy. Earthworms have a crucial role in sustainability because they play important role in soil fertility and plant growth. Earthworms are acknowledged as 'ecosystem engineers' as they extensively influence these physical, chemical, and biological properties of soil. Pheretima posthuma serves many vital economic roles in addition to being a small, but crucial species in their ecosystem. Earthworms, such as Pheretima posthuma, are beneficial to agrarian economies and therefore can be released into habitats similar to their original homes for agrarian purpose. They naturally plow the soil with their burrows, aerate the fields, and bring richer soil towards the surface. Their job as decomposer of leaves and other detritus returns nutrients to the soil, making them more fertile, and their bodily waste naturally produce nitrates and other ingredients for fertilizer.

The objective of the present study was to study the evaluation of toxicity of Pymetrozine and Cartap Insecticides on Pheretima posthuma. The insecticides Pymetrozine, 6-methyl-4-[€- (1yridine-3-ylmethylene) amino]-4,5-dihydro-2H-[1-3]-triazin-3 one, is a pyridine azomethine compound, which represents an emerging insecticide for plant-sucking insects, such as aphids, whiteflies and plant hoppers. Cartap hydrochloride is a thio-carbamate group of insecticide acts as a nereistoxin and has its effects on the nervous system of the insects. Its chemical name is S,S'-[2-(dimethylamino)trimethylene] bis (thiocarbamate)hydrochloride having chemical formula C7H16CIN302S2 and molecular weight 273.81g/mol. This study provides us when we increase the value of concentrations of insecticides, the mortality rate was increased. LC50 value of pesticides was calculated using the arithmetic method of Karber as adopted by Dede & Kaglo and confidence Interval was calculated by using computer program USEPA, 1993 (version 1.5) . The number of dead earthworms per group was recorded against the concentration for each

pesticide the 48 h. By using the contact filter paper method, the toxicity of cartap and pymetrozine on earthworms, indicated as LC50, increased with increasing exposure time.

Keywords: *Earthworms, Lethal concenteration (LC50), Pymetrozine, Cartap, Pheritima posthuma.*

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AFTEFS/SKUAST-K/AG/2024/118

Impact of Pretilachlor and Bispyribac-sodium on growth and reproduction on *Eisenia fetida*

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Earthworms are an essential part of soil ecosystems and the emblematic species of soil animals with the largest terrestrial faunal biomass. The primary organisms responsible for decomposing organic materials and converting major and minor mineral nutrients are earthworms. Manure worms, such as *Eisenia fetida*, are utilized commercially to create compost that is used in farming. Pretilachlor is a chloroacetanilide herbicide that is commonly used in transplanted and direct seeded rice to control a variety of grasses, broad-leaved weeds, and sedges. A systematic post-emergence herbicide called Bispyribac-Sodium 2,6-bis [(4,6-dimethoxy-2- pyrimidinyl) oxy] benzoate is used in rice fields to effectively suppress broad leaf weeds like Echinochloa species and annual and perennial grasses. Herbicides can affect earthworm function, growth and reproduction. In this the red wiggler worm (Eisenia fetida) were used. Pretilachlor and Bispyribac-Sodium were tested on earthworms to check the effects on growth and reproduction on Eisenia fetida. The growth and the survival rate, the earthworm samples were checked at interval of 15, 30, 45, 60 days The population of earthworms and the number of cocoons produced by them were recorded by counting the number. When determining the harmful effects of pretilachlor, the weight of the earthworms was a more sensitive indicator than the mortality. Earthworm toxicity to pretilachlor and bispyribac-sodium can be assessed using sensitive criteria, such as the number of juveniles per cocoon. When compared to the control earthworms, the treated earthworms' growth rates decreased as a result of Pretilachlor. On increasing the dose of Bispyribac-sodium caused decline in number of juveniles. When compared to the control earthworms, the treated earthworms' growth rates decreased as a result of Pretilachlor. On increasing the dose of Bispyribac-sodium caused decline in number of juveniles.

Keywords: *Earthworms, Pretilachlor, Bispyribac-sodium, Growth, Eisenia fetida.*

AFTEFS/SKUAST-K/AG/2024/119

Balancing Yield, Quality and Sustainability: The Impact of Mulch on StrawberryCultivation

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Strawberries are renowned for their delicious taste and nutritional value, making them one of the most sought-after fruits globally. As consumers increasingly prioritize both yield and quality, growers are actively seeking methods to enhance the sensory attributes and nutritional content of strawberries. In recent years, mulching has emerged as a promising cultivation technique that not only affects overall yield but also plays a crucial role in improving strawberry quality. Mulching involves covering the soil around strawberry plants with various materials, such as organic residues or plastic films. This introduction explores the effects of mulching on strawberry quality, investigating its potential to influence attributes like TSS, colour, titratable acidity, ascorbic acid, firmness, taste, aroma, reducing sugars and non-reducing sugars. The use of black mulch has been shown to increase juice percentage, total sugars, reducing sugars, Vitamin C, anthocyanin and minimum titratable acidity. Additionally, black plastic, agro-textile and sawdust mulch have significant effects on fruit skin colour (L*), chroma (C*) and hue values (H^0). Different mulch types have been observed to significantly influence the H^0. Organic optionslike dried banana leaves, straw, cardboard sheets, coconut and paddy husk have also demonstrated significant improvements in fruit quality while being environmentally friendly. Despite the advantages of organic mulches black polyethylene mulch has often been found to bethe most effective in terms of juice content, TSS, titratable acidity, ascorbic acid, total sugars, reducing sugars and non-reducing sugars. The choice of mulch can provide alternative and environmentally friendly options for enhancing strawberry quality and cultivation.

Keywords: *Sensory attributes, Nutritional content, Organic mulch, Fruit colour, Black polyethylene, Sustainable agriculture, Environmental impact, Quality attributes.*

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Enhancing Nutritional Quality Traits in Vegetables through BiotechnologicalApproaches

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The improvement of nutritional quality features in vegetable crops has been revolutionized by biotechnological techniques, addressing worldwide concerns associated with food security and hunger. The main biotechnology approaches used to enhance the nutritional qualities of vegetables are outlined herein, with a focus on genome editing, genetic modification, and sophisticated breeding methods. Vegetable crops can be genetically modified to improve their nutritional profiles by adding particular genes to vegetable crops. For instance, adding genes that synthesize vitamins and minerals can result in biofortified vegetables that have higher concentrations of vital nutrients. The production of vitamin A-enriched carrots and tomatoes are two successful examples. Transgenic techniques have also been utilized to increase antioxidant and phytochemical levels, which has improved health effects. CRISPR/Cas9 and other genome editing technologies have become highly precise techniques for modifying individual genes linked to nutritional characteristics. With this technology, specific alterationscan be made, including enhancing the production of more beneficial nutrients or decreasing anti-nutritional components. Utilizing CRISPR/Cas9 on vegetables has shown promise in improving qualities such as the flavonoids in peppers and the amount of iron in spinach. In addition to biotechnological technologies, advanced breeding techniques such as genomic selection (GS) and marker-assisted selection (MAS) speed up the development of nutritionally superior varieties. MAS uses molecular markers associated with nutritional qualities to aid in the selection of superior lines, whereas GS uses genomic data to anticipate and select for higher nutritional quality in breeding work. Overall, these biotechnology techniques present great opportunities for improving the nutritional value of vegetable crops. Researchers can produce vegetables with higher nutritional profiles by combining genetic engineering, genome editing, and advanced breeding, resulting in better health outcomes and addressing worldwide nutritional deficiencies.

Keywords: *Nutritional quality, vegetables, biofortification, CRISPR/Cas9, biotechnology*

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Applications of genome editing tools in crop improvement

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Genome editing tools have revolutionized the field of crop improvement by enabling precise and targeted modifications to plant genomes. Genome editing incorporates precisely manipulating cellular DNA sequences to change cell fates and organism features. Most traditional and modern crop-improvement approaches depend upon natural or artificially induced genetic variations and demand meticulous characterisation of the offspring of numerous generations resulting from time-consuming genetic crossings. On the contrary, genome-editing technologies allow for the rapid and accurate modification of genomes, allowing improvements to be introduced directly into elite types. These advanced biotechnological techniques including CRISPR/Cas9, TALENs, and ZFNs, offer a valuable foundation for studies of gene function, metabolic engineering, and trait modification for crop improvement. Development of genome editing methodologies began 20 years ago, first with mega-nucleases and followed by zinc finger nucleases, transcriptional activator like effector nucleases and most recently, clustered regularly interspaced short palindromic repeat (CRISPR)-associated protein (Cas), which is by far the most utilized method. The CRISPR/Cas9 system in particular has gained widespread adoption due to its simplicity, efficiency and versatility. In agriculture, they enable the development of crops with improved yield, resistance to pests, stress tolerance and enhanced nutritional value. In conclusion, the application of genome editing tools in crop improvement holds immense potential to address the challenges of modern agriculture. Continued research and development in this field will likely lead to the creation of crops that are more resilient, productive, and sustainable, contributing to global food security and agricultural sustainability.

***Keywords**: Genome editing, gene modification, Crispr-Cas9, TALENs, ZFNs, Crop improvement.*

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FTIR profiling of bioactive compounds extracted from agricultural wastes

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The aim of the present study was to analyze various phenolic compounds in extracts from agricultural waste, including fruit and vegetable waste. These extracts were prepared using both conventional (Soxhlet, magnetic stirrer) and non-conventional (ultrasonicator) extraction methods. Four different solvents—acetone, ethanol, methanol, and water—were used for the analysis, followed by the characterization of functional groups using Fourier Transform Infrared (FTIR) spectroscopy. FTIR analysis of the agricultural waste extracts confirmed the presence of various compounds, including amides, alcohols, phenols, alkanes, carboxylic acids,aldehydes, ketones, alkenes, primary amines, aromatics, esters, ethers, alkyl halides, isocyanates, isothiocyanates, acetylenes, nitriles, phosphines, and aliphatic amines, which showed major peaks. Qualitative and quantitative changes in metabolomic patterns were observed in the ranges of 1700–1500 cm^{-1}, 1500–1300 cm^{-1}, and 1100–950 cm^{-1}. These regions of the FTIR spectra provide information about the presence of phosphorus from nucleic acids and phospholipids, amino acids and amide bonds I and II from proteins, organic acids with phosphodiester bonds, and carbohydrates with complex polysaccharides. The results of this study generated an FTIR spectrum profile of the extracts, which can be used for further research.

Keywords*: Agricultural waste, Soxhlet, Ultrasonicator, FTIR*

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Hydroponic farming

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Hydroponic farming presents a viable alternative to traditional agriculture, particularly in regions facing significant soil depletion and water scarcity. This method is lauded for its efficiency in water usage and its environmental benefits, including the absence of pesticides. Traditional farming faces several challenges, such as soil degradation, the impacts of natural disasters, urbanization, climate change, and the increased use of fertilizers. Conversely, hydroponic systems can be adapted into multi-storey structures, potentially overcoming many of these challenges. This study explores the advantages and limitations of hydroponic farming through the cultivation of various crops, such as coriander and leafy vegetables. Notable benefits include reduced cultivation time, the elimination of soil-borne diseases, easy crop management, the absence of weed growth, and no need for water spraying. Additionally, hydroponic systems can achieve water savings of up to 70–80% compared to traditional soil-based farming methods. This abstract outlines the significance, benefits, and drawbacks of hydroponic farming, offering insights into its potential as a sustainable agricultural practice.

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DEVELOPMENT AND EVALUATION OF NUTRITIONAL AND FUNCTIONALPROPERTIES OF COMPOSITE FLOUR

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This work aimed at examining the physical and functional properties of composite flours made from purple wheat, banana flour, and lemongrass powder. While commonly cultivated wheat varieties are low in anthocyanins, colored wheat is rich in these beneficial compounds. Lemongrassis known for its high content of vitamins A and C, as well as essential minerals. The research wasconducted to evaluate the functional and nutritional profile of Six different composite flours produced from these ingredients. The water absorption capacity of these composite flours rangedfrom 3.03±0.18 to 3.15±0.17 g/g, and the oil absorption capacity ranged from 2.36±0.09 to 2.46±0.03 g/g. Gluten content varied from 8.00±0.15 to 10.98±0.26 g/g. The crude protein content ranged from 5.56±0.29% to 7.99±0.29%, and crude fat content ranged from 2.93±0.17% to 3.66±0.08%. The total sugar content in the composite flours varied from 10.93±0.23% to 15.20±0.68%, while reducing sugars ranged from 9.17±0.56% to 11.00±0.21%. Mineral availability percentages were as follows: calcium from 48.66% to 93.33%, phosphorus from 39.48% to 55.43%, iron from 55.67% to 67.85%, and zinc from 31.99% to 72.17%. Phytic acid levels ranged from 32.06±0.12 to 34.17±0.06 in unprocessed wheat-based composite flours and from 29.14±0.09 to 31.19±0.02 in malted wheat-based composite flours. Protein digestibility ranged from 28.87±0.15% to 41.60±0.10%, while starch digestibility ranged from 21.30±0.01 to 45.01±0.09 mg maltose released per gram of composite flour. The total phenolic content (TPC) ranged from 135.20±3.01 to 156.76±8.82 mg GAE/100g, and the total flavonoid content (TFC) ranged from 248.49±9.17 to 616.11±5.99 mg RE/100g. The β-carotene content ranged from 44.67±1.97 to 118.37±4.71 ppm. Antioxidant activity was evaluated using DPPH (28.20±0.77 to 35.47±2.48 mg TE/100g), ABTS (85.16±5.32 to 100.63±4.13 mg AAE/100g), and FRAP (91.51±4.81 to 111.11±2.40 mg TE/100g). The study recommends the promotion and use of purple wheat, banana flour, and lemongrass powder in the production of biscuits, cookies, cakes, buns, and bread in India, a country that primarily relies on wheat flour.

Key words: *Composite flour, gluten, minerals, nutritional and purple wheat*

AFTEFS/SKUAST-K/AG/2024/125

Efficacy of Single-Cut Forage Sorghum Genotypes for Yield and Quality Traits under Different Fertilizer Levels

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Sorghum is the fifth most important crop after wheat, rice, maize and barley and is widely cultivated in the semi-arid regions of the world. It is the best *kharif* fodder for nutrition, with starch (63.68%), high digestibility (50-60%), dry matter (20-35%), sugars (8-17%), crude protein (7.5-10.0%), calcium (0.53%), phosphorus (0.24%), and crude fiber (30-32%). The present field experiment was performed in the Forage Section Research Farm, CCS Haryana Agricultural University, Hisar, India, during the rainy (*kharif*) season in 2023. The experiment was carried out in a split plot design, with four fertilizer levels in the main plot (F_1 - Control, F_2 - 50% of the recommended dose of fertilizer (RDF), F_3 - 100% RDF (75 kg N+30 kg P_2O_5+30 kg K_2O /ha), and F_4 - 150% RDF, and five single cut forage sorghum genotypes in the sub plot plot (V_1 – SPV 2878, V_2 – SPV 2879, V_3 – SPV 2881, V_4 – SPV 2884, V_5 – CSV 35F). The soil of experimental field had low nitrogen content and a medium phosphorus and potassium content. Among single cut sorghum genotypes, SPV 2881 produced the highest green fodder and dry matter yield (434.83 and 121.54 q/ha), which was significantly higher over rest of the genotypes. Among genotypes, SPV 2881 also fetched highest benefit-cost ratio (1.91), followed by SPV 2879. The estimated HCN content was below critical limit (200 µg/g on fresh weight basis) in all the genotypes tested at 30 days after sowing. Highest crude protein content (9.65%) estimated in SPV 2881 followed by SPV 2879 (9.47%). Among fertilizer levels, the application of 150% RDF produced the highest green fodder yield, dry matter yield, crude protein content and crude protein yield, which was comparable to 100% RDF but considerably superior than lesser fertilizer dosages. The maximum BC ratio (1.91) was obtained by using 100% RDF followed by 150% RDF (1.89). Because sorghum is a fairly NPK demanding crop, using 100% RDF dramatically increased fodder output.

Key words: *Sorghum, Single-cut, Fodder Yield, Fertilizer Levels, HCN, Crude protein and B:C*

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Advances in Biotechnology and Genetic Engineering: Shaping the Future of Potatoes

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Potatoes, one of the world's most important staple crops and known for their high nutritional value are at the forefront of agricultural research due to their global significance for food security. However, potato production is hindered by various factors, including diseases such as late blight (caused by *Phytophthora infestans*), pests like the Colorado potato beetle, and abiotic stresses such as drought and extreme temperatures. Traditional breeding methods have been employed for centuries to improve potato varieties, but they are time-consuming and often lack the precision needed to address specific challenges. Biotechnology and genetic engineering have emerged as key tools in addressing these challenges, transforming the landscape of potato research and cultivation. The global demand for sustainable agricultural practices and improved crop yields has placed biotechnology and genetic engineering at the forefront of agricultural research, particularly in potato science. The integration of cutting-edge techniques such as CRISPR, gene editing, tissue culture and molecular breeding allows for more precise modifications of potato genomes, leading to improved traits such as increased resistance to pests, pathogens, and environmental stress. Additionally, these technologies hold promise for enhancing the nutritional content of potatoes, making them a more viable solution to malnutrition in many parts of the world. Genetic engineering can introduce traits from other plants or organisms to enhance a potato's resilience to environmental stresses. As the world continues to face mounting pressures on agricultural systems, these innovations will play a critical role in ensuring a stable and sustainable food supply for generations to come.

Keywords: *Genetic engineering, Tissue culture, Molecular breeding, CRISPR*

AFTEFS/SKUAST-K/AG/2024/127

2nd International Conference on Agritech Intelligence and Beyond: Cutting Edge Innovations in Agriculture and Allied Sciences AI-CIAS 2024

"Impact on Chemical and Bio-organic Fertilizers on *Capsicum annuum L.* plant"

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In recent years, the most important problem faced by the world is to produce good quality and quantity food to meet the demands of increasing population. Chemical based Phosphate fertilizers such as diammonium phosphate (DAP), mono-ammonium phosphate (MAP) and single super phosphate (SSP) are generally applied. To cope up the effects of chemical-based (DAP) fertilizer on soil PROM has been used as an alternative in the present study which enriched with growth, improve soil fertility and plant nutrients. A total of five fertilizer treatments and one control in three replications were analyzed. The effects of fertilizer application on plant parameters were on plant height, total number of leaves, leaf area, total number of branches, number of flowers, number of fruits, average fruit weight, average fruit diameter at three different stages (vegetative, flowering and fruiting). The experimental results revealed that treatment T1 (PROM), T2 (PROM+ DAP), T3 (PROM+ DAP), T4 (PROM+DAP) and T5 (DAP) with different concentrations displayed significant performance in all parameters, where in initially T5 (DAP) performed well in improving leaf area, plant height and no. of fruits. In addition, other treatments also exhibited a notable effect on different plant parameters. Based on these results, it was found that all organic fertilizers can potentially improve the growth and nutrients of capsicum. From this it was concluded that organic farming is pressing priority to save biodiversity and natural resources and also supports biodiversity of plant and soil that are beneficial to the ecosystem.

Keywords: *PROM, DAP, nutrients.*

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AFTEFS/SKUAST-K/AG/2024/128

Developing the concept of Artificial Intelligence in Agriculture

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The agricultural sector has experienced a substantial increase in the utilization of artificial intelligence (AI) in recent years. The agriculture sector is using AI technology to enhance the management of the food supply chain, monitor soil and growing conditions, manage pests, analyze data for producers, and better the health of crops. It provides data on weather forecasts and the optimal time to fertilize. AI-powered solutions will enable producers to increase crop quality, produce more with fewer resources, and expedite the time it takes for products to reach the market. AI assists in the comprehension of soil qualities, suggesting the nutrients that can be used to enhance soil quality, crop health, and reduce waste in the production of biofuel and sustenance. AI-based technologies, such as hyperspectral imaging and 3D laser scanning, as well as agricultural robotics and sensor technology for data collection and transmission, can contribute to the preservation of crop health. Machine learning, convolutional neural networks, IoT, big data, and computer vision are the most frequently employed technologies in the application of AI techniques. This paper investigated the necessity of AI in the agricultural sector. A basic overview of AI in agriculture is provided, along with a few factors that AI monitors in the field. lastly, we recognized and discussed the significant applications with challenges in the adoption of AI in agriculture.

Keywords: *Artificial intelligence, Agriculture sector, crop health, AI techniques*

AFTEFS/SKUAST-K/AG/2024/129

Mechanisms of Salinity Stress and Advances in Developing Salt-Tolerant Rice Varieties

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Salinity stress is a significant abiotic factor that adversely affects rice (Oryza sativa) growth and productivity, particularly in coastal and arid regions. Rice, being a salt-sensitive crop, exhibits various physiological, biochemical, and molecular responses to salt stress, including reduced photosynthesis, ion imbalance, and oxidative damage. Understanding these responses is crucial for developing salt-tolerant rice varieties. Advances in genetic and molecular tools, such as quantitative trait loci (QTL) mapping, genome-wide association studies (GWAS), and CRISPR/Cas9-mediated genome editing, have facilitated the identification and modification of key genes involved in salinity tolerance. Strategies like the overexpression of ion transporters, osmoprotectants, and antioxidant enzymes have shown promise in enhancing rice's tolerance to saline conditions. This review highlights recent developments in understanding the mechanisms of salinity stress and the breeding of salt-tolerant rice varieties through conventional and biotechnological approaches.

Keywords: *salinity stress, rice, Oryza sativa, salt tolerance, QTL mapping, GWAS, CRISPR/Cas9, ion transporters, osmoprotectants, oxidative stress.*

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Comparative study and Pathogenicity of different fungi associated with foliar blight disease of wheat

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Wheat (*Triticum aestivum* L.) belongs to Graminae family and is one of the oldest and most important cereal crops cultivated worldwide. The crop is attacked by various disease incitants *viz*., fungi, bacteria, viruses, nematodes etc. which interfere with its production. Among the fungal diseases, foliar blight is one of the most devastating foliar fungal disease leading to the reduction in plant vigour and crop yield. Study was carried out with the objective to study the the different fungal pathogens associated with the foliar blight disease of wheat and to study their host-pathogen interaction. A total of 114 samples collected from the wheat fields representing three districts, namely, Jammu, Samba, Kathua were used for isolation of fungal pathogens. Sample analysis revealed that seven fungi *viz*., *Bipolaris sorokiniana*, *Alternaria alternata*, *Alternaria triticina*, *Fusarium moniliforme*, *Curvularia lunata*, *Aspergillus* spp., and *Penicillium* spp., were isolated from blighted wheat leaf samples. Among 114 samples analyzed, *B. sorokiniana* was present in (37.72%) samples, followed by *A. alternata* (24.56%), *A. triticina* (7.90%), *C. lunata* (7.02%) *and F. moniliforme* (3.51%) and presented in 43, 28, 9, 8, 4 samples, respectively. The data revealed that *B. sorokiniana, A. alternata* and *A. triticina* were the most predominant pathogens associated with blighted wheat leaf samples. The pathogenic behaviour of *B. sorokiniana* and *A. triticina* was ascertained both individually and in combination on the wheat cv. PBW-343. Data presented demonstrated that the infection on wheat seedlings increased when both fungi were used in combination. The different shapes of conidia of mycoflora were seen under a microscope by comparing these microscopic characteristics with the relevant literature.

Key words: *Status, Foliar Blight, Mycoflora associated*

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Evaluation of Chilli germplasm against Die-back disease caused by *Colletotrichum capsici* under subtropics of Jammu

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Chilli (*Capsicum annuum* L.) is an economically important spice crop, but its production is significantly constrained by diseases like die-back and fruit rot, primarily caused by fungal pathogens such as *Colletotrichum spp.* These diseases lead to severe yield losses, deteriorating fruit quality and reducing market value. The present study aimed to screen a diverse chilli germplasm collection to identify resistant genotypes against die-back and fruit rot. A total of 80 chilli accessions were evaluated under natural field conditions and artificial inoculation tests for disease incidence and severity. Disease symptoms, including necrotic lesions on shoots and sunken, decaying areas on fruits, were assessed on a 0-5 scale. Among the tested genotypes, high levels of resistance to die-back were observed in Bhut Jolokia (9.06%), BS-27 (2.46%), BS-28 (0.34%), BS-35 (8.40%), BS-37 (3.82%), CC-0189 (0.63%), Hisar Sakti (0.76%), IC-326272 (5.28%), and IC-383072 (1.81%). In terms of fruit infection, Bhut Jolokia (10.12%), BS-27 (2.54%), BS-35 (9.56%), BS-37 (6.74%), IC-326272 (9.34%), IC-383072 (2.38%), Pant C-1 (11.9%), Pusa Sadabahar (12.43%), SH-C-1 (15.3%), Taiwan-2 (13.89%), and Tanjung-2 (11.78%) exhibiting significantly lower disease scores and maintaining superior fruit quality compared to susceptible ones. These resistant lines provide valuable genetic material for breeding programs aimed at developing new chilli cultivars with enhanced resistance to die-back and fruit rot. The identified germplasm lines with strong resistance to both die-back and fruit rot hold promise for improving the resilience of chilli crops in disease-prone regions.

Key words:-*Chilli (Capsicum annuum), die-back, fruit rot, germplasm screening, disease resistance, fungal pathogens Chilli (Capsicum annuum L.) cultivation faces significant yield losses due to die-back and fruit rot, which are caused by fungal pathogens. In this study, 89 chilli germplasm lines were screened for resistance against die-back and fruit rot under field conditions.*

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Application of UAV (Unmanned Aerial Vehicle) in Forestry

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From recent years, Due to increasing global threats like Global warming, Climate change, floods and Anthropogenic activities that poses the pressure on our planet resources like forests, wildlife, and our ecosystem. And in these devastating Scenarios, The Economic Ecological importance of Remote sensing for Monitoring our forest resources is also increasing due to decreasing forest cover, forest health, Increasing Forest fire incidences, Insect, and pest outbreaks. Traditional method of remote sensing includes the Satellite and manned aircraft which are expensive for gathering data or frequent monitoring. Here's UAV (unmanned Aerial Vehicle) comes to the rescue with high resolution, low lost, Different types of sensors it can hold and ability of real times operations. Here we compile a Literature review on application of Unmanned aerial vehicle in forestry research of Past 20 years. we identified more than 500 research outputs which includes research papers, Magazine articles. India contributes lesser than European countries in publishing literature related to Use of UAVs in Forestry applications. During the period 2000 and 2024, research publication on Use of UAV's has been increased in Forest fire, Disease outbreak detection, Wildlife monitoring and vegetation health assessment Due to increase in incorporation of machine learning in detection and classification of tree species. Despite of the increasing publication in this period but most of the papers are published in low impact journal which often perceived as having weak peer review standards. This review aims to provide the valuable information on application of UAVs in forestry, types of drones and sensors is to be used, trends, gaps, and research quality.

Keywords *– Forestry, Health monitoring, Sensors, Unmanned aerial vehicle.*

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Theme 2: Biotechnology and Genetic Engineering
Genetic enhancement for Brown planthopper resistance in Popular Basmati rice variety

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Pusa Basmati 1509 is one of the major foreign exchange earning varieties of Basmati rice. It is semi-dwarf, early maturing and has exceptional cooking quality. However, it is highly susceptible to various biotic stresses including the brown planthopper (BPH). The present study investigates the cross PB1509/ (PR122/*O. nivara* 104646) ^{*2}//PB1509^{*3}, leveraging PB1509's early maturity while addressing its known vulnerability to BPH. Phenotypic characterization for yield and attributing traits as well as BPH resistance of 21 advanced backcross Basmati breeding lines from this cross along with checks was carried out during *Kharif* 2022 using an augmented design. Six lines with BPH resistance and high yield potential were selected and reevaluated in *Kharif* 2023 using a randomized complete block design for yield traits and BPH resistance. Molecular marker analysis confirmed the presence of the *Bph34* gene in five lines. These lines also demonstrated intermediate amylose content validated by the presence of the *wx* gene and exhibited aroma which was confirmed by the absence of the *badh2* gene. Graphical genotyping with 145 SSR markers revealed that 27 markers were polymorphic underscoring diverse genetic contributions and highlighting the cross PB1509/ (PR122/*O. nivara* 104646) ^{*2}//PB1509^{*3} for achieving up to 90.1% genome recovery. This integrated approach combining phenotypic, molecular and genomic analyses represents a significant advancement in Basmati rice breeding, offering improved resistance to Brown Planthopper (BPH) without compromising Basmati quality.

Keywords: *Basmati rice, Brown plant hopper (BPH), molecular marker technology, amylose content, Bph34 gene, genome recovery.*

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Comparative study and Pathogenicity of different fungi associated with foliar blight disease of wheat

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Wheat (*Triticum aestivum* L.) belongs to Graminae family and is one of the oldest and most important cereal crops cultivated worldwide. The crop is attacked by various disease incitants *viz*., fungi, bacteria, viruses, nematodes etc. which interfere with its production. Among the fungal diseases, foliar blight is one of the most devastating foliar fungal disease leading to the reduction in plant vigour and crop yield. Study was carried out with the objective to study the the different fungal pathogens associated with the foliar blight disease of wheat and to study their host-pathogen interaction. A total of 114 samples collected from the wheat fields representing three districts, namely, Jammu, Samba, Kathua were used for isolation of fungal pathogens. Sample analysis revealed that seven fungi *viz.*, *Bipolaris sorokiniana*, *Alternaria alternata*, *Alternaria triticina*, *Fusarium moniliforme*, *Curvularia lunata*, *Aspergillus* spp., and *Penicillium* spp., were isolated from blighted wheat leaf samples. Among 114 samples analyzed, *B. sorokiniana* was present in (37.72%) samples, followed by *A. alternata* (24.56%), *A. triticina* (7.90%), *C. lunata* (7.02%) *and F. moniliforme* (3.51%) and presented in 43, 28, 9, 8, 4 samples, respectively. The data revealed that *B. sorokiniana, A. alternata* and *A. triticina* were the most predominant pathogens associated with blighted wheat leaf samples. The pathogenic behaviour of *B. sorokiniana* and *A. triticina* was ascertained both individually and in combination on the wheat cv. PBW-343. Data presented demonstrated that the infection on wheat seedlings increased when both fungi were used in combination. The different shapes of conidia of mycoflora were seen under a microscope by comparing these microscopic characteristics with the relevant literature.

Key words: *Status, Foliar Blight, Mycoflora associated*

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Assessment and optimization of inoculation techniques for charcoal rot disease in sunflower

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Charcoal rot caused by *Macrophomina phaseolina* poses severe threat to sunflower crop in most of sunflower growing countries especially in arid regions. The establishment of disease by artificial inoculation is essential for studies of the various aspects of plant pathology. Thus, in present study, an effort was made to standardize the inoculation techniques for development of charcoal rot in sunflower for their utilization in screening and etiological studies. A fungal pathogen isolated from a charcoal rot infected roots of sunflower was characterized based on cultural, morphological and molecular characteristics as *Macrophomina phaseolina* which was further used in assessing the inoculation technique on sunflower hybrid PSH 2080. Toothpick and stem inoculations techniques were performed on 50 days old plant at 30 cm height on stem by pricking the stem with *M. phaseolina* infected toothpick and placing a 5 mm round mycelial plug from 4 days old colony of *M. phaseolina* by peeling the epidermis with razor blade, respectively. Of the inoculation techniques tested under field conditions, tooth pick inoculation method came out as best inoculation technique based on disease severity (68.51%) for large scale screening that ensured rapid disease development as compared to the stem cut method. Under poly house conditions, soil inoculations at various inoculum densities were made using infected sorghum grain and sand maize media. Both the inoculum methods were effective in disease development but sorghum grain inoculation method was found more efficient and was able to induce cent percent disease incidence and more disease severity (63.62 % @ 4g sorghum grain inoculum per kg dry soil) than sand maize inoculation method and can be used in management and etiological studies.

Keywords: *Sunflower, Charcoal rot, Macrophomina phaseolina, Inoculation techniques, Screening*

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Enhancing Nutritional Quality Traits in Vegetables through Biotechnological Approaches

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The improvement of nutritional quality features in vegetable crops has been revolutionized by biotechnological techniques, addressing worldwide concerns associated with food security and hunger. The main biotechnology approaches used to enhance the nutritional qualities of vegetables are outlined herein, with a focus on genome editing, genetic modification, and sophisticated breeding methods. Vegetable crops can be genetically modified to improve their nutritional profiles by adding particular genes to vegetable crops. For instance, adding genes that synthesize vitamins and minerals can result in biofortified vegetables that have higher concentrations of vital nutrients. The production of vitamin A-enriched carrots and tomatoes are two successful examples. Transgenic techniques have also been utilized to increase antioxidant and phytochemical levels, which has improved health effects. CRISPR/Cas9 and other genome editing technologies have become highly precise techniques for modifying individual genes linked to nutritional characteristics. With this technology, specific alterations can be made, including enhancing the production of more beneficial nutrients or decreasing anti-nutritional components. Utilizing CRISPR/Cas9 on vegetables has shown promise in improving qualities such as the flavonoids in peppers and the amount of iron in spinach. In addition to biotechnological technologies, advanced breeding techniques such as genomic selection (GS) and marker-assisted selection (MAS) speed up the development of nutritionally superior varieties. MAS uses molecular markers associated with nutritional qualities to aid in the selection of superior lines, whereas GS uses genomic data to anticipate and select for higher nutritional quality in breeding work. Overall, these biotechnology techniques present great opportunities for improving the nutritional value of vegetable crops. Researchers can produce vegetables with higher nutritional profiles by combining genetic engineering, genome editing, and advanced breeding, resulting in better health outcomes and addressing worldwide nutritional deficiencies.

Keywords: *Nutritional quality, vegetables, biofortification, CRISPR/Cas9, biotechnology*

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Agronomic interventions to reduce emission of greenhouse gases

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Increasing greenhouse gas (GHG) emissions are a major contributing factor to climate change, which is one of the 21st century's top environmental concerns. The immediate consequences of climate shift include rising sea levels, food security, health issues, severe storms, migration, and an increase in financial losses. The climate smart agriculture is described as a methodical process aimed at creating farming policy that can offer a balanced supply of food. Some Climate Smart Agriculture practices include Integrated pest management (IPM), Agroforestry (AF) and fodder management (FM) put a strong focus on decreasing carbon emissions and land conservation, zero tillage/Minimum tillage (ZT/MT) enhances infiltration and retention of water, and organic matters by lowering resources expenditure throughout field cultivation. Nutrient-smart methods, which are determined on increasing effective usage of nutrients, include Site specific integrated nutrient management (SINM), which boosts the allocation of soil nutrients based on the region, season and kinds of crops. Site specific integrated nutrient management (SINM), which boosts the allocation of soil nutrients based on the region, season and kinds of crops, Leaf colour charts (LCC), which measure the essential quantity of nitrogen on the basis of crop greenness, are employed to diagnose nitrogen deficit in crops like maize and wheat. They are additionally utilized for split dose applications in rice fields. Knowledge-smart practices, which advances production and aids in lowering ecological footprints by using native knowledge and method, includes improved crop varieties (ICV), Contingent crop planning (CC).

Key words: *Greenhouse gases, Agroforestry, Zero tillage.*

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Contract Farming in Coochbehar District of West Bengal: A Socio-economic Profile Study

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The present study deals with the socio-economic profile of the contract farmers of the Coochbehar district of West Bengal. An *ex-post-facto* research design was adopted, using a purposive multistage random sampling method. The Coochbehar district has been chosen purposively because it has an active presence of contract farmers who have been involved in innovative contract farming opportunities for the last 10-12 years. Hundred (100) respondents were chosen out of ten (10) different villages. This study included nineteen independent variables for the profile study which included, personal variables, socio-economic variables, communication variables, and psychological variables. The mean age is 40.63 years (SD = 08.05) with the majority (62.00%) in the medium group (34-49 years). Education was mainly medium (75.00%), while the mean score was 08.47 (SD = 03.18), and the family education status is also mainly medium (70.00%) with a mean of 06.18 (SD = 01.43). In contract farming experience, the major portion is medium (62.00%), with 01.30-07.50 years of experience, having a mean experience of 04.40 years (SD = 03.11). Annual family income is mainly medium (66.00%), averaging ₹ 02.04 lakhs (SD = 00.86). Expenditure too is on an average of ₹ 01.44 lakhs (SD = 00.65). The landholding is medium (76.00%), with an average of 02.58 hectares (SD = 01.11). Regarding economically active members, most of them fall into the medium category (80.00%), averaging 02.27 (SD = 00.78). Personal possessions also are primarily medium (70.00%), with a mean of 08.08 (SD = 02.69). Communication skills post 68.00% at the medium level, with a mean of 15.93 (SD = 04.54). Extension contacts and mass media exposure are equally medium for most of the interviewees (56.00% and 65.00%, respectively). Extension participation is 73.00% in the medium range, averaging 06.24 (SD = 02.39). Concerning psychological variables, scores are in a medium level in economic motivation and risk preferences with a mean of 09.71 (SD = 01.57) and 15.43 (SD = 01.97), respectively.

Keywords: *socio-economic profile, contract farming, ex-post-facto, purposive multistage random sampling*

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An economic analysis of production and marketing of potato crops in Etawah district of Uttar Pradesh

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Potato (*Solanum tuberosum* L.) popularly known as the 'king of vegetables'. Vegetable are rich and comparatively cheap source of vitamins and minerals. Besides, vegetable have key role in neutralizing the acids produce during digestion of proteinous and fatty foods. Vegetables from the most important component of food of mankind, as they not only nutritive, but also indispensable for the maintenance of human health. Potato is a major world food crop and consumed by almost all the people in the world. The diversified uses of potato cover fresh food, processed product, animal feed and raw material for industries. Potato is a major food crop, grown in more than 130 countries in the world. According to FAO (2016), Potato is consumed by more than one billion people in the world. It is a high quality vegetable cum food crop. Uttar Pradesh is the Indian State with the highest potato production in India. This study has analyzed the cropping pattern, cropping intensity, cost of cultivation, costs and returns, Resource use efficiency and marketing efficiency of potato crops in Etawah district of Uttar Pradesh. The study is based on secondary data collected from published/unpublished record of district and block headquarters, books, journals; periodicals etc. Primary data were collected through personal interview method on well structured and pre-tested schedules. The data pertained for the agriculture year 2020-21. Suitable statistical tools were used for analysis of data. Study observed that cropping pattern shows that potato covering 16.96 area followed by rice (14.53), maize (11.42), wheat (9.69), urd (5.19), moong (4.50), respectively. Cropping intensity was observed 265.41 per cent on an overall average.

Cropping intensity decrease with the increase in the size of land holding. The perhectare cost of cultivation of potato increase with increase in the size of farms. The maximum total cost of cultivation was recorded on small farms (Rs.

63764.36). On an overall average cost C_3 was recorded Rs. 62226.76. Costs C_1, C_2 and C_3 were found increasing trend with increasing size of farms. The resource use efficiency of five variables namely, seed, human labour manure and fertilizer irrigation and plant protection were analysed includedfactor jointly explained 0.9222, 0.9269, 0.9182 and 0.9292 per cent variation of the dependent variable on marginal, large, small and medium farms, respectively. The cultivation of potato was characterized by decreasing return to scale on each farm situation. Therefore by increasing all the factors one per cent simultaneously resultsin increase of the returns by less than one per cent on each farm situation. In regard to marking of potato, three channels were identified viz., (i) Producer-Consumer (ii) Producer-Retailer-Consumer (iii) Producer- Wholesaler.Marketing cost, marketing efficiency and marketable surplus. It was observed that producer's share in consumer's rupee decreases with increases number of intermediaries. In the proposed study, channel first was most efficient as compared to second and third channel. In channel first producers share in consumers rupee was maximum followed by channel second and channel third. Constraints faced by the potato growers of the study are were categories as technical problem, management problem, marketing problem and miscellaneous problem. In the light of encountering constraints pertaining to earlier identified aspects, the policy issues are suggested for establishment of wide coverage of regulated market, setting up of processing unit, establishing cold storage with potential capacity, providing improved quality seed and environment friendly transport means along with pakka road linkage with rural locality and developing efficient system of market intelligence in the rural area to provide ideal marketing system in order to increasing efficiency of potato marketing.

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Innovation in Food Processing and Preservation

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The rapid advancement of technology in recent decades has transformed the food industry, particularly in the areas of food processing and preservation. This paper explores the innovative methods that have emerged to address the challenges of food safety, quality, and sustainability, while meeting the growing demands of a global population. Traditional food processing and preservation methods, though effective, are often insufficient in ensuring long-term food security and minimizing waste. Innovations such as high-pressure processing (HPP), pulsed electric fields (PEF), nanotechnology, and intelligent packaging are revolutionizing the field by enhancing food safety and extending shelf life without compromising nutritional value.

The integration of automation, artificial intelligence, and data-driven solutions in food processing facilities is driving efficiency and reducing human error. Additionally, sustainable approaches, such as plant-based preservatives and biodegradable packaging, are gaining traction to reduce the environmental footprint of food production. This paper also examines the role of biotechnology in developing genetically modified organisms (GMOs) and microorganisms that enhance food preservation. These innovations not only improve the sensory and nutritional qualities of food but also address global challenges such as food waste and resource scarcity.

However, the paper highlights that despite these advancements, there remain significant challenges, including the high costs of adopting new technologies, regulatory hurdles, and consumer resistance to certain innovations. The research underscores the importance of interdisciplinary collaboration in furthering innovations in food processing and preservation and advocates for the widespread adoption of these technologies to ensure food security, safety, and sustainability.

Keywords: *Food processing, food preservation, innovation, high-pressure processing, pulsed electric fields, nanotechnology, intelligent packaging, sustainability, biotechnology, food security.*

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AFTEFS/SKUAST-K/AG/2024/141

Deciphering Ethephon's Influence on Bitter Gourd: Implication for sex control

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A field experiment was conducted to study the influence of Ethephon on sex expression, growth and seed yield parameters of bitter gourd. Treatments involved 6 different concentration of Ethephon E_1: 50ppm, E_2: 100ppm, E_3: 150ppm, E_4: 200ppm, E_5: 250ppm, E_6: 300 ppm and three stages of Ethephon application S_1: 4 True leaf stage; S_2: 4 true leaf stage + 15 days after first application; S_3: 4 True leaf stage + 15 days after first application + 15 days after second application resulting in 18 different treatment combinations and one additional treatment i.e. no application. E_6S_3 i.e. 300 ppm concentration of Ethephon at three different stages i.e. 4 True leaf stage + 15 days after first application + 15 days after second application results in lower node number for first female flower (3.93), higher node number for first male flower (14.2), more number of female flowers (30.68), less number of male flowers (58.60).

Keywords: *Bitter gourd, Ethephon, Stages, Sex expression, Female flowers*

AFTEFS/SKUAST-K/AG/2024/142

Chemical management of spot blotch of wheat (*Bipolaris sorokiniana)*

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Spot blotch, caused by *Bipolaris sorokiniana*, is one of the important diseases of wheat worldwide. The main objective of this study was to investigate the suitable fungicides for foliar spray at minimum formulations. *In vitro* and field experiments were conducted to evaluate the efficacy of different systemic and non-systemic fungicides *viz*., Folicur 250 EC (Tabuconazole) Amistar 23 % SC (Azoxystrobin), Vitavax Power 75 % WP (Corboxin 37.5 % +Thiram 37.5%), Bavistin 50 % WP (Carbendazim), Indofil M-45 75% (Mancozeb) and Blitox-50% WP (Copper Oxychloride) at different concentrations to control spot blotch disease of wheat. Among the systemic fungicides, propiconazole exhibited maximum inhibition of *in vitro* mycelia growth at 0.05%, followed by Azoxystrobin, Thiram 37.5 +Corboxin 37.5 and Carbendazim. Among non-systemic fungicides, Mancozeb was found most effective at 0.3%. Under field evaluation Tabuconazole was most effective at 0.1% showed disease severity 19.21% as against 60.87 % in control, followed by Azoxystrobin, Mancozeb and Copper Oxychloride. Highest TKW (Thousands kernel weight) (46.30 gm) and yield (41.22 q/ha) was recorded under Tebuconazole treatment, followed by Azoxystrobin and Mancozeb.

Key words: *Wheat, spot blotch, Bipolaris sorokiniana, fungicides*

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Climate-smart Agriculture and Adaptation Strategies

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Climate-smart agriculture (CSA) is an approach designed to sustainably increase agricultural productivity while enhancing resilience to climate change and reducing greenhouse gas emissions. It integrates practices that help farmers adapt to changing climate conditions, such as improving water management, diversifying crops, and adopting conservation tillage. Key **adaptation strategies** in CSA include the use of drought-resistant crop varieties, improved irrigation techniques, and agroforestry systems that enhance soil health and biodiversity. CSA also promotes **climate resilience** by integrating modern technologies, such as **remote sensing** and **data-driven** decision-making tools, to monitor environmental conditions and optimize resource use. By combining these techniques with **policy frameworks** and financial support, CSA aims to protect livelihoods, ensure food security, and minimize the impact of climate change on agriculture.

Keywords*: climate-smart agriculture, adaptation strategies, resilience, food security, water management, agroforestry, drought-resistant crops, climate change.*

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Emerging challenges and sustainability of rice-based food systems and microbial solutions in Varanasi district of Uttar Pradesh, India

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Rice is grown in 43.86 million ha in India with a production level of 104.80 million tones and productivity of about 2390 kg/ha. Cultivation of hybrid rice has potential to increase productivity and needs to be promoted. Varanasi, Uttar Pradesh is well-suited for rice cultivation due to its fertile soil, warm climate, and abundant water resources. The soil in Varanasi is loamy and sandy, with a pH of 6.5-7.5. This type of soil is ideal for rice cultivation, as it is well-drained and can retain moisture. The warm climate in Varanasi is also ideal for rice, as the crop requires a temperature of at least 20°C to germinate and grow. However, the current climate conditions and excessive use of pesticides are making it more difficult to produce rice in Varanasi, leading to reduced crop yields, increased pest pressure, and increased production costs.

***Challenges*:**

1. Insufficient soil moisture due to abrupt seasonal variations (I.e., delay in the arrival of monsoon).
2. Poor soil fertility due to insufficient/overuse of fertilizers.
3. Soil Erosion, drought, flood, flash floods and water logging further destroy the crops to a great extent.
4. Resistance development in the microbes, insects, pests and weeds due to the prolonged use of the same quality of fertilizers.
5. Several spp. of Fusarium, Pythium and other water molds cause rice seed rot during germination.

Methodology:

***Study Area*:** Varanasi district, Uttar Pradesh, India

***FCI functioning in the Varanasi District*:** We annually receive 40300 MT of paddy and after milling 27000 MT of rice is obtained while 85000 MT of rice is distributed in Varanasi region through PDS (Public Distribution System). So, the remaining 58000 MT of rice is outsourced from surplus rice states (Punjab & Haryana).

1. We ensure that the supplies should reach all beneficiaries of the concerned district.
2. A biometric scan is performed upon handing over the supplies to the beneficiary to make sure the right person has received the right amount.
3. We try to maintain the nutritional aspects of the product through fortification with essentials nutritional supplements like Folic Acid (10,000ug/kg), Cyanocobalamin (1000ug/kg) and Iron (3525mg/kg) to prevent the nutritional deficiencies at the district level (adhering to the ICDS and PM Potion scheme of the Government of India).

Results and Discussion:

Nowadays insects and microbes show resistance against chemical treatment. So, there is a need to design different options for microbial and pest management.

Overall, the cultivation area available to meet the demands of a dense population like Varanasi is invariably low.

1. To achieve annual yields of 70% from the paddy which is currently 67%.
2. To grow less thirsty crop varieties using Genetic modification.
3. Dipping in hot water treatment for several spp.of water molds.
4. To design environment friendly, less-toxic and improved varieties of biofertilizers so that there is limited or no resistance development in the insects and pests.

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Genetic Modification and Gene Editing

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Genetic modification and gene editing are cutting-edge techniques in biotechnology that allow precise alterations to an organism's genetic material. **Genetic modification** (GM) involves the insertion of foreign genes into an organism's genome to introduce new traits, such as pest resistance or improved nutritional content. **Gene editing** techniques, such as **CRISPR-Cas9**, allow for highly targeted changes to specific genes within an organism's existing DNA, making it possible to enhance or silence particular traits. These technologies have widespread applications in agriculture, where they are used to develop crops with improved yield, stress tolerance, and resistance to disease. In medicine, gene editing holds potential for curing genetic disorders and creating new treatments for inherited diseases. However, despite the promising advancements, these technologies raise significant **ethical**, **environmental**, and **regulatory** concerns regarding their impact on ecosystems, biodiversity, and human health. As research progresses, ongoing discussions about safety and public acceptance are critical to harnessing the full potential of genetic modification and gene editing in both food production and healthcare.

Keywords*: genetic modification, gene editing, CRISPR-Cas9, biotechnology, agriculture, genetic disorders, crops, ethics, regulation.*

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IMPORTANCE OF INDOOR PLANTS IN METRO CITIES

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A metropolitan city is a region consisting of a densely populated urban clump, having housing areas, commercial areas, transport network, infrastructures and industries. Metro cities are the most polluted places in cities with high-rise buildings, and main air pollution in metro cities is usually particulate matter (PM) and carbon monoxide produced from open fires, gas stoves, central heating boilers, etc. Pollution in metropolitan cities is posing a serious threat to public health and the environment. Long period exposure to particulate matter can lead to many diseases such as respiratory asthma, bronchitis, COPD, cardiovascular diseases, lung cancer and heart attack. Plants have ability to purify the airs by pulling contaminants into the soil and microorganisms present in root zone convert these contaminants into food, which can be assimilate by the plant. Because plants absorb the carbon dioxide liberated from human and animal activities and in turn liberate oxygen, which create a healthy air for breathing. It has been reported that plants can remove VOCs (Volatile organic compounds) of from air to a larger extent. VOCs include formaldehyde, Benzene, Trichloroethylene, Carbon monoxide which is present in grocery bags, cigarette or tobacco smoke, personal care products, household cleaning products, gasoline, printing inks, paints and adhesives. Just after a few days of plant exposure any one will feel more open, fresh, less stressed and relaxed leading to increased productivity and overall well-being. Indoor plants have been reported to improve physical and mental health of inhabitants. Indoor plants in workspaces can improve focus, concentration and efficiency. The presence of greenery due to indoor plants creates a more pleasant and engaging environment and adds good vibrancy to the living spaces. They can transform any room into a visually appealing and incorporating indoor plants make a touch of nature into our homes. But we should choose indoor plant varieties that are safe for pets and children.

***Key Words**: Metropolitan city, Indoor plants, Pollution.*

AFTEFS/SKUAST-K/AG/2024/147

STUDIES ON PROCESSING AND STORAGE STABILITY OF JACKFRUIT READY TO SERVE DRINKS FOR NUTRITIONAL SECURITY

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A trial was conducted on Jackfruit to study the physical properties and chemical composition, to find out the suitable recipes for preparation of ideal RTS, also storage stability of Nectar prepared from suitable recipes. Physical and chemical properties revealed that average weight (g)-11500, Juice content(%)-35.70,TSS(%)-19.45, Total tritable acidity(%)-0.18, Ascorbic acid (mg/100g)-21.08 indicated the proper maturity stage of Jackfruit for RTS preparation.

In this study different recipes of Jackfruit RTS was standardized to explore the processing potential of Jackfruit, a minor fruit. There were five different possibilities of recipes. The RTS prepared from the recipes 12% pulp, 11% TSS and 0.25% Acidity gave highest organoleptic quality score ,grater consumer accept abilities and retain good nutritional qualities followed by RTS prepared from 10% pulp, 13% TSS and 0.30% Acidity and the quality of the prepared Nectar was maintained up to 5th months at ambient temperature.

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Study on enhancing quality through combined application of nutrients and biofertilizers of guava (*Psidium guajava* L.) cv. Hisar Safeda of rainy season

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The investigation entitled **"Study on enhancing quality through combined application of nutrients and biofertilizers of guava (*Psidium guajava* L.) cv. Hisar Safeda_of rainy season"** The research was carried out in a well-managed guava orchard located at Aryanagar and CCSHAU, Hisar, during the rainy season of 2019-20. A total of ten treatments, including a control, were arranged in a randomized block design with three replications each. The treatments involved various combinations of fertilizers, micronutrients, biofertilizers, FYM, and vermicompost, applied to observe their effects on guava plants. The treatments produced varying responses throughout the study. The rainy season fruits, with the highest Total Soluble Solids (TSS), total sugars, and the lowest acidity observed in treatment T8 (RDF 75% + $ZnSO_4$ + $MnSO_4$ + Borax + PSB + Azotobacter + FYM). On the other hand, treatment T4 (RDF 100% + $ZnSO_4$ + $MnSO_4$ + Borax + organic mulch) showed the maximum ascorbic acid content.

***Keywords**: Biofertiliser, guava, vermicompost, quality, TSS, FYM*

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Effect of different preservatives on shelf life of Guava nectar

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The present experiment "Effect of different preservatives on shelf life of guava nectar" was conducted in Post harvest laboratory of Department of Horticulture during 2022-23. In present study two varieties of guava i.e. Hisar Safeda and Hisar Surkha were used for making the bi-products. The physicochemical parameters of Hisar Surkha and Hisar Safeda pulp such as TSS, pH, acidity, total and reducing sugars were found out to be (11.21 and 11.10ºBrix), (3.74 and 4.62), (0.38 and 0.33%), (8.28 and 8.21 %) and (5.17 and 4.99 %), where as phenols, ascorbic acid, tannins, pectin and crude protein were recorded to be (153.90 and 142 mg/100g), (127.24 and 114.09 mg/100ml), (0.38 and 0.41%), (0.57 and 0.50%) and (0.89 and 0.78%) respectively. The preservatives used were Sodium Benzoate (0.3%, 0.6% and 0.9%), Sorbitol in form Potassium Sorbate (15%, 20% and 25%) and Potassium metabisulphite (0.1%, 0.2% and 0.3%). The experiment comprised of total 10 treatments having 3 replications each. The observations were recoeded at 30, 60, 90, 120 days. Samples were tested for total soluble solids (TSS) and sensory attributes i.e. color, flavor, texture and overall acceptability. Data was analyzed with complete randomized design (CRD). The effect of storage and treatments were studied for four months of storage with an interval of 30 days. During storage, TSS increased, mean score of color, flavor and texture declined, increased browning and overall acceptability decreased. The results showed that the treatments and 90 days storage interval have significant effect on acceptability of Guava bi-products. The addition KMS (0.2%) proved to be the best in terms of extending the shelf life and improvingthe quality of the products during storage.

Keywords*: Guava; Nectar; Organoleptically; Physicochemical; Browning*

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Sensor Technologies for Crop Monitoring

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Sensor technologies play a pivotal role in modern agriculture, enabling precise crop monitoring for optimized productivity and resource use. These technologies include **soil sensors**, **climate sensors**, **crop canopy sensors**, and **aerial imaging**. Soil sensors measure moisture, pH, and nutrient levels, aiding in irrigation and soil management. Climate sensors provide data on temperature, humidity, and sunlight, while crop canopy sensors, mounted on drones or satellites, detect plant health, stress, and nutrient deficiencies. Aerial imaging and in-field sensors like chlorophyll meters enhance real-time crop monitoring. Integrated with **IoT** and **data analytics**, these technologies support sustainable farming and improved yields. By combining sensor technologies with data analytics and **machine learning**, farmers can optimize crop yields, reduce input costs, and promote **sustainable agriculture** practices. These innovations are essential for addressing the growing global demand for food while minimizing environmental impact.

Keywords:- *sensor technologies, crop monitoring, precision agriculture, soil sensors, climate sensors, IoT, sustainable farming.*

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Nutraceuticals and Functional Foods

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Nutraceuticals and functional foods have emerged as key players in the health and wellness industry, bridging the gap between nutrition and medicine. This abstract explores the growing importance of these bioactive-rich products in promoting health and preventing chronic diseases. Nutraceuticals, derived from food sources with medicinal properties, and functional foods, which are enhanced to provide specific health benefits, are gaining popularity due to increasing consumer awareness and desire for natural health solutions. The review examines the scientific evidence supporting their efficacy, focusing on key bioactive compounds such as antioxidants, omega-3 fatty acids, and probiotics. Regulatory challenges and the need for standardized quality control are addressed. While promising, further research is necessary to fully understand the long-term effects and optimal use of these products in diverse populations.

Keywords: *Nutraceuticals, functional foods, bioactive compounds, chronic disease prevention, antioxidants, omega-3 fatty acids, probiotics, health promotion, regulatory challenges, consumer awareness.*

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Soilless Cultivation in Horticulture: A Sustainable Path for Modern Crop Growth

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Growing population and climate change will make it difficult to supply enough high-quality food, fuel, and fodder by 2050. The amount of arable land available is decreasing as a result of industrialization and urbanization; in 1960, it was 0.50 ha, but today it is just 0.25 ha. The ongoing intense farming resulted in unhealthy soil. With population growth constantly driving up demand for food, fuel, and fodder, it is becoming increasingly impossible to maintain supply using current agricultural methods under a regime of climate change. Soilless culture is one of the finest solutions to solve this issue. A unique technique called "solensess culture" uses growing media—which can be solid, liquid, organic, or inorganic—to cultivate crops or plants without the need for soil. One of the main benefits of using soilless media is that it can save up to 85–90% of the water used in conventional agriculture while producing superior yields and virtually no environmental harm. Many locations use soilless medium for plug tray nursery rearing on a business basis. In the recent past, hydroponic gardening has become popular as a novel method of growing plants. One of the fastest and most effective ways to generate seed potatoes is aeroponics, which cuts costs and time by producing a huge number of micro tubers in a single generation. Since the growing environment is usually controlled, a strong, resilient production system may be created to ensure a steady supply of fruits, vegetables, and flowers.

Keywords: *Hydroponic, aeroponic, nursery, flowers, population*

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Modeling the Future of Forests: Insights into Policies, Ecosystem Services, and Biodiversity

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Forest are complex and dynamic ecosystems providing important flow of various ecosystem services that are critical for the welfare of the society. Due to global pressures such as climate change, deforestation, and land-use changes intensify, the future of forests has become a focal point for policymakers and researchers. This paper reviews insights gained from recent modeling studies that explore the future of forests under various policy scenarios, with a particular focus on ecosystem services and biodiversity conservation. These models provide a valuable tool for simulating complex interactions between ecological, social, and economic factors that influence forest dynamics. They help to predict potential outcomes of different policy interventions, sustainable forest management, and conservation strategies.Our review reveals that policy-driven scenarios, and the promotion of improving forest management through sustainable forestry practices, can significantly enhance the provision of ecosystem services. Furthermore, the modeling studies underscore the importance of integrated approaches that consider the trade-offs between timber production, biodiversity conservation, and other ecosystem services. They suggest that policy measures promoting a balance between forest utilization and preservation can lead to more sustainable outcomes. This study demonstrates the potential of modeling studies to inform policy decisions aimed at securing the future of forests, emphasizing the need for adaptive, multi-scale strategies that account for the complexities of forest ecosystems and the diverse benefits they provide.

Key words: *Ecosystem, Models, Society, Climate change, Sustainable, Trade-offs*

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Impact of Dietary Supplementation of Amla and Fenugreek on the Carcass Characteristics and Yield of Wholesale Cuts of Kids

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An experiment was conducted for 240 days on twenty-four male kids (Rohilkhandi breed) aged approximately 4-5 months. The kids were taken from the Sheep and Goat farm of IVRI, Izatnagar and were randomly distributed into four treatment groups, each consisting of 6 animals, based on their body weight (7.69 kg). The concentrate mixture consisted of maize (30%), soybean meal (33%), wheat bran (34%), mineral mixture (2%) and common salt (1%). Wheat straw was provided *ad libitum* after complete consumption of concentrate mixture. Ration of the kids of groups T_1 contained no supplement, whereas, the rations of kids in groups T_2, T_3 and T_4 contained 3% amla fruit, 3% fenugreek seeds and 3% amla and fenugreek seeds, respectively. Feed consumption and body weight changes were recorded at fortnightly intervals during the experimental period. The dressing percentage expressed either on live or empty BW basis and percent of leg, loin, rack, shoulder and neck and fore shank and brisket were similar ($P>0.05$) among the four groups; however, dressed weight (% of PSW) was significantly ($P<0.05$) higher in T_2, T_3 and T_4 than T_1. Dressed weight (% of EBW) was significantly ($P<0.05$) higher in T_4 and other groups are comparable. From the results, it was observed that different dietary treatments did not have significant effects on carcass characteristics and yield of wholesale cuts of kids except dressed Wt (% of PSW) and dressed Wt (% of EBW).

Keywords: *Amla, Carcass characteristics, Fenugreek, Kid*

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Developing the concept of Artificial Intelligence in Agriculture

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The agricultural sector has experienced a substantial increase in the utilization of artificial intelligence (AI) in recent years. The agriculture sector is using AI technology to enhance the management of the food supply chain, monitor soil and growing conditions, manage pests, analyze data for producers, and better the health of crops. It provides data on weather forecasts and the optimal time to fertilize. AI-powered solutions will enable producers to increase crop quality, produce more with fewer resources, and expedite the time it takes for products to reach the market. AI assists in the comprehension of soil qualities, suggesting the nutrients that can be used to enhance soil quality, crop health, and reduce waste in the production of biofuel and sustenance. AI-based technologies, such as hyper spectral imaging and 3D laser scanning, as well as agricultural robotics and sensor technology for data collection and transmission, can contribute to the preservation of crop health. Machine learning, convolutional neural networks, IoT, big data, and computer vision are the most frequently employed technologies in the application of AI techniques. This paper investigated the necessity of AI in the agricultural sector. A basic overview of AI in agriculture is provided, along with a few factors that AI monitors in the field. Lastly, we recognized and discussed the significant applications with challenges in the adoption of AI in agriculture.

Keywords: *Artificial Intelligence, Agriculture Sector, Crop Health, AI techniques*

Insecticide toxicity on agriculture with fish farming and noxious effects on oxygen equilibrium curves and haematological disparities

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Aquatic Toxicology in the paddy fields and on aquatic organisms of India is the foremost effects of environmental pollutants. Pesticides especially the insecticides, on the health of fish, snail crabs and other aquatic organisms are major issues now. Pesticides have been found to be highly toxic not only to fish but also to the other organisms and categorized according to their target uses such as herbicides (weed control), insecticides (insect control), and fungicides (Mycotic control), but the more acute toxicity are insecticides. Over usage of insecticides contaminate the surface waters and induce ill effects on the growth, survival and reproduction of aquatic animals. Over dose concentrations of insecticides are present in all paddy fields of Tamilnadu state and they are toxic to aquatic organisms, especially fish and all aquatic organisms. The major Chemical groups of insecticides that are usually applied are Organophosphate, Carbamates, Organochlorine, Pyrethroids, and Nicotinoids. The insecticidal residues which contaminate the water are combined with surface runoff and surface drainage, usually within a few weeks after insecticide application. Species such as *Catla catla, Labeo rohita, Cirrhina mrigala, Cyprinus carpio, Chanos chanos, Oreochromis mossambicus, Anabas testudineus, Mugil* spp., *Clarias batrachus, C. macrocephalus, Lates calcarifer, Channa striatus* and *C. marulius* have been widely cultured in rice fields. The fish species which could be cultured in rice fields must be capable of tolerating shallow water((12-15 cm), high temperatures (up to 35ºC),low dissolved oxygen, high turbidity and toxicity from 0.01mg/ kg to 0.1 mg / kg. In Tamilnadu state the cypermethrin 4 EC was applied by most of the farmers (100.00 %) which was followed by imidacloprid 17.8 SL (88.95 %), fenpyroximate 5 EC (83.79 %), monocrotophos 36 WSC (83.14 %), The unexperienced practice without safe and security measures the farmers spraying the insecticides without properly scaled quantity of insecticides in paddy fields. This unsystematic practices leads to toxic pollutant release in surface water of the paddy field. Such over dose insecticidal residues enter the

food and respiratory chain of fishes leads to adverse physiological and respiratory disorders in paddy field cultivated fishes. The present study was intended to investigate the adverse effects such as nonstandard oxygen consumption, metabolic changes, irregularity in O_2 equilibrium curve, abnormal haematological changes of fishes reared from paddy fields. A proper quality assurance methods in sample preparation, handling, and test trial were followed in accordance with ICAR guidelines. The experimental fish species *Cyprinus carpio* were collected from the fish farm integrated with paddy fields near Kannanthan kudi village, Orathanadu taluk, Tanjavur District, Tamilnadu. Cypermethrin 4 EC, a technical grade broad spectrum manufactured by Bayer Crop Science Ltd., Gujarat, India, was used for evaluation of its toxicity. Our results are in approved with the results of other workers. The toxic effects (LC50) cypermethrin on test fish species showed 6.0 µg/L. A significant changes in carbohydrate metabolism, O2 consumption capacity, lower values for erythrocyte count (RBC), haemoglobin content (Hb), and haematocrits were observed and compared with the control group during our study.

KEY WORDS: *Carbohydrate, erythrocyte, haematocrits, insecticide, toxicity*

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Evaluation of bio-rationals against whitefly *Bemisia tabaci* (Gennadius) in cotton

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An Experiment was conducted at Cotton Research Farm, Sirsa, CCS Haryana Agricultural University, Hisar to evaluate the bio-rationals against whitefly *Bemisia tabaci* (Gennadius) in cotton during *Kharif* 2023. Experimental plots were treated with biorationals compounds *i.e*. *Azadirachtin*, *Lecanicillium lecanii*, *Metarhizium anisopliae* and *Beuveria bassiana* with or without yellow sticky traps and observations recorded at 1, 3, 5, 7 and 10 days after treatment. After first spray, mean whitefly population 14.66/leaf was recorded miminum in *Lecanicillium lecanii* + Yellow Sticky Traps treated plots followed by *Metarhizium anisopliae* + YST (15.39/leaf) and *Beuveria bassiana* + YST (16.44/leaf). Maximum mean whitefly population (31.28/leaf) was recorded in control. Similar observations were recorded after second spray. Nymphal parasitization by *Encarsia* in whitefly was highest in control plot (6.81%) followed by *Lecanicillium lecanii*+ YST (6.67%) and *Azadirachtin* + YST (6.63%). As per yield comparison of different treatments of bio rationals compounds, maximum yield was obtained from the plots treated with *Lecanicillium lecanii*+ YST (21.61q/ha) followed by *Metarhizium anisopliae* + YST (20.69q/ha) and *Azadirachtin* + YST (20.44 q/ha).

Keywords: *Cotton, whitefly, bio-rationals, yellow sticky traps*

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Role of Probiotics in Promoting Aquaculture Sustainability by enhancing Health and Productivity

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Probiotics are the mono culture or mixed culture of live bacteria, microalgae or yeasts which improve the health and sustainability of the host. These have been recognized as a vital tool in aquaculture which significantly contribute to the health and growth of aquatic organisms. Gram positive bacteria like *Bacillus subtilis, Clostridium, Lactococcus, Streptococcus a*nd gram negative bacteria like *Aeromonas, Pseudomonas, Phaeobacter* etc. are administered as probiotics to enhance the growth of aquatic animals. Various strain of bacteriophages, microalgae and yeasts have been found effective probiotics in fishes, prawns and other shrimps. These microflora modulate the gut microbiome and enhance nutrient absorption, increase the immune system and disease resistance in aquatic animals. This is helpful to decrease mortality in fishes by increasing immunity. Probiotics also maintain good quality of water by breaking down waste and reducing harmful bacteria. These have reduced the demand of antibiotics to aquatic life and probiotics have emerged as a new industry. Probiotics can be administered both as monoculture and mixed culture with combination of probiotics. Adequate dose and administration at proper time in aquaculture will provide the desired results. There is great need to work on the development of particular probiotics for specific fish or shrimps species which will meet the enhanced demand of aquatic food at global level.

Keywords: *Probiotics, Aquaculture, Aquatic Health, Antibiotics, Sustainability, Microbiome.*

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Carbon Farming: A Greener Way Towards Carbon Neutrality and Climate Resilience

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Atmospheric carbon dioxide (CO_2) is a critical greenhouse gas responsible for significant disruptions in the Earth's climate system. According to the Intergovernmental Panel on Climate Change (IPCC), anthropogenic CO_2 emissions have contributed to a 1.1°C rise in global temperatures above pre-industrial levels, leading to extreme weather events, rising sea levels, and biodiversity loss. With population growth and industrialization, CO_2 concentrations have surged from pre-industrial levels of around 280 ppm to over 415 ppm in 2021, necessitating urgent mitigation strategies to limit warming to below 2°C. One such strategy is carbon farming, a regenerative agricultural approach designed to sequester atmospheric CO_2 in soils and vegetation, thereby reducing greenhouse gas emissions. Carbon farming techniques, including agroforestry, zero-till farming, biochar application, and soil carbon sequestration, have been shown to increase soil organic carbon stocks and improve soil health. Biochar, a form of charcoal produced from biomass, has been demonstrated to enhance soil fertility while capturing CO_2 for long-term storage. Additionally, agroforestry practices, which integrate trees into agricultural landscapes, can sequester significant amounts of carbon while enhancing biodiversity and ecosystem resilience. Beyond environmental benefits, carbon farming offers economic incentives through carbon credits, providing farmers with financial rewards for reducing emissions. Such farming can increase soil fertility and support sustainable agricultural practices, fostering resilience in the face of climate change. The scalability and long-term impact of carbon farming depend on robust verification systems, consistent monitoring, and supportive policy frameworks. Effective policies, such as carbon pricing and subsidies for sustainable practices, are essential to incentivize broader adoption and ensure the longevity of carbon farming's contributions to global climate mitigation efforts. Carbon farming to become a widespread solution, international cooperation and sustained commitments

are necessary to harness its full potential for climate resilience and carbon neutrality.

Keywords: *Greenhouse gases, carbon credit, climate change, biochar*

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Problem of Paddy Stubble Burning in Northern India: Causes, Effects and Management

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Agriculture is the major activity of food production in India and most of the population is indulged directly or indirectly in this activity. A huge quantity of wheat and rice crop residue is produced in fields of Punjab, Haryana, Uttar Pradesh and Delhi. Around 80 percent of paddy stubble is leftover in the fields after harvesting the crop with combine harvester which is burnt by the farmers in open fields during October and November months every year. Farmers prefer to burn the paddy stubble due to insufficient funds to uproot the straw, less window time between rice and wheat crops, less availability of farm labour and low availability of modern farm machinery like Happy Seeders and Rotavators to uproot the straw. Crop residue burning produce harmful toxic gases, smoke and particulate matters which causes air pollution, respiratory diseases, global warming, road accidents, eye irritation and loss of soil biota. Paddy stubble is extensively used as fodder for cattle, bedding material for mushroom cultivation, raw material in compost and biogas production, in biomass based thermal power plants and as raw material in paper industries. Government of India has realized the seriousness of the problem and organizing workshops and awareness camps for farmers and providing incentives to them to minimize the cases of burning of crop residue in the fields. Crop residue burning incidences are continuously being observed through satellites and Air Act 1981 has been strictly implemented in the states to check the fire incidences. According to the recent data, paddy stubble burning cases have been decreased in the last two years but there is still great need that farmers must stop the burning of crop residue to sustain the pollution free environment for the future generations.

Keywords: *Paddy Stubble, Toxic Gases, Crop Residue, Happy Seeders, Fire Incidences.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/161

Climate change adaptation through climate smart agricultural practices in India

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The phenomena of climate change pose multifaceted challenges to crop and livestock farming, with severe implications on smallholder farmers' income and livelihoods. Climate change has profound implications (economic, environmental, and social) predominantly on rainfed regions in developing countries like India, where agriculture constitutes the backbone of the economy. CC is an additional burden, as rapid population growth, industrialization and depletive exploitation of resources are already exerting pressure on ecological and socio-economic systems. In this context, the current study analyzes how farmers perceive climate change in the rainfed ecosystem in India, farmers' adaptation strategies, and their major determinants in addressing climate change. This article also evaluates the importance of climate-smart agriculture (CSA) in promoting sustainable agricultural development and ensuring food security and mitigating the negative impacts of climatic changes on agricultural productivity in India. The farmers using CSA adaptation strategies were found to have achieved higher output, yield and return compared to those who did not. Zero budget natural farming as a climate-resilient farming system can enhance food and nutritional security, enabling farmers to improve soil fertility and yields through lower costs, risk and irrigation requirements, thus protecting the ecosystem by improving soil organic matter, water retention and biodiversity and reducing air and water pollution as well as greenhouse gas emissions. The review highlights the need to undertake more empirical research to gain a deeper understanding of the emerging patterns of CSA and their impacts on agricultural development and livelihoods of farmers in Chhindwara district.

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PROMISING ACTIVITY OF NEW OSBPI-BASED FUNGICIDE MIXTURE (FLUOXAPIPROLIN 30 g/L + FLUOPICOLIDE 200 g/L SC) AGAINST LATE BLIGHT OF TOMATO

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The present study aimed to assess the bio-efficacy of new fungicide combination Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC in comparison with Fluoxapiprolin 20 g/L SC @ 938 ml/ha, Fluopicolide 480 g/L SC @ 261 ml/ha and Famoxadone 16.6% + Cymoxanil 22.1%SC @ 500 ml/ha against late blight of tomato. Results from the two-year field trials lead to the conclusion that two applications of Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC @ 500 ml/ha in 500L of water per hectare at 10 days interval were effective for the management of late blight of tomato when applied at disease appearance. The maximum disease control was recorded in Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC @ 625 ml/ha (77.57 and 83.95% in 2020-21 and 2021-22, respectively) which was at par with Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC @ 500 ml/ha with respective values of 73.1 and 79.55%. Also, the maximum yield was obtained from Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC @ 625 ml/ha (351.55 and 333.07 q/ha) which was at par with Fluoxapiprolin 30 g/L + Fluopicolide 200 g/L SC @ 500 ml/ha (347.44 and 328.39 q/ha).

Key words: *Phytophthora infestans, Management, Chemical control, Tomato*

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Organic Farming and Extension Strategies for Sustainable Agriculture

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Organic farming is an agricultural approach that emphasis on biodiversity, ecological balance, soil fertility control and avoids synthetic chemicals. It provides increased crop diversification, nutrient recycling, better soil health, and environmental sustainability. Constraints such as certification expenses, market access, and low yields still exist. Significant aspects of organic farming includes biological pest control techniques, effective water management plans, soil fertility management with organic additions like compost and manure. Crop diversification and intercropping support biodiversity and efficient land use. Sustainable agriculture practices complement organic farming through techniques like agroforestry, crop rotation, conservation agriculture, and mulching. Organic farming is greatly aided by extension strategies, that includes ICT tools, demonstration plots, and Farmer Field Schools (FFS) to spread scientific knowledge. The reach of organic farming is increased through collaborations with regional organisations and NGOs. Government incentives, organic certification procedures, and market connections are important facilitators of policy assistance. Analysing sustainability criteria, such as social and environmental implications, helps in assessing the effectiveness of organic farming. Farmers and extension agents can enhance their skills by participating in workshops, learning through active engagement, and exchanging knowledge through training and capacity building activities. Financial risk, ignorance, and certification barriers are obstacles for growth of organic farming. Nonetheless, there are plenty of chances for growth due to rising consumer demand, global marketplaces, and government backing. Sustainable agriculture can be promoted through integration of organic farming with effective extension strategies, thus by benefiting farmers, communities, and the environment.

Keywords: *Biodiversity, Crop Diversity, Farmer Field School, Sustainability*

AFTEFS/SKUAST-K/AG/2024/164

Early Detection and Diagnosis of Peach Diseases Using Deep Learning Architect VGG-16 Convolutional Neural Network

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Early recognition and diagnosis of fruit crop diseases are more important for increasing the development of healthy fruit industry. The present study proposes a deep learning-based model for identifying peach crop diseases. This system of examination and detection can save time and resources for farmers, and accurately classify major diseases of peach. For this study, we assembled an extensive image dataset under natural epiphytotic conditions with complex background and various illuminations, angles, and distances to reflect real-time scenarios. The complexity of the collected images was created based on the taxonomic information of peach diseases. To enhance the robustness of our model, the images were converted to Joint Photographic Experts Group followed by data augmentation techniques such as resizing, rotating, flipping and scaling was employed to reduce the chances of over fitting. VGG-16 model was trained on 70 per cent dataset and 10 per cent validation dataset for performing transfer learning. The system is fine-tuned for the architecture to have greater processing time and low memory consumption. The architecture was evaluated using different network parameters. The performance of architecture was evaluated using training loss function, accuracy, sensitivity, precision and F1-score. The model applies to classify major diseases of peach crop such as leaf curl, shot hole, and rust as well as healthy leaf data set. Finally, the network parameters were adjusted through various techniques involving progressive resizing, cyclical learning rate and focal loss function for improving the performance of the model. The model achieved an overall disease detection accuracy of 92.04 per cent, with 92 per cent precision, 92.25 per cent recall and 92.25 per cent F1-score on 20 per cent test-set images, not used in training. We suggest that such systems mounted on aerial-or ground-based vehicles can help in automated high-throughput plant phenotyping,

precision breeding for plant resistance, and reduced pesticide use through targeted application across a variety of plant and disease categories.

Keywords: *Convolution neural networks; Deep Learning; Image recognition; Peach diseases; Visual Geometry Group (VGG).*

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Synthesis and Characterization of Green manganese Oxide nanoparticles, their different characterization and effect of manganese Oxide Nanoparticle on the Germination on seeds

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Green synthesis of metal nanoparticles is an interesting research area due to the important applications for the environment friendly development technologies. Normally, nanoparticles are prepared by chemical and physical methods which are environmentally benign wastages largely and also can be hazardous for human health. Present study reported a simple and low cost method for the synthesis of manganese nanoparticles by reducing manganese sulphate with the help of natural products (Citrus x sinensis). Citrus x sinensis peel extract were used for the reducing and stabilizing manganese nanoparticles. The characterization manganese nanoparticles was done by using EDX, UV- Vis and FT-IR, spectroscopic techniques. The morphology of manganese nanoparticles was confirmed by SEM technique and green synthesized manganese nanoparticles administered in varying concentration to assess the changes in germination percentage.

Keywords: *Green synthesis, cost-effective, plant extract, capping agents, germination percentage.*

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Role of Drones in Modern Farming

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Drones, also known as Unmanned Aerial Vehicles (UAVs), are rapidly gaining prominence in agriculture due to their ability to provide real-time data and enhance precision farming. It has numerous advantages, such as improved monitoring, increased efficiency, and reduced resource consumption. This technology plays a crucial role in various applications, including crop monitoring, soil and field analysis, precision irrigation, planting, pesticide and fertilizer application, and livestock management. Drones equipped with multispectral, hyperspectral, and thermal sensors can capture detailed images of fields, allowing farmers to monitor crop health, assess plant growth, and detect signs of stress, diseases, or pest infestations. This real-time monitoring enables timely interventions, thereby reducing crop losses and minimizing the need for excessive pesticide or fertilizer use. Additionally, drones are used for creating 3D maps of fields, aiding in soil analysis and assisting farmers in making informed decisions about crop rotation, soil health management, and planting strategies. In precision irrigation, drones provide valuable data on water distribution and soil moisture levels. Moreover, drones are employed in aerial spraying, delivering pesticides and fertilizers with high precision and uniformity across large fields, reducing wastage and environmental impact. Drones also assist in planting by dropping seeds or seedlings with precision in difficult or uneven terrains. Despite the numerous benefits, the adoption of drones in agriculture faces challenges such as high costs, regulatory restrictions, limited flight times, and the need for skilled operators. Addressing these challenges through advancements in drone technology, cost reduction, and improved regulations could lead to more widespread use. Drones represent a significant technological advancement in agriculture, offering innovative solutions to enhance efficiency, sustainability, and productivity. With ongoing developments, drones are poised to play an even greater role in the future of precision farming and smart agriculture.

Keywords: *Unmanned Aerial Vehicles, Precision farming, Drones, Aerial spraying, Sustainability.*

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Chemical ecology of endangered *Trillium govanianum* along an altitudinal gradient: A case study from Kashmir Himalaya

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Kashmir Himalaya is the home of a wide range of medicinal plants due to its diverse altitudes and geographical features. The biotic and abiotic factors that come with varying altitudes have a significant impact on the structure, function, and biochemistry of plants, which in turn affects the production of bioactive compounds. Among these, *Trillium govanianum*, a perennial shrub found in the Himalaya, is known for its medicinal properties attributed to compounds like alkaloids, flavonoids, and terpenoids. Diosgenin, an important saponin present in this shrub, is used as a precursor for synthesizing various steroids. *Trillium govanianum* has been traditionally used to treat various ailments and has gained scientific interest for its antibacterial, antifungal, antioxidant, and anticancer properties. However, the variation in the content of its secondary metabolites across different altitudes and their correlation with biological activities still needs to be explored. This study aims to analyze the variation in secondary metabolite content of *Trillium govanianum* across different altitudes and investigate its relation to antimicrobial and antioxidant activities. We characterize plant extract by using gas chromatography-mass spectrometry (GC/MS) and performing bioactivity assays, to uncover distinct chemical compositions and diverse biological activities across altitude gradients. Understanding these adaptive mechanisms is crucial for predicting species responses to climate change and guiding conservation efforts.

Keywords: *Trillium govanianum, Altitudinal gradient, Environmental stressors, Antimicrobial activity, Antioxidant activity, GC/MS.*

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Mitigating Soil-borne Diseases in Vegetables via Grafting Techniques

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The intensity of biotic and abiotic stressors is progressively escalating, presenting a significant challenge to vegetable crop development. Soil-borne diseases and harsh climatic conditions also diminish productivity. Vegetable grafting has emerged as a potential and unique solution to address this issue. This procedure merges two distinct plants to create a singular plant that possesses the advantageous characteristics of both. East Asia is the foremost market for vegetable grafting, attributed to the significant prevalence of grafted cucurbits and other vegetables. Approximately 40% of watermelon, 20% of melon, 30% of cucumber, 15% of eggplant, 1% of tomato, and 1% of capsicum crops undergo grafting techniques. Grafting procedures encompass Side Grafting, Cleft Grafting, Tongue Grafting, Tube Grafting, Hole Insertion Grafting, and One-Cotyledon Grafting, each offering distinct methodologies for establishing a successful graft union. Subsequent to R.M. Bhatt and his team's introduction of vegetable grafting in India at IIHR, Bangalore, the NBPGR regional station in Thrissur, Kerala, focused on grafting cucurbits, particularly *Momordica cochinchinensis*, to augment production by grafting female plants onto male plants. Recent advancements in vegetable grafting include double-grafted and single-grafted tomatoes, micro-grafting, and grafting robots. Grafting techniques in vegetables are anticipated to gain more recognition and application worldwide owing to their dual advantages. Initially, resistant rootstocks may be employed to mitigate the risk of crop loss due to soil-borne diseases. Secondly, hybrid rootstock lines may be chosen to augment plant vigor and elevate crop production, even in the absence of disease pressure. In conclusion, vegetable grafting is a very efficient method.

Keywords: *Vegetable, soil-borne, resistance, grafting techniques*

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Influence of Plant Growth Regulators on Morphological and Yield Parameters in Coriander (*Coriandrum sativum* L.)

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Coriander (*Coriandrum sativum* L.) is a versatile herb widely utilized for its culinary and medicinal properties. Keeping in view the importance of this crop the present study was conducted in the Department of Vegetable Science research farm at CCS HAU, Hisar (Haryana) in the Rabi 2023, on cultivar Hisar Bhoomit (DH-228) to examine the effects of various plant growth regulators (PGRs) on the morphological characteristics and yield attributes of Coriander. Different plant growth regulators (PGRs), including Salicylic Acid, Jasmonic Acid, Benzyladenine (BA), Gibberellic Acid (GA3), and Naphthalene Acetic Acid (NAA), were applied at various concentrations at two critical growth stages: 45 days after sowing (DAS) and 65 DAS. The morphological and yield-related traits evaluated included plant height, number of primary and secondary branches, umbels per plant, umbellate per umbel, seeds per umbellate, and seeds per umbel. The results demonstrated that benzyladenine (BA) at 20 ppm significantly enhanced plant height, the number of primary and secondary branches, umbels per plant, umbellate per umbel, seeds per umbellate, and seeds per umbel compared to other respective treatments. These findings highlight the efficacy of PGRs in effectively improving both growth and yield parameters in coriander. These findings suggest that targeted use of PGRs can substantially improve both morphological and yield attributes, offering practical strategies for enhancing coriander cultivation. Future research should focus on refining PGR application techniques and exploring their interactions with other agronomic practices to maximize crop productivity.

Keywords: *Benzyladenine, Coriander, Plant growth regulators, yield attributes*

AFTEFS/SKUAST-K/AG/2024/169

Novel Late Blight Resistance Potato Clone LP-16-6-5 and its Biochemical Responses in the Indo-Gangetic Alluvial Plains of India

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This study is an attempt to identify the resistance levels in novel genotypes of potato against late blight disease and assessment of associated biochemical responses. The resistant check, Kufri Chipsona -1 (KC-1) and the newly developed clone, LP-16-6-5 had significantly lower late blight incidence, severity, AUDPC, susceptibility index (S_x) and incubation period (IP_{50}) than the other test genotypes. Also, in contrast to the resistant (KC-1) or moderately resistant (LP-16-6-5) genotypes, the highly susceptible (Kufri Ganga), susceptible (Kufri Pukhraj) and moderately susceptible (KP-16-19-9, KP-16-8-9, KP-16-3-12, KP-16-27-15, Kufri Jyoti and KP-16-9-61) genotypes had lower levels of total phenols, o-dihydroxy phenols, flavonols, Peroxidase (PX), Polyphenol oxidase (PPO), Catalase (CAT), Phenylalanine ammonia-lyase (PAL), Tyrosine ammonia lyase (TAL), and Lignin, indicating an impaired defence system. On the contrary, there was a rise in the contents of hydrogen peroxide, malondialdehyde (MDA) as well as proline, suggesting the onset of adaptive mechanisms that maintain normal osmoregulation in the susceptible cultivars.

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Comprehensive analysis of morpho-physiological, biochemical and root architectural characteristics of bread wheat genotypes under drought and restricted irrigation condition

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Drought stress is one of most important phenomena which limits crop production and yield. To combat the effects of climate change, drought resilient varieties are required. Therefore, this this research focussed on the evaluation of thirty-six advanced wheat lines, including four standard checks, for their morpho-physiological and yield characteristics under irrigated and restricted irrigation conditions. The study identified substantial genetic variability among the wheat lines in both moisture regimes. Under restricted irrigation, all the evaluated lines exhibited reduction in plant height, days to flowering and maturity, number of tillers, spikelets per spike, and overall yield. Despite these reductions, the checks demonstrated relatively stable performance with minimal yield decline. Notably, the genotypes PBW-677, BWL-3504, and BWL-3498 exhibited yield reductions of only 0.38-1.99%, comparable to the checks PBW-175 (0.33%) and C-306 (0.53%). In contrast, genotypes PBW-765, HD-2967, and BRW-3775 experienced severe yield reductions ranging from 34.65 to 39.47%. Physiological and biochemical analyses indicated that the genotypes PBW-677, BWL-3504, BWL-3498, and BWL-5233 were less affected by water deficit, with minimal decline in chlorophyll content, NDVI, Membrane stability index, Relative water content, total soluble sugars, and proline content. These genotypes also exhibited longer seminal roots, higher root biomass, and increased root hair density under water stress. The results underscore the critical role of root architecture and physiological traits in enhancing drought tolerance. The identified genotypes PBW-677, BWL-3504, BWL-3498, and BWL-5233, demonstrating minimal yield reduction and robust

physiological responses under restricted irrigation, offer valuable genetic resources for breeding programs aimed at developing drought-resistant wheat varieties.

Keywords: *Wheat, Drought Tolerance, Morphological Traits, Root Architecture, Yield Reduction.*

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EFFECT OF PESTICIDES AND AGRICULTURAL PRACTICES ON STINGLESS BEES IN RAJASTHAN

Seema Yadav, Abhishek Rajpurohit, Manish Sarwa

Rajasthan has rich wild pollinators such as stingless bees which play a crucial role in the pollination process of various indigenous plants and crops in the arid zone region of the state. However, the rise in the use of efficient farming practices such as the synthetic pesticides is considered a major danger to these bees. This research aims at determining the impact of regular pesticide application and other methods of farming on stingless bees health, behavior, and colony productivity in distinct agricultural areas in Rajasthan. The study was conducted during 2022-2024 in the conventional and integrated farming systems that include monoculture farming systems, chemical based crops, and organic farming systems. Thus, during study, we gathered information on levels of pesticide residues in pollen and nectar collected by bees and on the bees foraging activity, the strength of the colonies. The studies suggest that the effects of pesticide-infected crops led to reduced foraging ability, disoriented flight patterns, and substantial decline in the rate of brood rearing. An additional problem in areas with monocultures is that there is less diverse habitats and foraging requirements which increased the rates of colony collapse. Consequently, this study raises awareness and highlights a number of recommendations to encourage the sustainable farming practices in Rajasthan including, the limitation of pesticide application; increased crop diversity; and support the increased implementation of ecological farming practices. The observations suggest that preserving stingless bees' populations and maintaining the necessary ecosystem balance for farming and cross pollination are critical in the arid zones of Rajasthan.

Keywords: *Stingless Bees, Pesticides, Agricultural Practices, Pollinator Conservation, Rajasthan, Colony Health.*

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Robotics and Automation in Horticulture

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Robotics and automation are revolutionizing horticulture, addressing key challenges such as labor shortages, increasing demand for food production, and the need for sustainable agricultural practices. The integration of advanced technologies into horticultural operations enhances productivity, precision, and efficiency while reducing reliance on manual labor. One of the most significant impacts of robotics in horticulture is evident in harvesting processes. Automated systems, such as robotic arms and autonomous vehicles equipped with advanced sensors and artificial intelligence (AI), are increasingly being used for fruit and vegetable picking. These robots can identify ripeness, handle delicate crops with care, and operate efficiently even in complex environments, reducing post-harvest losses and enhancing the speed of harvesting. Crop monitoring is another area where automation is making significant contributions. Drones and ground-based robots are now being used to collect real-time data on crop health, soil conditions, water levels, and pest infestations. These systems are integrated with AI algorithms to analyze the data, enabling early detection of diseases or deficiencies and facilitating precision agriculture. In addition to planting and harvesting, robots are being developed to automate tasks such as pruning, weeding, and fertilizing. Automated systems can navigate through crops, trim plants, and remove weeds with precision, reducing the time and effort required for these labor-intensive activities. Automated irrigation systems, guided by real-time data, ensure efficient water use, further enhancing the sustainability of horticultural practices. Despite these advances, challenges remain. The high cost of robotic systems, coupled with the need for specialized infrastructure, limits widespread adoption among smaller farms. However, as technology continues to evolve and become more affordable, it is anticipated that robotics and automation will become integral to horticulture.

Keywords: *Robotics, Artificial intelligence, Automation, Drones*

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Role of Artificial Intelligence (AI) in Jaggery Processing

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Artificial Intelligence (AI) in Jaggery Factory Automation integrates cutting-edge technologies like artificial intelligence (AI), machine learning (ML), and computer vision to revolutionize jaggery production. Through AI-powered sensors and algorithms, factories can enhance efficiency, improve quality control, and boost productivity. For example, AI systems inspect incoming sugarcane, detecting defects or impurities to ensure only premium raw materials are used.AI also monitors and controls key stages of production, optimizing processes such as juice extraction, clarification, and crystallization. This reduces energy consumption and improves operational efficiency. Real-time quality checks are enabled by AI, allowing for precise grading of jaggery products and ensuring they meet customer standards. Additionally, predictive maintenance powered by AI helps identify potential equipment issues before failures occur, minimizing downtime. Inventory management is streamlined as AI tracks materials and optimizes stock levels, preventing waste and ensuring timely deliveries. AI even improves energy optimization, lowering costs and promoting sustainability. Overall, AI Jaggery Factory Automation offers increased production efficiency, enhanced product quality, reduced operational costs, and sustainable practices. This advanced system provides jaggery businesses with a competitive edge while meeting the growing demands of the market.

Keywords: *Artificial Intelligence (AI), Jaggery processing, automation, Energy optimization*

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In Vitro evaluation of native *Trichoderma* isolates for the control of sheath blight in rice incited by *Rhizoctonia solani* "

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Rice (*Oryza sativa* L.) is one of the most important staple crops cultivated worldwide, particularly in Asia, where it plays a critical role in ensuring food security. In India, rice is extensively grown across various regions, contributing significantly to the nation's agricultural economy. Despite the continuous advancements in rice production, there is still a considerable gap between the potential yield and the actual yield achieved by farmers. This discrepancy is largely attributed to various biotic and abiotic stresses that affect rice crops during their growth stages. Among the biotic stresses, sheath blight, caused by *Rhizoctonia solani*, stands out as one of the most devastating diseases. It causes severe damage to the crop, leading to substantial economic losses year after year. The present study was conducted to investigate the effectiveness of native *Trichoderma* isolates in controlling *Rhizoctonia solani* under in vitro conditions in the Department of Plant Pathology, CCSHAU, Hisar. Ten isolates of *Trichoderma* were collected from soil samples from different districts of Haryana and were tested for their antagonistic activity against *Rhizoctonia solani* using the dual culture technique under *in vitro* conditions. Among the ten fungal isolates, T1 and T5 were found to be the most effective in inhibiting the mycelial growth of *Rhizoctonia solani*. These isolates showed significant potential as biological control agents, offering a promising and eco-friendly approach for managing sheath blight disease in rice cultivation systems.

***Keywords**: Rice, cultivated, biotic, yield, disease, culture.*

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Organic Farming and Extension Strategies for Sustainable Agriculture

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Organic farming is an agricultural approach that emphasis on biodiversity, ecological balance, soil fertility control and avoids synthetic chemicals. It provides increased crop diversification, nutrient recycling, better soil health, and environmental sustainability. Constraints such as certification expenses, market access, and low yields still exist. Significant aspects of organic farming includes biological pest control techniques, effective water management plans, soil fertility management with organic additions like compost and manure. Crop diversification and intercropping support biodiversity and efficient land use. Sustainable agriculture practices complement organic farming through techniques like agroforestry, crop rotation, conservation agriculture, and mulching. Organic farming is greatly aided by extension strategies, that includes ICT tools, demonstration plots, and Farmer Field Schools (FFS) to spread scientific knowledge. The reach of organic farming is increased through collaborations with regional organisations and NGOs. Government incentives, organic certification procedures, and market connections are important facilitators of policy assistance. Analysing sustainability criteria, such as social and environmental implications, helps in assessing the effectiveness of organic farming. Farmers and extension agents can enhance their skills by participating in workshops, learning through active engagement, and exchanging knowledge through training and capacity building activities. Financial risk, ignorance, and certification barriers are obstacles for growth of organic farming. Nonetheless, there are plenty of chances for growth due to rising consumer demand, global marketplaces, and government backing. Sustainable agriculture can be promoted through integration of organic farming with effective extension strategies, thus by benefiting farmers, communities, and the environment.

Keywords: *Biodiversity, Crop Diversity, Farmer Field School, Sustainability*

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AFTEFS/SKUAST-K/AG/2024/176

Role of prevailing weather conditions in fruit splitting of Daisy mandarin

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Fruit Splitting is a physiological disorder that affects fruit quality and marketability and it is closely linked to specific weather conditions. The present study was planned to investigate role of prevailing weather conditions in the splitting of Daisy Mandarin. The experiments were conducted in the years 2021 and 2022 at the Fruit Research Farm, Punjab Agricultural University, Ludhiana. Daisy mandarin plants were used to conduct this experiment. The experimental plants were spaced at 6 m × 3 m apart and were maintained using standard cultural practices as prescribed by Punjab Agricultural University, Ludhiana. Daily data of different meteorological parameters was collected from the Agrometeorological Observatory, Punjab Agricultural University, Ludhiana. Fruit splitting was observed more in year 2022 as compared to 2021. It was observed that higher temperature (maximum and minimum), relative humidity (morning and evening) and rainfall during July month contributed significantly to splitting. Through rigorous correlation and regression studies, maximum & minimum temperatures, morning & evening relative humidity and rainfall were observed as important parameters causing splitting. Higher temperature causes fruit to expand quickly, leading to cracks, especially when combined with high humidity. Humidity levels influence the moisture content of the fruit which can make the skin more susceptible to splitting. Additionally, heavy rainfall after dry weather can saturate the soil, resulting in excessive water uptake by the fruit and further increasing the likelihood of splitting.

Keywords: *Citrus, Cracking, Fruit, Rainfall, Weather data.*

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Gene-coexpression network and molecular modelling studies on high-affinity potassium transporters involved in salt tolerance in different species of rice

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Salinity stress is a major impediment in achieving food and nutritional security in the climate change era as it adversely affects the crop yield. It is characterized by the accumulation of toxic levels of Na+ ions in the cytosol of plant cells due to soil salinity. Higher amount of potassium ion (100 to 200mM) compared to sodium ion (10mM) is found in the cytosol of plant cells under normal conditions. Higher K^+/Na^+ ratio is optimal for cellular metabolic functions. Under typical NaCl mediated salt stress, a higher Na^+/K^+ ratio disrupts the cellular homeostasis due to the inhibition of most of the K^+ ion activated enzymes of plant cells. Therefore, maintenance of low Na^+/K^+ ratio in the cytosol under salt stress is needed for salinity tolerance in plants. A number of plant molecular determinants namely sodium ion transporters/channels play a major role in salinity tolerance by controlling the accumulation of Na^+ ion in the plants. Till now, the molecular picture of salinity tolerance is not clearly known. In this investigation, we constructed the gene co-expression network of important high affinity potassium transporter(HKT) genes of rice implicated in the salinity tolerance in order to identify novel co-expressing transcription factors (TF) with the candidate HKT genes and interrogated the molecular anatomy of HKTs of different species of rice (*Oryza sativa subsp. japonica, O. sativa subsp. indica, Oryza barthii, Oryza rufipogon, Oryza glumipatula, Oryza glabberrima and Orya meridionalis)* using multiple sequence alignment and molecular modelling tools. Coexpressing transcription factors namely NAC, AP2-EREBP, and MYB were found in the gene coexpression network of OsHKT3, OsHKT4 and OsHKT9 genes, OsHKT3 and OsHKT9, and OsHKT7 and OsHKT8, respectively. All these findings would be helpful in the evolution of salt tolerant rice cultivars using molecular breeding tools.

Keywords: *HKT, Salinity tolerance, Gene co-expression*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
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The Future of Farming: Remote Sensing, IoT, and Machine Learning in Agricultural Productivity and Resource Optimization

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The use of RS in agriculture dates back to 1972 when the first successful launch of the LandSat Multispectral Scanner System (MSS) satellite occurred. Remote sensing technology has transformed agricultural practices, particularly in crop monitoring, by providing near-real-time data and spatial-temporal insights into crop growth and yield. This abstract highlights the potential of remote sensing for agricultural monitoring, focusing on technologies like hyperspectral imaging (HSI) and multispectral imaging (MSI), which have been instrumental in monitoring crop health and optimizing precision agriculture techniques. Industry 4.0 technologies, including the Internet of Things (IoT), drones, and Big Data analytics, have significantly boosted agricultural productivity. IoT applications in agriculture have enabled real-time monitoring of crop conditions, leading to more sustainable practices and optimized inputs like water and fertilizers. Advancements in remote sensing (RS) and machine learning (ML) have proven highly beneficial for farmers and policymakers by minimizing crop losses and optimizing resource utilization through valuable crop insights. By using RS results, farmers can save at least 30% on chemical consumption per year, with potential savings ranging from 12,000 rupees (approximately $160) to 95,000 rupees (roughly $1300) per hectare, primarily due to reduced chemical usage and more efficient resource management. Remote sensing acts as a "radiodiagnosis" tool, offering non-contact and continuous monitoring of diseases and pests. When combined with ML algorithms, RS sensors enable accurate weed detection at a low cost without harming the environment. The National e-Governance Plan in Agriculture (NeGPA), formulated by the Committee on Doubling Farmer's Income (DFI), is focused on harnessing advanced technologies like remote sensing, ML, artificial intelligence, robotics, drones, IoT, sensors, data analytics, cloud computing, and blockchain for better agricultural management. The market for remote sensing

in agriculture has grown significantly in recent years, increasing from $1.82 billion in 2023 to an estimated $1.98 billion in 2024 at a compound annual growth rate (CAGR) of 8.8%. By 2028, the market is projected to reach $2.76 billion, driven by the growing adoption of IoT, transforming farming operations by enabling data-driven decision-making and improving efficiency. The number of IoT devices is expected to surge to 25.4 billion by 2030, further accelerating the growth of remote sensing technology in agriculture.

Keywords: *Crop monitoring; hyperspectral imaging; Industry 4.0; IoT; remote sensing; precision agriculture.*

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Path and interrelation studies for yield and quality traits in tomato (*Solanum lycopersicum* L.)

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Correlation and path studies between yield and yield attributing traits have significant contribution in designing any crop improvement program. To fulfil that aim a experiment was conducted on thirty genotypes of tomato (*Solanum lycopersicum* L.) procured from ICAR-NBPGR Regional Station, Hyderabad and other ICAR institutes at CCSHAU, Regional Research Station, Karnal, during the *Autumn Winter* season of 2021-22 to assess the nature of association among traits through correlation and path analysis for sixteen parameters. The character association analysis indicated that fruit yield per plant was significantly and positively correlated with average fruit weight (0.659), number of branches per plant (0.439), number of fruits per plant (0.323), equatorial diameter (0.317), polar diameter 0.303), number of locules (0.284) and plant height at final harvest (0.274). Number of fruits per plant had a significantly negative correlation with average fruit weight (-0.471). Path coefficient analysis results indicated that highest positive direct effect towards fruit yield per plant was contributed by average fruit weight (1.0135) followed

by number of fruits per plant (0.8827), equatorial diameter (0.0828), plant height at final harvest (0.0753), pericarp thickness (0.0688), polar diameter (0.0679). Average fruit weight showed a positive indirect effect on fruit yield per plant *via* equatorial diameter (0.0249), pericarp thickness (0.0309) and titrable acidity (0.0186) and negative indirect effects through number of fruits per plant (-0.4130). Number of branches per plant showed a positive high indirect effect on fruit yield per plant *via* average fruit weight (0.4484) followed by pericarp thickness (0.0188) and plant height at final harvest (0.0220).

***Key words**: Genotypic correlation coefficient, phenotypic correlation coefficient and path analysis*

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SITE SPECIFIC NUTRIENT MANAGEMENT

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Most of the nutrients required by crops come from the soil. But the supply of nutrients is usually insufficient to meet the nutrient requirements for achieving high crop yields. The use of fertilizers is therefore, essential to fill the above gap between the crop nutrient needs and the supply of nutrients from soil and available organic inputs. The SSNM helps in enhancing nutrient use efficiency as its focus is on feeding crops like rice, maize, wheat, etc. with nutrients as and when needed. The major advantage for farmers from an improved nutrient management strategy is an increase in the profitability. The SSNM avoid the wastage of fertilizers by preventing excessive rates of fertilization and by eliminating fertilizer application when the crop does not require nutrient inputs.It also ensures that N, P, and K are applied in the ratio which are required by the crop, optimal use of existing indigenous nutrient sources such as crop residues and measures and application of N, P and K fertilizers is adjusted to the location and season specific needs of the crop.With SSNM, the amount of fertilizer needed for a particular field is determined by subtracting the indigenous nutrient supply, which represents the amount of a specific nutrient (N, P, or K) available from the soil, crop residues, irrigation water, or

biological nitrogen fixation during a growing cycle of crop, from the total amount of nutrients needed by the crop to achieve a given target yield. Leaf color chart (LCC) ensures that nitrogen is applied at the right time and in the amount needed by the crop in order to prevent nutrient losses. Nitrogen omission plots to determine the amount of P and K fertilizers needed to meet the crop needs. This ensures that P and K are applied in the ratio required by the crop. Local randomization for application of Zn, S and micronutrients and integration with other integrated crop management (ICM) practices such as the use of quality seeds, optimum plant density, integrated pest management and good water management.

Keywords: *SSNM, nutrient use efficiency, productivity, sustainability, LCC.*

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Study of Thermal Heat Units of Maize (*Zea mays L.)* as Influenced by Dates of Sowing, Mulching and Irrigation Regimes

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This study aimed to evaluate the effects of the dates of sowing, mulching and irrigation regimes on the crop growth, yield, and water-use efficiency of maize (*Zea mays* L.). Maize Cultivar PMH-10 was sown on three dates of sowing i.e D_1= 15 May, D_2=1 June, D_3= 15 June under three irrigation regimes (I1 = IW: CPE 1.25, I2 = IW: CPE 1.0 and I3 IW: CPE 0.75) and mulch application (M1: straw mulch @ 5 t ha^{-1} and M2: without mulch) in a split plot design in 2022 and 2023 on sandy loam soil at Department of Agriculture, Guru Nanak Dev University, Amritsar. Results revealed that the early sown crop (15th May) took higher number of days and heat units to attain various phenophases. Maize variety PMH-1 consumed maximum heat units of 2155°C days and 2032°C days for maturity during 2022 and 2023 under early sown condition. The heat use efficiency was highest for the crop sown during June. Among irrigation regimes, the HUE was higher (2.92 kg ha^{-1}^{o}C day^{-1}) in IW: CPE = 0.75 level of irrigation as compared to other treatments and higher HUE was obtained with mulch

application (M1) (2.98 kg ha^{-1}°Cday^{-1}) as compared to without mulch. The sowing of maize crop during 15th June with irrigation of IW: CPE 0.75 under mulch application have been found to be the most efficient for heat utilization.

Keywords: *Irrigation, Maize, Mulching, Thermal heat Units.*

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Sensor Technologies for Horticulture Crop Monitoring

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Sensor technology is becoming a cornerstone of precision horticulture, enabling real-time crop monitoring and data-driven decision-making to optimize crop health, productivity, and resource use. Sensor technologies in horticulture mainly focuses on monitoring critical parameters such as soil moisture, nutrient levels, plant health, temperature, and pest presence. By integrating sensor networks with advanced data analytics and wireless communication, farmers can achieve unprecedented levels of accuracy and efficiency in crop management. Soil moisture and nutrient sensors are used to monitor water and essential nutrient availability at various depths, helping to ensure that irrigation systems are only activated when necessary, allowing precise fertilizer application, reducing waste, and minimizing the environmental impact. Moisture sensors not only conserve water but also prevent over-irrigation, which can lead to nutrient leaching and root damage. Sensors also monitor plant health by detecting parameters like chlorophyll content, leaf temperature, and canopy structure. These metrics provide early indications of plant stress, allowing for timely interventions to prevent disease spread or optimize growing conditions. Sensors that measure environmental variables such as temperature, humidity, and light intensity also play a crucial role in maintaining optimal growth environments, especially in controlled greenhouses. In addition to these, advanced imaging sensors, including multispectral and hyper spectral cameras, offer insights into plant physiology

and detect issues such as nutrient deficiencies or pest infestations early on. When integrated with IoT platforms and data analytics tools, sensor networks enable farmers to make more informed decisions, leading to higher crop yields, reduced input costs, and more sustainable farming practices. As sensor technology continues to evolve, its role in horticultural crop monitoring is poised to expand, offering even more sophisticated tools for sustainable and efficient crop management.

Keywords: *Sensors, Monitoring, Efficiency, Technology*

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Performance of ber (*Ziziphus mauritiana* Lamk.) cultivars for qualitative and organoleptic traits along with biotic and abiotic stress under semi-arid conditions of Haryana

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The present research was carried out at the experimental orchard of CCS Haryana Agricultural University, RRS, Bawal (Rewari), Haryana on ber cultivars planted at 7×7 m in RBD. These cultivars are studied for organoleptic and quality parameters along with biotic and abiotic stress. Among organoleptic traits studied cultivars Gola, Umran, Narendra Ber Selection 1 and Narendra Ber Selection 2 were observed most acceptable (8) followed by Chhuhara, Goma Kirti, Thar Sevika and Thar Bhubhraj (6) whereas, Kaithli was observed the least acceptable (5). Mature fruit colour varied as greenish-yellow, yellowish and yellowish-green. Fruit firmness in mature fruits was soft, medium and hard. Among qualitative traits, maximum TSS (20.72 °B) and TSS/acid ratio (64.8) was observed in Chhuhara, however, minimum TSS (15.30 °B) and TSS/acid ratio (42.5) both was observed in Goma Kirti. The titratable acidity was observed minimum (0.32%) in Chhuhara whereas, it was maximum (0.38%) in Kaithli. Likewise, the maximum ascorbic acid content

(94.70 mg/100 g pulp) was recorded in Gola and minimum (88.65 mg/100 g pulp) in Thar Sevika. For biotic stress, Gola and Kaithli were found susceptible in fruit fly infestation and Kaithli was recorded highly susceptible to powdery mildew whereas, Gola, Umran and Chhuhara were found susceptible and others were resistant to powdery mildew. For abiotic stress, frost injury was observed in Chhuhara whereas, rest of the cultivars were resistant against frost injury and fruit cracking was found in Gola and Narendra Ber Selection 1.

Key words: *ascorbic acid, organoleptic, qualitative, titrable acidity.*

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Ultrasound-Assisted Extraction of Anthocyanins from Butterfly Pea Flower: ASustainable Approach

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Butterfly pea flower (*Clitoria Ternatea* L.) belongs to Fabacae family which is a rich source of anthocyanins. Anthocyanins are natural pigments with significant antioxidant, anti- inflammatory, and anti-cancer effects, are widely employed in food, pharmaceutical, and cosmetic sectors. Various conventional methods employed for extraction of bioactive compounds has certain limitations in terms of time, energy, and solvent requirements. Ultrasound assisted extraction (UAE), being a green extraction technology, offers various advantages such as shorter processing times, lower energy consumption, and higher extraction yields when compared to traditional approaches. This study provides a review of mechanism, concepts, and factors affecting extraction of bioactive compounds with particular focus on pigment extraction from flowers. The present study investigated the use of ultrasound-assisted extraction (UAE) to increase the extraction of anthocyanins from Butterfly Pea Flower (*Clitoria Ternatea* L.) in a sustainable manner. In this research, the effects of important extraction parameters, including ultrasonic power (200–250 W), sonication time (15–35 min), and solid-solvent ratios (1:20–1:40 g/ml), was investigated to identify their effect on anthocyanin content. The results demonstrated that the total anthocyanin content varied significantly, ranging from 14.19 to 49.26 mg/g DW, depending on the extraction parameters. The optimal conditions for

maximum anthocyanin yield were achieved at 250 W ultrasound power, 35 minutes of sonication, and a 1:30 solid-solvent ratio. Further increases in solid-solvent ratio or prolonged sonication time led to reduced extraction efficiency, attributed to the dilution of solvent and potential degradation of anthocyanins. These findings confirm that UAE is an effective and environmentally friendly method for extracting anthocyanins, offering a greener alternative for applications in food, cosmetics, and nutraceuticals.

Keywords: *Ultrasound assisted extraction (UAE), Anthocyanins, Butterfly Pea Flower, sustainable extraction*

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SMART- CLIMATE FARMING

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Smart- climate farming (SCF) is a method for reorienting and transforming agricultural development in response to the new realities of climate change. The concept was initially introduced in starting of 21st century and has since undergone significant modifications as a result of the inputs and interactions of numerous stakeholders who have been involved in the development and implementation of the concept SCF's objective is to establish globally applicable principles for the management of agriculture in the context of climate change. These principles could serve as a foundation for policy support and recommendations from multilateral organizations, including the United Nations' Food and Agriculture Organization (FAO). SCF is a comprehensive strategy that tackles the interconnected issues of food security and climate change. It focuses on three main goals: promoting sustainable agricultural productivity to improve farm incomes, food security, and overall development; enhancing the resilience of agricultural and food security systems to climate change; and reducing greenhouse gas emissions from agriculture, including crops, livestock, and fisheries. To achieve these objectives, it is necessary to

bring about changes in the behavior, strategies, and agricultural practices of farming households. This can be done by enhancing their access to climate resilient technologies and practices, knowledge and information to increase productivity. Additionally,providing them with inputs, market information, and assistance for income diversification can be helpful. It is also important to organize them better for collective action. SCF can help foster a shift towards agriculture and food systems that are highly efficient, environmentally friendly, and sustainable. This is accomplished by advocating for the implementation of climate smart practices that have been validated by robust evidence, and creating a supportive atmosphere that encompasses favourable policies, institutions, and financial resources. SCF tackles the task of satisfying the increasing need for food, fibre, and fuel, even in the face of a changing climate and limited opportunities for agricultural expansion on new lands. SCF is dedicated topromoting economic development, reducing poverty, and ensuring food security, while also prioritizing the productivity and resilience of natural and agricultural ecosystem functions.

***Keywords**: Smart- climate farming, food security, climate resilient technologies*

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Reviewing the Impact of Global Warming on Silk Farming

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Climate change poses a significant threat to global agriculture, disrupting crop production, soilhealth, water resources, and regional food security. Sericulture, offers a vital livelihood opportunity for millions of people due to its high employment potential, low capital requirements, and lucrative nature. India provides employment to over 8.5 million individuals across the entire silk production value chain. However, the domesticated mulberry silkworms,which are sensitive to temperature fluctuations, are vulnerable to climate change. As cold- blooded animals, temperature directly impacts their physiological activities, making them susceptible to changes in climate. The sericulture

sector is impacted by climate change in a number of ways. Rising annual mean temperature, irregular rainfall, humidity, lack of management practices, accumulation of anthropogenic greenhouse gases in the atmosphere andlack of management practices will lead to reduced production of raw silk, mulberry leaf yield,silk content, breakage in silk thread during reeling or spinning, water stress, drought, risk of soil acidification and salinization, decomposition of organic matter, Nitrogen fixation, and mineralization of N, P, and S and unpredictable monsoon. The impact of global warming on silkworms is more concerned as they participate in several biotic interactions that are critical to the ecological functioning of our country and significantly boost its GDP. The exact effect of climate change on soil health and sericulture industry is based on prediction and not yet proven, but several explanations have been proposed in this regard. Based on prediction of several researchers from various Indian institutions, the temperature may rise from 0.5 to 4.0^{o}Cin the various part of the country in next few decades from the accumulation of anthropogenic greenhouse gases in the atmosphere, which may change practices and economy of sericulture drastically.

Key words: *Clod blooded, Sericulture, GDP, Climate change and Anthropogenic*

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Soil physico-chemical characteristics of natural and plantation forest beside Bauxite MineArea of Mainpat, Surguja, Chhattisgarh

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The present study is an attempt to study the soil physico-chemical characteristics of natural forestand plantation area in and around bauxite mine area of Mainpat area of Surguja division of Chhattisgarh, India. Soil sampling was done from three different depths (5, 10 and 15cm) of natural forest area followed by the three different restoration sites (Kesara, Sapnadar and Kudari) of bauxite mining area. Various soil parameters such pH, conductivity, specific gravity, % moisture and bulk density was determined for the soil samples of both the natural forest and restoration site of the bauxite mine area following

the standard method. Results reveal that soil ofboth the plantation site and the natural forest were found to be acidic in nature. The soil of the natural forest beside bauxite mine area reflected that organic carbon % increased top to bottom layer of the soil. On the other hand, the value of moisture content, conductivity and specific gravity values showed a declining trend with gradual increase in the soil depth. 6 different species were used in the plantation site for ecorestoration of the soil quality of the bauxite mined area. Highest moisture content of soil was recorded by *Acacia aurieuliformis* in the Sapnadar site, followed by *Eucalptus* sp in the Kudari site. Highest specific gravity and bulk density value was recorded by *Alkanna tinctoria* in the sapnadar site followed by *Eucalptus* species in rest of the study sites. pH and bulk density value was found to be higher in the restoration site in comparison to the natural forest area. From the results it can be concluded that selection of suitable species for ecorestoration of soil of bauxite mined site would be a suitable strategy for restoring the quality of degraded soil.

Keywords: *Bauxite mining, Soil, Physical attributes, Plantation*

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Effect of Germination on Nutritional, Anti-Nutritional Factors and Mineral Contentof Pearl, Barnyard and Kodo Millets

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Commonly consumed millet like pearl millet, barnyard millet and kodo millet were germinated for different time interval. The influence of germination on millets were studied for nutritional, anti-nutritional and mineral content. The results showed that the anti-nutritional factors viz, tannin content of germinated pearl, barnyard and kodo millet was 0.034 mg/100g, 0.653 mg/100g, and 0.237 respectively, while the phytic acid content after processing of pearl, barnyard and kodo millet was found to be 247.88 mg/100g, 100 mg/100g and 98.5 mg/100g respectively. It was observed that there was a significant reduction in tannin and phytic acid content after the

germination. After germination it was seen that there was reduction in protein and ash content of all the three millets while no significant change was observed in the moisture and fat content. It was observed that there was significant (P ≤0.05) increase in the iron and calcium content of germinated millets.

Keywords: *Millets, Pearl, Barnyard, Kodo, Anti-nutritional factors.*

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Evaluation of elite wheat genotypes on the basis of morpho-physiologicaltraits under terminal heat stress conditions

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Bread wheat (*Triticum aestivum* L.) is an allohexaploid species, belongs to *Poaceae* family, composed of 21 chromosome pairs ($2n = 6x = 42$) organized in three sub-genomes, namely A, B and D Genome (BBAADD). In today's scenario of increasing world population, production and productivity of wheat is also faced to many biotic and abiotic stress. Crop failure is largely driven by various climate-related hazards, with heat stress being the most significant factor limiting crop production in wheat. A substantial portion of global crop yield losses is due to heat stress caused during the reproductive phase, stress during the flowering and grain-filling phases, a condition referred to as terminal heat stress. This study evaluated the effects of terminal heat stress on various morphological and physiological traits in wheat under both normal and heat-stress environments. Thirty wheat genotypes were examined and significant differences were found among them for all heat stress indices based on a combined analysis of variance. The findings indicated that traits like enhanced stay green duration, lower canopy temperature during the reproductive stage and a reduced heat susceptibility index were linked to improved grain yield in wheat and hence could be prioritized in breeding programs to enhance crop's resilience to heat stress. Correlation analysis revealed that grain yield was positively associated with biological yield and harvest index. Genotypic and

phenotypic correlations showed that most of these traits were positively associated with grain yield, except for the heat susceptibility index. Path analysis revealed that biological yield had the most significant direct effect on grain yield, followed by harvest index, SPAD index, and peduncle length. Several promising wheat cultivars *viz*., HD 3086, SA 1033, SA 1032, SA 2022, and SA 2034 were identified for their heat tolerance and potential for late-sown conditions, which could be valuable for breeding programs aimed at developing climate- resilient wheat varieties and further crop research.

Keywords: *Climate change, stress indices, resilient breeding, wheat grain yield*

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Modern Agricultural Machinery for Precision Farming: A Review

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Precision farming is a management approach that involves the collection, organization, and evaluation of individual, temporal, and spatial data. This data is then integrated with other available information to support management decisions that are based on estimated variability, resulting in increased productivity, quality, profitability, and sustainability of agricultural output. Farm management software, GPS-based sensing devices, variable rate applications systems (for pesticides and irrigation), steering systems, and remote sensing are among the advanced sensing tools that farmers can employ in the new agricultural era. Revolutionary changes in agriculture are brought about by the introduction and utilization of modern and precise agricultural technologies. Precision technology enables farmers to enhance both farm productivity and profitability by utilizing real-time field information. This approach safeguards the environment, which can serve as a pivotal moment in their success stories. Drones, rotavators, DSR machines, super seeder, and combine harvesters, among others, have revolutionized agriculture by providing producers with significant cost savings, increased efficiency, and increased profitability. Drones have the capacity to map farmland, provide crop

health reports, enhance spraying accuracy, monitor livestock and irrigation systems, and collect more real-time data. The capacity to capture and analyze this data in real time has tangible benefits for farmers, including improved crop yields, reduced consumption of resources on insects and pests, weeds and herbicides, and more informed management decisions. The futuristic perspective of precision farming is elucidated through a comprehensive review of current trends, benefits, and challenges.

Keywords: *Precision Farming, Sensing Tool, Drone, Super Seeder, Crop Yields, Weeds.*

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Application of Artificial Intelligence in Farming Sector

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India's diverse soil and climatic conditions, along with its varied agroecological regions, facilitate the cultivation of numerous agricultural crops, which substantially bolster the Indian economy by increasing farm productivity, creating employment opportunities, and supplying raw materials to various food-processing industries. The conventional agricultural practices employed by farmers in India are inadequate to satisfy the food requirement. Consequently, fulfilling the demand with less resources presents a challenge; however, it can be accomplishedthrough the integration of Artificial Intelligence (AI) in the domain. Recent research has shownthe utilization of AI in agriculture by forecasting unfavourable climatic conditions, facilitating optimal micro-environments through remote-controlled drip irrigation, and automating irrigation processes. Additionally, AI aids in crop genotype determination, disease diagnosis, pest and weed management, maturity assessment of fruits and vegetables, yield prediction, robotic harvesting, minimizing post-harvest losses, and enhancing fruit quality evaluation in the processing sector. The automation of agriculture through the integration of AI in various farming

operations facilitates precision cultivation, resulting in increased crop production andenhanced quality while conserving resources, hence addressing food demands. Artificial intelligence can diminish cultivation expenses by optimizing labour use, enhancing the efficiency of fertilizers and pesticides, and minimizing crop losses through timely and matureharvesting.

Keywords: *AI, automation, conventional agriculture, cultivation, harvesting*

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Evaluation of Development, Performance, and Cost-effectiveness of a Hand-Operated Maize Sheller

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The conventional methods of shelling maize include rubbing the cobs against one another, rubbing on blocks, or using an iron cylinder with a wire mesh embedded inside. These techniques are both time-consuming and tiresome. The tubular maize sheller was devised for maize shelling and was found to be more efficient in terms of shelling efficiency, labor requirement, field capacity, and damage/broken grains than the local practices. Small and medium-sized producers are unable to afford the high-capacity power-operated shellers, which are equipped with loading, cleaning, grading, and bagging capabilities. With the aforementioned factors in mind, a study was conducted to develop and evaluate a hand- operated maize sheller with a low capacity and a low grain broken percentage. The purpose of this study was to benefit small and marginal farmers, particularly for seed purposes. The effectiveness and operational cost of the hand-operated maize sheller were evaluated and developed. The optimal machine capacity, cleaned grain, shelling efficiency, and damaged grain were determined to be 48.15 kg/h, 98.95 %, 98.76 %, and 0.98 %, correspondingly, at a 13% moisture content of the cobs. The machine's operational cost was Rs 68.93/h, with a payback period of 0.7 years.

Keywords: *Cleaned and damaged grains, capacity, shelling efficiency, operational cost*

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Synthesis of cellulose nanoparticles extracted from agricultural wastes

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The synthesis of cellulose nanoparticles from agricultural waste presents a sustainable approach to valorizing biomass and promoting eco-friendly materials. This study explores the extraction and characterization of cellulose nanoparticles derived from agricultural residues, such as rice straw and rice bran. Utilizing a combination of chemical treatments and mechanical methods, cellulose is isolated and used for the formation of nanoparticles. The non-conventional method (Ultrasonictor) was used to prepare the extract from cellulose and then further characterization by particle size analyzer (PSA) to assess the size and structural integrity of the synthesized nanoparticles. The size range of synthesized nanoparticles was within 100nm and these highlighted the size distribution (40% intensity) and stability of cellulose nanoparticle. The results demonstrate that cellulose nanoparticles exhibit promising properties, such as high surface area, biodegradability, and compatibility with various polymers. These attributes position cellulose nanoparticles as potential candidates for applications in bio- composites and environmental remediation. This research highlights the importance of agricultural waste as a valuable resource for the development of innovative and sustainable nanomaterials, contributing to both waste reduction and the advancement of green technology.

Keywords: *Rice straw, Ultrasonicator, Particle Size Analyzer (PSA)*

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Nanotechnology: Future in Forest Management

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Due to the startling rate at which forests are being destroyed for resource exploitation, forest cover is decreasing at a faster rate for around 3.3 Mha/year annually (FAO). Researchers, worldwide are under pressure to provide solutions for the conservation and management of forest resources. Numerous studies on the uses of nanotechnology in the fields of industrial science, forestry, agro-ecosystems, medical science and climate science have been conducted. Nanotechnology has enormous potential in the field of paper and pulp industry. This can lead to enormous cut in carbon footprint, as these industries are responsible for large amount of harmful gases emission. Owing to the special qualities of nanoparticles they require less material and space the have unique features which can be wonderful if utilized properly in forest science. Several potential uses of nanotechnology in forestry and forest resource management exist, including the detection and monitoring of stress, monitoring of climate change, management of forest risk, use of forest biotechnology, monitoring of forests, study of forest ecology, and the paper and pulp industry. Lignocellulosic material with a nanofibrillar structure is formed from renewable forest resources and can used as a wide range of commercial products. Nanowires incorporated into paper can be used to create conductive, flexible, usable, and transparent paper products. Conductive nanocoating on wood fibres can be used for development of sensors, communication devices and electronic paper displays. A visionary research programme in this domain can transfigure pulp and paper industry. The forest-based economy may be surprised by the possibilities for wood and forest-based product development made possible by nanotechnology.

Key words: *Forest, Nanotechnology, Applications, Climate change, Paper and pulpwood*

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Plant-Derived α-Glucosidase Inhibitors: Harnessing Plant Secondary MetaboliteBiodiversity for Type 2-Diabetes Therapeutics

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α-Glucosidase inhibitors are crucial in the management of Type 2 diabetes due to their ability to reduce postprandial hyperglycemia. However, the limited availability of inhibitors such asacarbose, voglibose, and miglitol, coupled with their adverse side effects from prolonged use, underscores the need for alternative therapeutic agents. Natural compounds derived from plants offer a promising reservoir of structurally diverse molecules with potential anti-diabetic activity. This study aims to demonstrate the potential of plant biodiversity in discovering new α- glucosidase inhibitors of non-polar nature through robust, high-throughput screening of plant species. Hexane-extracted metabolites from 43 species demonstrated significant inhibitory activity, with IC50 values ranging between 0.056 and 3.387 mg/ml, outperforming the standard inhibitor, acarbose. Chemo-profiling using Gas Chromatography-Mass Spectrometry (GC-MS) was conducted to identify and characterize the bioactive compounds responsible for this inhibition. Principal Component Analysis (PCA) and Partial Least Squares Discriminant Analysis (PLS-DA) were employed to analyze the distribution of these bioactive metabolites, revealing distinct clustering between inhibitory and non-inhibitory plant species. Phytol emerged as a key differentiator for non-inhibitory extracts. However, the study is limited by the number of plant species screened. This study highlights the success of the high-throughput screening approach and the importance of harnessing plant biodiversity to discover plant-derived biopharmaceuticals. The identified metabolites hold promise for the development of natural diabetes therapeutics, aligning agricultural innovation with healthcare advancements.

Keywords: *Plant secondary metabolites, Hexane extracts, α-glucosidase, GC-MS*

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Maize (*Zea mays* L.) + Legume Intercropping Systems in India; ACritical Review

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The Indian population is growing rapidly (1.25 billion) and it has to fulfill its food and nutrition requirement. A collaborative strategy should be adopted for increasing productivity by intensifying available land use system. Intercropping is advanced management practices of soil fertility status, consisting of cultivating two or more crops in the same space at the same time, which have been practiced in past decades and achieved the goals of agriculture. Growing legumes in western Uttar Pradesh not only major biological nitrogen source but also a powerful option to reduce synthetic nitrogen fertilizers and associated consumption fossil energy. Inclusion of legumes in the cropping system has been known since times immemorial. Legume help in solubilizing insoluble P, improving the physical condition of soil, increasing soil microbial biomass and restoring organic carbon and also has smothering effect on suppressing weed. The carryover of N released from legume for succeeding crops in intercropping system is also imperative. In a country like India, where the average consumption of nutrients by chemical fertilizers is low, the scope for exploiting direct and residual fertility due to maize+legumes intercropping has a great potential. This review deals with the important aspect of legumes on increasing productivity and nutrient use-efficiency and improved soil fertility status under smallholder farms of semi-arid area of India in various intercropping systems. In this study, the work carried out by researchers about different intercropping system is discussed, and it would be beneficial to the researchers who are involved in this field. Maize yield increased when sown with legume. Grain legumes like mashbean, mungbean and redgram provide an equivalent to 70 kg N ha^{-1} on main crop. Various studies have shown that among legume/cereal intercropping system, the combination of maize/cowpea is considered to be highly suitable with a minimum competition for nutrients, water, light and space besides resource use-efficiency. Nitrogen economy in maize+legume is still a researchable issue because the key point for leguminous crop grown with maize in intercropping system is nodulation problem. Legumes with indeterminate growth are more efficient in N_2 fixation than determinate types. Intercropping enhanced

higher and more stable grain yield than the mean sole crops, higher cereal protein concentration than in sole crop (11.1 versus 9.8 %), higher and more stable gross margin than the mean sole crops and improved use of abiotic resources according to species complementarities for light interception and use of both soil mineral nitrogen and atmospheric N_2.

Keywords: *Intercropping, Maize + Cowpea, Legumes.*

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Precision Agriculture: A Tool for Forest Management

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Smart agriculture and forest management can work together synergistically to enhance sustainability, improve yields, and promote biodiversity. Integration of Trees and Crops; Combining agricultural crops with trees can improve soil quality which can reduce erosion, and enhance biodiversity. Trees can provide shade for certain crops, helping to regulate temperature and moisture. Precision Agriculture is a Data-Driven Decision Making process in which using sensors, drones, and satellite imagery to monitor crop health and soil conditions, allowing for targeted interventions. Resource Optimization like efficient use of water, fertilizers, and pesticides reduces waste and environmental impact. Sustainable Practices like conservation tillage reduces soil disturbance, which helps in maintaining soil structure and health, and can promote carbon sequestration. Other method is cover cropping in which planting cover crops improves soil fertility and prevents erosion, while also providing habitat for wildlife. Smart agriculture techniques help in biodiversity conservation. Healthy forests support diverse ecosystems that can enhance agricultural resilience. Forests play a crucial role in watershed management, regulating water flow and improving quality. Cultivating a variety of crops and tree species can reduce vulnerability to pests and climate change. Both forests and agroforestry systems can capture carbon, contributing to climate change mitigation. Educating farmers and forest managers about sustainable practices and technology can lead to better outcomes. Utilizing traditional knowledge alongside modern techniques can enhance local resilience and sustainability. By integrating these approaches, smart agriculture and forest management can create a more resilient and productive system that benefits both people and the planet.

Key words: smart tools, data management, resilience, carbon sequestration, productivity.

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Enhancing Agricultural Commercialization through Horticulture: Strategies for Sustainable Development and Economic Resilience

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Horticulture is a cornerstone of agricultural commercialization, playing a pivotal role in enhancing food security and driving economic development. This paper explores the transformative impact of horticultural practices on the commercialization of agriculture, focusing on the production of high-value crops such as fruits, vegetables, and ornamental plants. We analyse innovative cultivation techniques, including hydroponics and precision farming, that improve yield and resource efficiency, facilitating entry into competitive markets. The study also highlights the significance of supply chain management and marketing strategies in connecting producers with consumers, emphasizing the growing demand for sustainably produced and locally sourced products. Additionally, we investigate the role of technology in enhancing post-harvest processes, packaging, and distribution, thereby increasing market accessibility and reducing food waste. The findings underscore the potential of horticulture to not only meet consumer needs but also to drive economic resilience in agricultural communities. This research advocates for collaborative efforts among stakeholders to promote horticultural commercialization as a pathway to sustainable agricultural development and enhanced rural livelihoods.

Key words. Horticulture, Agricultural Commercialization, Sustainable Development

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Solar Powered Water Filtration Units

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This abstract discusses the development and functionality of Solar Powered Water Filtration Units (SWFUs) designed to address water scarcity in remote areas. These units harness solar energy to filter and sterilize water, ensuring access to clean drinking water. Key components include the battery storage system, water intake system, pre-filtration stage, filtration chamber, UV sterilization unit, clean water storage tank, and dispensing system. Each unit is enclosed in a durable structure and equipped with a monitoring system to ensure optimal performance. The advantages of these units are highlighted, such as cost-effective water production, reduced energy consumption, and health benefits through reliable access to clean water. The technology also supports sustainability by reducing reliance on fossil fuels and reaching underserved communities.

Keywords: Solar energy, water filtration, sustainability, public health, renewable resources, clean water.

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Challenges Encountered by Maize Farmers in Punjab and Jammu Region

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Maize (*Zea mays* L.) is one of the most significant cereal crops globally. It serves as a crucial food source in Asia and is a staple for over 1.2 billion people in Sub-Saharan Africa and Latin America. Known for its high productivity compared to other members of the Poaceae family, maize is often referred to as the Miracle Crop and Queen of the Cereals. Maize is one of the major field crop cultivated in almost all districts of Jammu and Kashmir (J&K), covering an area of 289.17 thousand hectares with a production of 508.80 thousand MT. It is the primary crop in the hilly districts of J&K and plays a crucial role in local livelihoods. Maize crop is cultivated in almost all districts of Punjab, covering an area of 105.2 thousand hectares and production of 395 thousand MT. The present study was conducted in Punjab and Jammu region of Jammu and Kashmir where four districts (two each from the respective states/UT) namely Ropar and Hoshairpur districts of Punjab and Jammu and Rajouri districts of Jammu region were purposely selected for studying the maize crop. The study adopted Purposive Sampling technique for the selection of districts and blocks based on highest area of the crop under study. However villages and producers were selected randomly. A total number of 360 respondents were studied from twelve blocks of Punjab and Jammu region out of which six blocks of Punjab were Bhunga, Hoshiarpur-I, Hoshiarpur-II, Anandpur Sahib, Nupur Bedi and Ropar respectively and remaining six blocks of Jammu were Akhnoor, Bhalwal Brahmna, Nagrota, Sunder Bani, Kalakote and Nowshera respectively. Data was collected at individual farmer level, through open ended interview schedule. Data was tabulated and analyzed through SPSS software in which Z-test was applied to compare the proportions from two independent groups to determine if they are significantly different from one another. The study revealed major problems faced by the maize growers and it was found that the insect-pest attack had the most significant impact on the maize cultivation followed by wild animal menace, non-availability of inputs, low price, power shortage and labour shortage during the peak time.

Keywords: *Maize, low price, wild animal menace, labour shortage, miracle crop.*

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A Test to Measure the Knowledge of Systematic Walnut Growers about Walnut Cultivation

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A study was conducted to develop a test for measuring the knowledge of systematic walnut growers about different production recommendations of walnut as it is one of the important nuts grown in the country. In India walnuts are grown in Arunachal Pradesh, Himachal Pradesh, Uttarakhand and Jammu and Kashmir but Jammu and Kashmir contributes around 98 per cent of the country's total output. Walnuts are also an important part of the erstwhile state's booming horticulture industry, which generates respectable profit and does a great deal to combat poverty in the region. As Jammu and Kashmir produces 98% of India's total walnut produce but still walnut producers have been hit by the decline in exports due to poor quality, production is decreasing day by day, rates have fallen as well due to poor quality and lack of mechanization, varying size of fruit, lack of high quality grafted plants by government, poor orchard management while the cost of labour has been increased multifold due to its huge canopy which is because of lack of proper knowledge regarding walnut production recommendations. In this direction an attempt was made to develop a test.The test consists of twenty - seven items and thirty-six systematic walnut growers with reliability coefficient 0.90 by using the formula of Spearman Brown prophecy. The reliability coefficient was also calculated by using Cronbach Alpha which was 0.83. For the formulation of test, difficulty index and discrimination index were also calculated in order to retain the final items for further data collection in the study area.

Keywords: *Knowledge, recommendations, mechanization, reliability coefficient, difficulty index, discrimination index.*

Biotechnological Advances in Mulberry Crop Improvement

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Biotechnology, in recent years, has created unprecedented opportunities in almost all the sectors. It has become the world's fastest growing and the most rapidly changing technology. The advent of high throughout genomics, proteomics, metabolomics and genome editing based technologies has shifted the paradigm to address the biological questions in novel ways and helped in devising new strategies to improve the crop and animal productivity. Their applications are found in a wide range of organisms including mulberry silkworm *Bombyx mori* as the only truly domesticated insect which has been has been intimately and completely dependent on humans for its survival and reproduction. Since *B. mori* remains critically important to sericulture throughout the world, the significance of *B. mori* has grown with the sequencing and annotation of its genome along with the development of genetic technologies that enable the genome to be manipulated. *Bombyx mori* larvae have also exhibited enormous potential to be used as living 'bioreactors' which, after appropriate genetic modification, can produce valuable proteins, therapeutics and silk-based biomaterials. In the past 10 years, great advances have been achieved in the development of genetic technologies in *B. mori*, including transposon-based technologies that rely on piggyBac-mediated transgenesis and genome-editing technologies that rely on protein- or RNA-guided modification of chromosomes. (Wills *et al*., 1995). The successful development and application of these technologies has not only facilitated a better understanding of *B. mori* and its use as a silk production system, but also provided valuable experiences that have contributed to the development of similar technologies in non-model insects. These major scientific advances have greatly promoted *B. mori* as a model organism not only for lepidopterans but also for general biological phenomena and mysteries.

Application of biotechnological methods for crop improvement has significantly contributed to the success of modern day agriculture. Enhancement of yield potential, improvement of quality, resistance to pests

and diseases, tolerance to abiotic stresses and resistance to herbicides are the main focus of crop improvement in many agricultural crops through biotechnological approach. Mulberry (Morus spp.) is a crop of economic importance in the sericulture industry. Its foliage forms the sole source of food for the domesticated silkworm, *B.mori* L. However, biotechnology application holds a great promise in further improvement of mulberry crop especially in those areas where conventional research has not achieved the desired success. Already considerable progress has been made in this direction.

***Key Words**: Biotechnological, Mulberry, Leaf yield, Bombyx mori L.,*

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Studies on the different planting season and spacing on vegetative growth, flower yield and yield attributing character of African marigold (*Tageteserecta* L.) variety PusaNarangiGainda

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The present investigation was conducted during *Kharif, Rabi* and *Summer* season 2019-20 and 2020-21at College of Agriculture and Research Station, Raigarh, Chhattisgarh. The treatment comprised of three factors i.e. different planting season (Se_1: Kharif ,Se_2 :*Rabi* and Se_3 : *Summer*) three spacing (S_1: 30 x 30 cm, S_2 : 45 x 45 cm, and S_3 : 50 x 50 cm). Three factor experiments are laid out in randomized block Design (Factorial) with three replication. The results revealed that (Se_1): *Kharif* season produced significantly higher value of plant height, diameter of flower and yield attributes, (number of flower per plant, flower yield per plant (g), flower yield (kg) and yield (t/ha)) followed by (Se_2) *Rabi* season during both the years 2019-20 and 2020-21 and mean of two years. While, (Se_2)*Rabi* season recorded higher plant spread, primary and secondary branches, first bud appearance, fresh weight of individual flower, and 50% flowering under this investigation. The maximum significant plant height and earliest first bud appearance, flower yield per plant (g), flower yield (kg) and yield (t/ha) was obtaining in treatment (S_1) 30 x 30 cm during both the years 2019-20 and 2020-21 and mean of two years. Maximum plant spread (E-W and N-S) in observed in treatment (S_3) 50 x 50 cm during both the years and on the basis of mean data followed by (S_2) 45 x 45 cm during this investigation.

Keywords*: Marigold, planting season, flowering and flower yield.*

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Integrated nutrient management as a strategy for improving soil physico-chemical properties under saline water irrigation in pearl millet-wheat cropping system

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The higher evaporation rate and use of poor quality irrigation water in arid and semi-arid areas leads to development of soil salinity. The experiment was conducted to evaluate the effect of integrated nutrient management on soil properties under saline water irrigation in pearl millet-wheat cropping system during 2022-23 and 2023-24. The experiment was consisted of twelve treatments viz. T_1 (75 % RDF), T_2 (recommended dose of fertilizers, RDF), T_3 [75% RDF +ST-3 (*Azotobacter chroococcum*)], T_4 (RDF +ST-3), T_5 [75% RDF+ 2.5 t/ha Biogas slurry (BGS) + ST-3], T_6 (RDF+ 2.5 t/ha BGS+ ST-3), T_7 [75% RDF+ 2.5 t/ha Vermicompost (VC)+ ST-3], T_8 (RDF+ 2.5 t/ha VC+ ST-3), T_9 [75% RDF+ 10 t/ha farm yard manure (FYM) + Biomix], T_{10} (RDF+ 10 t/ha FYM+ Biomix), T_{11} (75% RDF+ 2.5 t/ha VC+ Biomix) and T_{12} (RDF+ 2.5 t/ha VC+ Biomix). The available nitrogen, phosphorus and potassium content were increased significantly with integrated nutrient management, while decreased non-significantly with increasing salinity under sole application of inorganic fertilizers. Soil pH reduced with INM as compared to initial values with increasing salinity level. The electrical conductivity (EC_e) of soil increased significantly after two years of study due to continuous use of saline water.

Keywords: *Integrated nutrient management, saline soil, cropping system, vermicompost, biogas slurry*

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Approach for deactivation of lipase in Millets

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After the international year of millet, millet-based products, and millet flour were fortified and product value addition was highly commercialized. Milltes have high nutritional benefits with average fat per 100 gm approximately (Little= 5.2 gm; Foxtail= 4.3 gm; Kodo= 4.2 gm; Banyard= 4 gm; Finger= 2 gm; Brown top= 1.89 gm; Proso= 1.1 gm), that leads to the enzymatic rancidity (lipases and peroxidases) and decrease the self-life of millets and its products. For the deactivation of lipase, research was held in the direction of genetic modification of millet variety and lipase species, and a combination of novel technologies including drying, pulse electric field, irradiation, microwave, and membrane techniques.

In this abstract, we introduce a new research approach for reducing lipase enzymes in millet grain. Techniques need to be developed in the direction of enzymatic interactions with other molecules, which can be incorporated into the packaging material and processing techniques. This kind of approach can lead us towards the leaching out of lipase enzyme from sufficiently grown millet plants and related products including Instant finger millet upma mix, little millet puttu podi, Ladoo mix, Vegetable khichdi, Millet semolina, Multigrain drink mix. Here we are suggesting the development of nano-particles-rich films that can provide strong interaction with the lipases, and present the matrix components including (nitrogen-rich porous carbon film filled with broad bean extract, nitrogen-rich porous graphite film filled with broccoli extract, nitrogen-rich porous carbon film filled with meat extract) that can form the nano-particles and film matrix for the reduction of lipases in millets. Nanoparticle film must contain static Nitrogen molecules for bonding with the triad (Asp-His-Ser) present in the lipase structure after reaction with the Ho radical-rich component present on the film surface in the unbound state.

Keywords- *Lipase, nitrogen-rich porous graphite film, peroxidases, enzymes*

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Studies on location specific seasonal survey for digital mapping of important cashew diseases in Sindhudurg district of Maharashtra State

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The field experiment has been conducted for three seasons (Rainy, Winter and Summer) to study the location specific survey for digital mapping of important disease of cashew in Sindhudurg district during 2021 and 2022. The data of disease index of different major and minor disease has been collected at two different locations from each tehsil of Sindhudurg district. The collected information was compiled and formatted in to virtual image on computer by producing map that gives accurate information of disease status in the Sindhudurg district.

The Kudal and Vaibhvwadi Tehsil recorded, high percent disease index of cashew disease such as red rust and branch dying respectively during all recorded seasons. The highest yellow leaf spot was recorded during 2021-22. The Vengurla recorded highest leaf spot during 2022-23. The kudal tehsil recorded highest red rust percent disease index during rainy season. The tehsil Malvan recorded highest percent disease index of bloosam blight and sooty mould.

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PROBIOTIC: A POTENT FUNCTIONAL FOOD

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Probiotic microorganisms have been used as "food additives" in the functional food industry, which has experienced explosive growth in recent years. Probiotics are described as microbes that are alive and when given in sufficient quantities, boost the host's health. Due to their immense potential for health, probiotics are currently the focus and trending topic in human dietary selection. Probiotic foods are expected to make up between 60% to 70% of the whole functional food market. Probiotic foods are said to offer several health advantages since they support the maintenance of intestinal flora in a balanced and well-composed state and boost defense against pathogen invasion. The fact that probiotics are safe, inexpensive, and effective at preventing microbial infections is one of their most important features. Over the last few decades, considerable progress has been made in the production of dairy products that include probiotic microorganisms. Nonetheless, a variety of non-dairy probiotic products, including those based on vegetables, cereal, fruit juices, soy, oats, confections, breakfast cereals, and baby foods, have been developed recently considering the high prevalence of lactose intolerance. When consuming probiotic foods, they should be safe and contain the right probiotic organisms in sufficient quantities. It must endure the processes involved in food processing as well as the final food items that they are fashioned into. Probiotic microorganisms can be added to food for both commercial or domestic use as culture concentrates, which usually come in dried or deep-frozen form. These items come in powder or tablet form and can be eaten as nutritional supplements or as food products (fermented or non-fermented). This Review article looks at probiotics' various main uses, including their role as functional and nutritional foods and in enhancing human health.

Key Words: *Functional Food, health benefits, Dairy or Non Dairy probiotic products*

AFTEFS/SKUAST-K/AG/2024/208

Regulatory framework and policy implication for smart climate agriculture strategies to enhance digital agriculture and Agri tech solution for sustainable development in agro- economic

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The adoption of smart climate agriculture in to digital agronomics and AgriTech is very vital for promoting sustainable development within the agro-eco factor space. This paper under discussion looks into the legal requirements and policy measures required to effectively expand the use of smart agriculture tools including precision farming, artificial intelligence driven crop management, IoT applications and climate smart farming. Through digital technologies and solutions in the context of AgriTech, agriculture can make especially significant progress in the efficiency of resource use, the productivity of production, and climate preparations that are needed for sustainable development.The following regulatory reforms must be embraced in the proposed regulatory framework for the agriculture value chain; It should also enable establishment of successful public-private partnership collaborations to finance processes that encourage adoption of technologies for digital agriculture by large farms and other stakeholders in the sectors as well as guarantee that even farmers from small rural areas can benefit from improved technologies. Elements of farmer training and development are equally important in order to enhance proper use of the technology and to cushion against the negative impacts of fast adoption of the policies. They will help to make more stable and productive an agro-economic sector, to achieve food security at the national level and to further the process of sustainable use of agriculture. The paper calls for utilization of climate smart approaches in tackling challenges arising for from climate change whilst at the same time spurring innovation in the process.

Keywords: *Precision Agriculture, Climate Change, Information Agriculture, Agriculture Technology, Sustainable Partnership, Agriculture Economy, Policy Regulation*

AFTEFS/SKUAST-K/AG/2024/209

Performance evaluation of a Hybrid Paddy Thresher with an aspirator

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This research evaluates the performance of a hybrid paddy thresher with an aspirator under varying operating conditions. It examines the efficiency of threshing, cleaning, and grain loss at different grain moisture levels (13%, 15%, and 17%) and threshing cylinder speeds (15 m/s, 22 m/s, and 25 m/s). The highest threshing efficiency of 98.6% was achieved at 15% moisture content and a cylinder speed of 22 m/s, resulting in the lowest grain loss of 2.3% under similar conditions. These findings highlight the importance of considering moisture content and cylinder speed for optimal thresher performance.

This study recommends operating the combined paddy thresher at a cylinder speed of 22 m/s with a grain moisture content of 15% to achieve maximum efficiency and minimal grain loss. This balanced approach maximizes threshing and cleaning performance while reducing grain loss, making the thresher suitable for practical use in various agricultural environments.

Key Words: *Hybrid Thresher, Aspirator, Threshing capacity, efficiency, Grain losses etc.*

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BREEDING STRATEGIES FOR GENERATING CLIMATE SMART CROPS

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Agriculture and climate change are internally correlated with each other in various aspects. Climate change affects agriculture in different ways, e.g., variations in annual rainfall, average temperature, heat waves, modifications in weeds, pests or microbes, global change of atmospheric CO2 or ozone level, and fluctuations in sea level. Climate change threatens farmers ability to produce quality crops. The threat of varying global climate has greatly driven the attention of scientists, as these variations are imparting negative impact on global crop production and compromising food security worldwide. Climate resilience is the capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly. The key focus of climate resilience efforts is to address the consequences of climate change. There are many challenges to the breeders to develop climate resilient crop varieties. Big challenge is need to produce more food in limited area with good quality. There are several opportunities to the breeders to develop climate resilient crop varieties. Past and present experiences indicate the potential of crop breeding to combat climate change through the development of crop varieties with resistance/tolerance to drought, heat, and major diseases and insect pests. To this end, the crop breeding program applies both conventional and molecular approaches including focused identification of germplasm strategy (FIGS), targeting mega environments, shuttle breeding, doubled haploids, marker assisted selection, and key location phenotyping, genomic selection, genome wide association studies, transgenic technology and CRISPR-CAS technologies and prime editing are most promising. Deployment of genomic technologies can accelerate development and delivery of improved germplasm with enhanced resilience and adaptability.

Keywords: *Heat stress, genomic selection, germplasm and food security.*

AFTEFS/SKUAST-K/AG/2024/211

Methods for preservation and natural preservatives for extending the food longevity

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Food is a very basic requirement for human survival. Food preservation is treating foods to delay its deterioration. It employs any techniques to keep food from spoilage after harvest or slaughter. The main idea behind all methods of food preservation is to slow down the activity of disease causing bacteria or kill the bacteria altogether. Understanding the effects of each preservation method on foods is critical in food processing. High pressure processing developed largely to cater to those consumers who demand foods that are nutritionally healthier, more natural, and minimally processed with no preservatives. Its popularity is growing worldwide, the high cost of production and food safety when operated at low temperatures remain concerns. High pressure processing promises processing of foods in a healthier manner with the goodness of natural foods but with enhanced shelf-life. Food preservation methods such as heating, pickling, edible coating, drying, freezing and high-pressure processing can solve the problem by extending the food products shelf life, stabilize their quality, maintaining their appearance and their taste. Traditionally, pickling, fermenting and sun-drying have been our preferred methods to enjoy our favourite fruits and vegetables throughout the year. Over time, other proceses like freezing, dehydrating and canning gained prominence and have become common practices in the food preservation industry. Canning stands out as a widely employed technique in modern times, encompassing the sealing of food within airtight containers to prevent spoilage. This method entails subjecting them to specific temperatures and eliminating bacteria and enzymes that may contribute to decay.

Keywords: *food preservation, food safety, preservation methods.*

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Benefits of Zygogramma *biocolorata* beetles for destruction of parthenium grass (weed)

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The topic I chose for my research paper is very important because farmers nowadays are dealing with a lot of issues, and one of the main causes of these issues is carrot grass, also known as Congress grass. This exotic grass arrived in India with wheat from America and is now ruining farmers' crops and other assets. It also causes skin conditions, respiratory conditions, and other illnesses to manifest in farmers' bodies. I'm writing this paper in order to learn more about this subject. Additionally, this grass is harmful because to its rapid growth and reproduction. It spreads quickly by dispersing seeds, automatically consuming all of the nutrients given to farmers' crops to help them thrive. becomes malnourished. This type of grass is particularly challenging to eradicate from the crop because, after it dries, it also falls to the ground and sprouts afresh. After researching, I discovered that Zygogramma biocolorata has a rate that can be readily managed by the person who consumes it through food. There may be some control over the problem of carrot grass if we raise the population of this dark brown beetle, which feeds on the grass with its leaves. I'm conducting research on this subject, examining Zygogramma biocolorata reading habits and meeting behaviours. Over fifty insect species have been documented on parthenium in India; however, none of the indigenous species have been discovered to be host-specific thus far. The well-documented Mexican beetle Zygogramma biocolorata Pallister (Coleoptera: Chrysomelidae) was brought to India based on its success in other nations where it was established. It was discovered to be host specific and capable of feeding only on parthenium after intensive laboratory and field research, and the Indian government approved its usage. Thus, to control parthenium, Mexican beetles might be introduced and distributed throughout India. Mexican Zygogramma biocolorata insects. A significant weed across Asia, Africa, Australia, and the Pacific region, Parthenium hysterophorus poses a threat to human and animal health as well as the environment and economy. P. hysterophorus is found in Bangladesh, Nepal, India, Pakistan, and Sri Lanka in South Asia. 1988 saw the introduction of Zygogramma biocolorata, a host-specific leaf-feeding beetle from Mexico, to India.

Purpose

The main purpose of writing this article is that farmers suffer huge losses every year due to Indian Niyam Grass and there is no permanent means for this by which we can eliminate it forever, but according to our study, there is a beetle that can continuously destroy its crop because this beetle eats this crop and makes its life on it. If we change its mating and feeding ecology, then it may be possible to completely destroy this type of weed.

Result

My research work is on this subject, so I am doing a new review on this subject by assessing the facts through field work observation so that we can get some new results and work is also going on on how we can increase the population of Zygogramma biocolorata

Conclusion

The petitioner's rule is shown to be extremely detrimental to grass growers, leading to several health issues. Although this beetle is quite successful in eliminating this grass, more research is necessary to boost its population and production capacity. Carrot grass needs to be grown so that the grass is destroyed in order for it to spread from one location to another. Before attempting to tackle the problem, every farmer needs to be informed about what carrot grass is, its drawbacks, how to get rid of it, what to do with it, and what technologies to employ. issue from the start. can be let go. Farmers can't contribute to the solution of this issue unless they are well aware of it, because.

Key words: - *Grass, Beetles, Insect, Colour, Leaves, Consumes.*

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"Empowering Farmers: The Essential Role of Smart Farming Solutions"

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In an era of rapid technological advancement, smart farming has emerged as a transformative approach that addresses the critical needs of farmers worldwide. This abstract explores the pivotal role of smart farming solutions in enhancing agricultural productivity, sustainability, and resilience. By integrating technologies such as Internet of Things (IoT) devices, data analytics, and precision agriculture, farmers can optimize resource use, monitor crop health in real time, and make informed decisions based on actionable insights. Smart farming empowers farmers by providing them with tools to increase efficiency, reduce costs, and minimize environmental impact. These technologies enable better management of water, soil, and nutrients, leading to improved crop yields and reduced waste. Furthermore, the adoption of smart farming practices fosters adaptability in the face of climate change and fluctuating market demands, ensuring food security for future generations. This abstract highlights the necessity of training and support for farmers to effectively leverage these technologies. It underscores the importance of collaboration among stakeholders, including governments, tech companies, and agricultural organizations, to create accessible solutions tailored to diverse farming contexts. Ultimately, the integration of smart farming solutions represents a crucial step towards empowering farmers, enhancing their livelihoods, and promoting sustainable agricultural practices.

Keywords: *Smart Farming, food security, Internet of Things (IoT), sustainable agricultural practices and precision agriculture.*

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Genome wide identification of lipoxygenase (LOX) gene family in *Cajanus cajan* using computational approach

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Lipoxygenases (LOXs) are a family of pivotal enzymes that catalyze the lipid peroxidation of polyunsaturated fatty acids such as linoleic acids producing signaling molecules such as oxylipins. These are precursors for phytohormone such as Jasmonic acid (JA) that play role in defense responses while also regulating seed quality in *Cajanus.* In *Cajanus*, LOX initiate the peroxidation pathway thereby generating reactive oxygen species (ROS) that play role in cellular signaling as well as induction during pathogen attack, dormancy etc. These are thus potential candidates which needs to be studied for improving disease resistance and enhancing shelf life of the C*ajanus* crop. The current study thus identified 22 LOX gene family in *Cajanus* genome using computational biology that localize to chloroplast and cytosol. Each member had an intact Lipoxygenase and PLAT domain which is highly conserved. The CcLOXs are unevenly distributed on the genome and the proteins have different molecular weight, pI and amino acid composition. The characteristic motifs and gene features are also demonstrated. Based on the phylogenetic analysis with three other legumes, Oryza, *Arabidopsis* and *Solanum*, *Cajanus* LOXs could be divided into Type I- and Type II- LOXs and are most closely related to *Glycine max* LOXs. The genes are intron-rich and the gene structure is conserved in all the members. *In-silico* expression analysis indicated the role of CcLOXs in biotic stress and developmental processes. This global survey has provided an updated resource for future study of LOXs in *Cajanus cajan*. It lays a foundation upon which strategies may be developed to increase the crop's tolerance to stress and thus its yield.

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Transforming Rice Cultivation in Punjab: The Environmental and Economic Impacts of Direct Seeding

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In the wake of escalating environmental concerns and water scarcity, Punjab's agriculture is transitioning from puddled transplanted rice (PTR) to direct seeded rice (DSR), aiming to enhance environmental sustainability and resource-use efficiency. This study evaluates the comparative impacts of these practices on water and energy consumption, and greenhouse gas emissions, thereby contributing to climate-smart agricultural strategies. Conducted in Sri Mukatsar Sahib, Punjab where DSR is increasingly adopted, the study involved a multi-stage sampling of 120 farmers, analyzing energy use across various farm sizes. Data indicated that DSR significantly reduces energy expenditure, consuming on average 21,708.61 Mega Joules per acre, with variations across farm sizes—small farms expending the least energy. The study also examined energy inputs like human and machine labor, diesel use, and the application of chemical fertilizers. Notably, medium-sized farms demonstrated the highest energy use efficiency (EUE) at 4.10, attributed to optimized grain yield. These findings underscore DSR's potential in reducing input costs and enhancing sustainability, marking it as a viable climate-adaptive farming method. Emphasizing DSR could be pivotal in meeting future food security needs while mitigating environmental impacts, aligning with global climate resilience goals.

Keywords: *Direct Seeded Rice, Puddled Transplanted Rice, Energy Use Efficiency, Sustainable Agriculture, Climate Adaptation, Water Conservation, Punjab.*

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Cluster analysis and principal components analyses for yield and yield contributing traits in soybean [*Glycine max* (L.) Merrill]

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The cluster analysis based on D^2 statistics classified 200 soybean genotypes into seven distinct clusters. Cluster I had the highest number of genotypes (121), followed by clusters III (51) and II (16). Clusters IV, V, VI, and VII contained 9, 1, 1, and 1 genotype, respectively. The highest inter-cluster distances were observed between clusters VII and IV, followed by clusters VII and II, cluster VI and IV, and cluster VII and I, indicating significant differences in trait combinations between these clusters. Each cluster exhibited different mean performance for various traits, highlighting their distinct trait profiles. The cluster analysis identified moderate diversity among the soybean genotypes and revealed distinct trait profiles within each cluster. Principal Component Analysis (PCA) revealed that first five principal components (PCs) were found to be critical in explaining over 71% of the total variation, with eigen values greater than one, signifying their significance. PC1, which contributed significantly to the variation, was mainly influenced by traits like seed yield per plant, number of seeds per plant, number of pods per plant, biological yield per plant, and harvest index. These traits are crucial determinants of soybean yield and productivity. Certain genotypes, including JS 75-46, MACS 57, Gujrat soybean 1, EC 251456, EC100804, Pusa 37, TGX 8253 D, RSC 11-07, EC 242003, and CAT 660, displayed high PC scores in PC1, indicating their superiority in terms of seed yield and related traits. The findings provide valuable insights for targeted breeding strategies, utilization of heterosis, and identification of genetic resources to develop improved soybean varieties with higher yield and other desirable traits.

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Collection and evaluation of different germplasm of pomegranate

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A field study was carried out to collect and evaluate the different germplasm of pomegranate during different years (2019-20, 2020-21 and 2021-22). Seven cultivars of pomegranate collected from different institutions were evaluated (Ganesh, Mridula, Bhagwa, Jalore Seedless, Basein Seedless, Kandhari and Jodhpur Red). The results of the study revealed a significant increase in number of fruits/plant, yield (kg/plant), fruit skin colour, fruit girth (cm), TSS (^{0}Brix), acidity (%) and juice (%) of pomegranate. During 2019-20, maximum number of fruits/plant (112.0), fruit yield (27.7 kg/plant) and fruit girth (21.1 cm) were recorded in cv. Bhagwa and maximum TSS (14.1^{0}Brix), minimum acidity (1.13 %) and juice content (35.9 %) were recorded in Mridula. Whereas during 2020-21, maximum number of fruits/plant (125.7), fruit yield (30.0 kg/plant) and fruit girth (20.7 cm) were also recorded in cv. Bhagwa and maximum TSS (14.1^{0}Brix), minimum acidity (1.11%) and juice content (34.7 %) were recorded in Mridula. Similarly during 2021-22, maximum number of fruits/plant (112.3), fruit yield (27.7 kg/plant) and fruit girth (20.3 cm) were recorded in cv. Bhagwa and maximum TSS (14.3^{0}Brix), minimum acidity (1.10%) and juice content (32.0 %) were recorded in Mridula. The challenges faced during the research work was extreme variations in day and night temperatures.

Keywords: *Pomegranate, skin colour, acidity, yield, TSS.*

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Revolutionizing Food Processing through By-Product Innovation

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The development of fishing technologies has been the main reason of the huge rise in fisheries and aquaculture production that has proceeded the growth of the world population and the quick increase in population and industrialisation which follows. As a result, the amount of fish waste produced globally has increased enormously. Depending on the type and degree of processing, about 70 percent of fish are processed before being sold, producing 20 to 80 percent of fish waste. By lowering the amount of products of that are discarded into the environment, the fish processing industry's persistent use of by-products and wastes from industrial production tends to encourage raw material sustainability, increased profitability, and access to added value. Fish waste products have nearly the same nutritional value as fish's edible parts. Collagen, gelatin, bioactive peptides, protein hydrolysates, enzymes, antimicrobial peptides, pigments, chitosan, chitin, lipids, and minerals with high nutritional value and good flavour that are suitable for storage can be generated by reprocessing fish waste. Fish oil, which is rich in omega-3 fatty acids and has a variety of uses in food products and cosmetics, and fish meal, which is the most important type of ingredient in the feed industry, can be prepared from whole inexpensive fish and parts of more expensive fish.

Keywords: *Fish, by-productive, Innovative, Fish meal*

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Speed Breeding in crop improvement: Oppurtunities and challenges towards global food security

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Considering fast-changing environment, emerging pathogens, and the imminent need to feed a global population that is predicted to increase to 9–10 billion people by the year 2050, plant breeders are faced with the challenge of exploring more efficient crop improvement strategies. The urgency to enhance crops under these conditions has become a paramount concern for scientists worldwide, as current crop enhancement projects progress at a pace insufficient to meet the growing food demand. Traditional breeding methods, which often take over 10 years to develop high-performing cultivars with desired traits, are proving to be inadequate. However, a new approach known as Speed breeding presents a game-changing opportunity for crop improvement in the face of a changing world offering the potential to significantly accelerate the development, marketing, and commercialization of improved plant varieties. Speed breeding, a methodology that manipulates temperature, light duration, and intensity to accelerate plant development, has emerged as a promising solution for achieving climate resilience, long-term yield, and nutritional security. Recent innovations in breeding technologies, including genotyping, marker-assisted selection (MAS), high throughput phenotyping, genomic selection (GS), overexpression/knock-down transgenic techniques, and genome editing, can be combined with speed breeding to achieve more precise and expedited outcomes in crop enhancement. This review explores the key opportunities and challenges associated with speed breeding to guide pre-breeding and breeding programs. To achieve more efficient outcomes in enhancing major food crops, this review highlights various alternative approaches and strategies adopted for speed breeding. Integrating speed breeding with existing technologies will be essential for future crop breeding success, and concerted efforts and ongoing research holds the potential to pave the way for a resilient and productive agricultural future.

Keywords: *Marker Assisted selection, Phenotyping, genome editing, and nutritional security*

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Revolutionizing Agricultural Productivity: The Impact of Strategic Credit Utilization in South-Western Punjab's Precision Farming

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In the agriculturally rich region of South-Western Punjab, the strategic management of agricultural credit emerges as a critical enabler for the modernization of farming practices. This comprehensive study investigates the sophisticated utilization of credit among large-scale farmers, underscoring its crucial role in the integration of precision agricultural technologies. Drawing on primary data collected from 80 leading farm households, the research meticulously reveals a robust correlation between the astute management of credit and marked improvements in crop yields and farm operational efficiencies. The findings significantly highlight the transformative potential of institutional credit in driving the widespread adoption of high-tech farming equipment. This advancement heralds a new epoch in precision agriculture characterized by enhanced efficiency and increased scalability. The strategic deployment of credit not only catalyzes substantial agricultural output but also promotes sustainable farming practices, thereby aligning with global trends towards more scientifically managed agriculture. Furthermore, the study introduces an innovative framework for credit deployment, emphasizing a balanced approach between financial strategy and technological advancement. This model promises to revolutionize agricultural productivity by fostering a synergy between economic feasibility and cutting-edge technology. The potential for scalability and replication of this model offers promising avenues for policy formulation and implementation in similar agronomic contexts globally.

Keywords: *Precision Agriculture, Credit Utilization, Agricultural Productivity, Institutional Credit, Punjab Farming.*

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Adaptation Strategies vis-à-vis Climate Smart Agriculture: Unleashing factors through multinomial Logistics & Neural Networks in Green revolution belt of India

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The Green Revolution in India refers to a period during the 1960s and 1970s when India significantly increased its agricultural production, particularly in wheat and rice, through the introduction of high-yielding varieties (HYVs) of seeds, modern irrigation techniques, chemical fertilizers, and pesticides. This movement helped India transition from a food-deficit nation to one of self-sufficiency in food grains. But with due course of time detrimental effects of Green Revolution also surfaced. In the light of this adaptation strategies vis-à-vis climate smart agriculture in Green Revolution belt of Punjab and Haryana was tried to be quantified with 360 respondents. The adoption index was coded as low, 0 (100 respondents; 27.8%), moderate 1 (152 respondents; 42.2%) and high 2 (108 respondents; 30%) to apply multinomial logit model (MLR) model for the set of 9 variables viz., Owned Land, Innovativeness, Recognition, Distance of Agri-support System DASS, Climate vagaries, Agrarian fortitude, Agri asset, climate related timely information CRTI & Fatalism. Predictor variables viz., owned land, Innovativeness, DASS, Climate vagaries [odds ratio (OR), 0.292; 90% CI of Estimate (E) =0.148 to 0.577] were significant to transcend or descend from 0 to 1; while Predictor variables viz., owned land, Recognition [odds ratio (OR), 1.207; 90% CI of Estimate (E) =1.041 to 1.399], CRTI [odds ratio (OR), 2.590; 90% CI of Estimate (E) =1.603 to 4.184; p=0.001] & Fatalism were significant to transcend or descend from 0 to 2. Pseudo R-Square Cox and Snell value was 0.744; Nagelkerke value was .841 while McFadden value was .631 which suggested a very strong model fit. The MLR model was validated through Multilayer perceptrons (MLP) Artificial Neural Network, which divulged that overall accuracy of training, testing & holdout were 90.0% 86.2%, & 91.4%, respectively with specificity & sensitivity of 0=0.956; 1=0.951 & 2=0.950 shows the model's excellent performance in

distinguishing between different outcomes in this class. The research concluded that grassroots innovations in agriculture, social recognition & CRTI can be given momentum so that more farmers falls in the climate resilient agriculture adoption categories.

Keywords: *Climate-related timely information; Climate resilient agriculture; Climate-smart agriculture; Green Revolution; High-yielding varieties; Multinomial logit model.*

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"BIO-PESTICIDES: A SUSTAINABLE SOLUTION FOR ORGANIC FARMING"

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Bio-pesticides are increasingly being recognized as an essential component of sustainable agricultural practices, particularly in organic farming. Bio-pesticides, which are derived from natural organisms or their byproducts, are an environmentally friendly alternative to traditional chemical pesticides. They help to manage pests while preserving biodiversity and soil health. This abstract explores the efficacy, application methods, and benefits of bio-pesticides in organic farming systems. Research indicates that bio-pesticides can effectively target specific pests, minimizing harm to beneficial insects and pollinators. Their use promotes integrated pest management (IPM) strategies, which improve crop resilience and yield. Furthermore, bio-pesticides typically have lower toxicity and shorter degradation times, lowering the risk of chemical residues in the environment and on food products.

Despite challenges such as variability in efficacy and the need for specialized application techniques, bio-pesticides are gaining popularity in organic farming. This trend is consistent with growing consumer demand for organic produce and sustainable agricultural practices. The incorporation of bio-pesticides into organic farming not only promotes ecological balance, but also increases the economic viability of farming operations. Overall, bio-pesticides are a promising way to improve pest management in organic agriculture, resulting in a more sustainable and productive farming landscape. To fully realize their potential in organic systems, future research and development efforts should focus on optimizing their use, expanding formulations, and improving farmer education.

Keywords: *Organic farming, use of Bio-pesticides, sustainable agriculture, beneficial insects and pollinators*

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Genetic Modification for Nutritional Enhancement: Biofortification and Future Prospects

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The global challenge of malnutrition, affecting millions across developing and developed nations, calls for innovative solutions to improve food quality and nutrient content. Genetic modification offers a promising avenue for nutritional enhancement through biofortification, where crops are genetically engineered to produce higher levels of essential vitamins and minerals. This approach provides a sustainable, long-term solution to address micronutrient deficiencies like Vitamin A, iron and zinc deficiency, which contribute to widespread health problems such as blindness, anemia and weakened immune systems. Prominent examples include Golden Rice, engineered to produce beta-carotene for combating Vitamin A deficiency and iron-biofortified beans aimed at reducing iron deficiency anemia in regions heavily reliant on legumes. Advancements in CRISPR-Cas9 gene-editing technology have enabled more precise biofortification, allowing for targeted modifications without the introduction of foreign DNA, thus overcoming many regulatory and public acceptance hurdles associated with traditional GMOs. While biofortification offers numerous benefits—such as reducing the need for external supplements and fortification programs—significant challenges remain. These include ensuring trait stability across varying environmental conditions, navigating complex regulatory landscapes and ensuring access to biofortified crops for vulnerable populations. Despite these challenges, the future prospects of biofortification are promising, with ongoing efforts to develop climate-resilient crops that combine nutritional enhancement with resistance to abiotic stresses like drought and salinity. As biofortified crops move from research to widespread cultivation, they hold the potential to improve public health, increase food security and provide a sustainable solution to malnutrition in both developed and developing regions.

Keywords: *biofortification, malnutrition, CRISPR-Cas9, Golden Rice*

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RTE Foods for the Future: Enhancing Wellness and Resource Utilization through Modern Food Technologies

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Global access to nutritious meals is a critical challenge, with millions struggling to find affordable and balanced food options. Simultaneously, human health and environmental responsibility are becoming increasingly important. Researchers, scientists, and policymakers worldwide are exploring innovative strategies to address these intertwined issues. One such development is the growing prominence of Ready-to-Eat (RTE) foods, which offer convenience in a rapidly changing world. As shifts occur in how we work, manage time, eat, and shop, RTE foods — such as paneer, rajma masala, pav bhaji, and butter chicken — have gained widespread acceptance due to their minimal preparation requirements. This review critically examines the advantages, challenges, and implications of RTE foods in promoting resource efficiency, human wellness, and technological advancements in food processing and preservation. The study analyzes current market trends, price comparisons, and nutritional profiles of RTE foods relative to traditional meals. By exploring consumption patterns and dietary habits, the research seeks to evaluate whether RTE foods can meaningfully contribute to enhancing health outcomes and optimizing resource utilization. The paper also investigates whether all RTE foods are inherently unhealthy or if innovations in processing can lead to healthier alternatives. This analysis will shed light on how RTE foods, driven by innovations in food processing and preservation, can support global efforts to advance both human well-being and resource conservation.

Keywords: *Ready-to-Eat (RTE) Foods, Food Processing Innovations, Human Wellness, Food Technology Advancements*

AFTEFS/SKUAST-K/AG/2024/225

BIODIVERSITY: THE ROLE OF NATURAL ENEMIES IN PEST SUPPRESSION IN TEMPERATE AGRICULTURE

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The diversity of natural enemies in temperate zones is critical for preserving ecological balance and increasing agricultural sustainability. This region is home to a varied range of predators, parasitoid that all play important roles in pest population control. This study examines the diversity, distribution, and ecological roles of these natural enemies, emphasizing their importance in IPM methods. Habitat complexity, seasonal fluctuations, and landscape management approaches all have an impact on these creatures' abundance and effectiveness. Farmers can improve agroecosystem resilience by promoting biodiversity through methods such as cover crop planting, hedgerow maintenance, and chemical input reduction.

This work emphasizes the need for additional research into the relationships between natural enemies, pests, and climatic circumstances in order to enhance biodiversity conservation techniques in temperate agricultural systems, thereby promoting sustainable farming practices and increasing crop yields.

Keywords: *Biodiversity, natural enemies, temperate zone, sustainable farming practices*

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ILLUMINATING SOLUTIONS: THE IMPACT OF LIGHT TRAPS ON SUSTAINABLE PEST MANAGEMENT

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Light trap management is an efficient approach in sustainable agriculture for managing insect populations while reducing environmental impact. This method uses light traps to attract and capture certain insect pests, lowering their populations in the crop environment. Farmers can use light traps to monitor insect populations and identify infestations early on, allowing for timely responses. The planned installation and operation of light traps can complement other sustainable measures, such as crop rotation and biological management, to enhance overall pest control efficacy.

Furthermore, light traps lessen dependency on chemical pesticides, resulting in a healthier ecosystem. Education and training on the proper use of light traps, as well as continued research into their effectiveness and integration with other pest management strategies, are critical for optimizing their benefits. Finally, light trap management promotes the principles of sustainable agriculture by increasing crop resilience, yields, and biodiversity.

Keywords: *Light trap, crop management, pest control, biodiversity*

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"CLIMATE- SMART AGRICULTURE FOR TEMPERATE CROPS"

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Climate-smart agriculture (CSA) is a comprehensive approach to increasing agricultural productivity while ensuring environmental sustainability and resilience to climate change. This abstract investigates the application of CSA principles to temperate crops, which face distinct challenges as a result of changing climatic conditions, such as altered precipitation patterns and increased frequency of extreme weather events. Farmers can improve yield stability and optimize resource use by implementing innovative practices such as crop diversification, precision farming, and improved soil management. Furthermore, incorporating agro ecological techniques such as cover cropping and intercropping can benefit soil health and biodiversity. This approach not only addresses food security, but it also encourages lowers greenhouse gas emissions. Case studies highlight the potential of CSA strategies to create resilient agricultural systems that benefit farmers and the environment by illuminating successful implementations of these strategies in temperate regions.

Keyword: *CSA strategies, crop diversification, weather parameters, temperature, temperate crop*

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Cluster analysis and principal components analyses for yield and yield contributing traits in soybean [*Glycine max* (L.) Merrill]

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The cluster analysis based on D^2 statistics classified 200 soybean genotypes into seven distinct clusters. Cluster I had the highest number of genotypes (121), followed by clusters III (51) and II (16). Clusters IV, V, VI, and VII contained 9, 1, 1, and 1 genotype, respectively. The highest inter-cluster distances were observed between clusters VII and IV, followed by clusters VII and II, cluster VI and IV, and cluster VII and I, indicating significant differences in trait combinations between these clusters. Each cluster exhibited different mean performance for various traits, highlighting their distinct trait profiles. The cluster analysis identified moderate diversity among the soybean genotypes and revealed distinct trait profiles within each cluster. Principal Component Analysis (PCA) revealed that first five principal components (PCs) were found to be critical in explaining over 71% of the total variation, with eigen values greater than one, signifying their significance. PC1, which contributed significantly to the variation, was mainly influenced by traits like seed yield per plant, number of seeds per plant, number of pods per plant, biological yield per plant, and harvest index. These traits are crucial determinants of soybean yield and productivity. Certain genotypes, including JS 75-46, MACS 57, Gujrat soybean 1, EC 251456, EC100804, Pusa 37, TGX 8253 D, RSC 11-07, EC 242003, and CAT 660, displayed high PC scores in PC1, indicating their superiority in terms of seed yield and related traits. The findings provide valuable insights for targeted breeding strategies, utilization of heterosis, and identification of genetic resources to develop improved soybean varieties with higher yield and other desirable traits.

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Mitigation of Ethalfluralin from Entisol Soil

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A laboratory experiment was undertaken to investigate the mitigation of ethalfluralin (35 EC) in Entisol soil. To carry out this study, surface soil samples (0-15 cm) were collected from experimental farm of CCSHAU Hisar (Haryana) in year 2021 and processed for initial soil physico-chemical properties analysis**.** Ethalfluralin was applied to soil samples and it got highly sorbed in soil. Desorption study was carried out by using various extractants such as β-CD, SA, chitosan (LMW, MMW and HMW) and their combinations (β-CD-cLMW, β-CD-cMMW and β-CD-cHMW) to evaluate the efficiency of extractants. β-CD-cLMW biocomposite was most effective (approximately 2 times as compared to control) to remove the adsorbed ethalfluralin from soil.

Key words: *Entisol, biocomposite, ethalfluralin, desorption*

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Effect of *Fusarium solani* on emergence and growth of Cluster BeanSeedling

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Among Pulse crops cluster bean has a special contribution. It is grown in Rajasthan, Gujarat, Haryana, Uttar Pradesh. In India Rajasthan stands first in terms of area and production of Cluster bean. The crop produces gum which is called guar gum and is exported in foreign countries. Its seeds contain protein-18% and Fibre-32 % and about 30-33 % gum in the endosperm. Cluster bean known to suffer many fungal diseases, which affects its quality and low yield resulting in severe economic losses. Incidence of *Fusarium solani* was high in symptomatic seeds as compared to the asymptomatic seeds of both the seed samples in petriplate and water agar seedling symptom test. It was 85%, 79% (SBM) and 83%, 73% on 8th day of sowing in both the samples respectively. Where as in pot experiment germination started after 3rd day of sowing. These experimental results clearly revealed that infection of *Fusarium solani* affected the emergence and growth of seedling. It was 89%, 91% in control and 65%, 40% in all the categories of symptomatic seeds of both the seed samples respectively. Infected seedlings show brown to black streaks on collar region of the stem and brown to black necrotic patches on leaves, Root tip portion showed the rotting and small in size. In pot experiment seedlings obtained from symptomatic seeds, pods and seed setting are very few. On incubation these infected parts showed the presence of *Fusarium solani*.

Keywords: *Cluster bean, Emergence, Fusarium solani, Incidence, Incubation, Symptomatic.*

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Microbial Diversity and Putative Function in Sediment of River Ganga Through Metagenomics Approach

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The Ganga is the most important river in India, serving as an essential resource for agriculture, drinking water, and religious rituals. However, it became severely polluted due to the discharge of industrial effluents and untreated sewage, leading to a decline in aquatic biodiversity. This study investigated microbial diversity, functional gene annotation, and plastic-xenobiotic degrading enzymes in sediment metagenomes from the River Ganga. Next-generation sequencing technology has transformed metagenomics in the examination of microbiomes and their essential function in many aquatic ecosystems. We employed a high-resolution metagenomics method using the Illumina HiSeq 2500 to elucidate the structural composition and functional roles of the community microbiome in the sediments of the River Ganga. Bacteria predominate among the microorganisms in sediment samples from the Ganga River. Pseudomonadota constitutes the predominant bacterial phylum in sediment samples. Genes associated with the degradation of xenobiotic compounds, including nitrotoluene, benzoate, aminobenzoate, chlorocyclohexane, and chlorobenzene, were markedly overrepresented in the microbiome of contaminated regions. KEGG database pathway analysis revealed an increased abundance of genes associated with energy metabolism, encompassing oxidative phosphorylation, nitrogen, methane, sulfur, and carbon fixation pathways, within the Ganga sediment metagenome data. Enzymes that degrade pollutants are more prevalent in contaminated microbiomes, indicating their involvement in the degradation of plastics and dyes. Our study has elucidated bacterial diversity and dynamics in the community structure and function of contaminated river microbiomes, which is anticipated to facilitate the discovery of novel functional genes and enzymes with potential applications in health and bioremediation. This work will contribute to pollution mitigation and the sustainable management of river ecosystems.

Keywords*: Sediment Samples, Microbial Diversity, River Ganga, Functional Genomics, Metagenomics*

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Estimation of Wheat Yield using Logistic Regression and Discriminant Function Analysis in Karnal District

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Planning, formulation and implementation of any policy is only possible when we have timely and effective pre-harvest forecast of crop yield data is available, So that crop procurement, price structure, distribution and import-export related decisions can be implemented accordingly. These are very useful for farmers to decide their future prospects and course of action in advance. The statistical modelling approaches viz., multiple linear regression, ordinal logistic regression and discriminant function analysis were used to achieve pre-harvest wheat yield forecasting in Karnal region of Haryana. The weather-yield forecast models have been developed using data from 1980-81 to 2014-15 whereas, the data from 2014-15 to 2017-18 were used for validation of the fitted models. Fortnightly weather data in wheat crop starting from 1st November to one month before harvest were utilized for the model building. Data for the last one month of the crop season were excluded as the idea behind the study was to forecast yield in advance of the crop.

The performance(s) of the developed models were observed on the basis of PRESS residuals, root mean square error(s) (RSME), mean absolute percentage error (MAPE) and mean absolute deviation (MAD) as well. The overall result indicates the preference of using prediction equations based on multiple regression, scores/ probabilities of response categories obtained in logistic and discriminant analysis over the regression models using weather parameters as predictors and found that discriminant analysis based on scores gives better results than other techniques.

Keywords: *Multiple linear regression, Ordinal logistic regression, Discriminant function analysis and weather- yield models*

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Genetic Analysis for Seed Yield and Its Attributing Traits in Indian Mustard (*Brassica juncea*) Under Early Heat Stress Conditions

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This study was carried out to investigate the genetic variability and association among twelve morphological traits in 45 genotypes of Indian mustard (*Brassica juncea*) under early heat stress condition. The experiment was conducted using a randomized block design with two replications during 2021-22 at the field of the Department of Genetics and Plant Breeding, CCS Haryana Agricultural University. Traits such as days to flowering, plant height, primary and secondary branches and seed yield per plant were measured. The analysis of variance revealed significant differences among genotypes for all the traits. High genotypic and phenotypic coefficients of variation were observed for secondary branches per plant and seed yield per plant. Heritability estimates varied, with the lowest for days to flowering and the highest for siliqua length, indicating substantial genetic control over these traits. Genetic advance as a percentage of the mean was highest for seed yield per plant and secondary branches per plant. Correlation analysis revealed significant positive associations between seed yield per plant and traits like secondary branches per plant followed by primary branches per plant and plant height. Path coefficient analysis indicated that secondary branches per plant exerted the highest direct positive effect on seed yield, followed by primary branches per plant and plant height, highlighting its importance as a target for selection. These findings underscore the significant genetic variability among the evaluated genotypes and the potential for genetic improvement in mustard breeding programs through strategic selection of key yield-contributing traits.

Key words: *Brassica juncea, correlation analysis, genetic variability, seed yield and selection*

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Development of Paan flavoured Milk Drink

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The betelvine's scientific name is *Piper betle* L. It is a member of the piperaceae. The significance of the leaves has been discussed in relation to every aspect of human existence in these sources, including social, cultural, religious and even daily living, which is still very important in the modern world. At social, cultural and religious events like weddings and poojas (religious festivals) for example a well-made betelvine is still often served Paan flavored milk is prepared from non-fermented fresh milk. Flavoured milk encourages children to drink milk so that milk can be easily used for the nutrition of women and children in anganwadi, Mid-Day meal, Hostel and School. Currently flavoured milk available in the market contain synthetic chemicals added for flavour and colour which is not good for children's health. In this region processed products of betelvine like paan flavoured milk drink has a huge potential for growth and provide employment to marginal farmers with a high value income. In paan flavoured milk drink various nutritional components present like vitamin C, thiamine, niacin, riboflavin and carotene, which is helpful to cure diabetes, healing of wound, lowering cholesterol, asthma and also found anti-cancer agents.

The present study entitled "Development of Paan Milk Drink " was carried out during the year 2022-23 to 2023-24 in the RABL College of Agriculture and Research Station, Chhuikhadan KCG (C.G.). The experiment was laid out in Completely Randomized Design (CRD) with 03 replications, 08 treatments. Various chemical, nutritional and economics parameters were recorded under this investigation. The result revealed that the chemical and nutritional evaluation of pH, TSS acid ratio and non reducing sugar was significantly superior in the treatment FM1 (1%). While total sugar, reducing sugar**,** Total soluble solids and acidity was significantly superior in the treatment FM8 (8%). The quality and sensory evaluation like colour, appearance, taste, flavour and overall acceptability significantly superior in the treatment FM5 (5%). The economic parameters like cost of production, gross returns, net returns and B:C ratio (1.84) was superior in the treatment FM5 (5%). While the lowest B:C ratio (0.63) found in treatment FM1 (1%). Therefore, it may be conducted that treatment FM5 (5%) may be selected for making best quality betelvine beverage.

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Impact of Biochar on Soil Health, Environment and Economic Perspective

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Biochar produced through the thermo-chemical conversion of biomass mitigates greenhouse gas emissions and enhances ecological systems in agriculture. This article highlights a systematic focus on the advancement and enhancement of biochar and its production techniques. Biochar possesses distinct qualities that render it an efficient, economical, and eco-friendly substance for removing various pollutants. The variability in physicochemical parameters, such as surface area, micro porosity and pH enables biochar to optimize its effectiveness for specific applications. This review aims to document the recent progress in biochar research by focusing on 1.Interaction of biochar with plant roots and microorganisms 2. How biochar induced priming effect on climate change and GHG emissions3. How biochar amendments alter the soil environment, support habitats for microorganisms due to its porous structure and stimulate the creation of stable soil micro-aggregates and assure soil biological health through different processes. Biochar functions as a source of carbon and nutrients. To facilitate the commercialization of biochar for extensive applications, it is essential to get involved in the critical discourse regarding the merits and demerits of biochar for diverse soil applications concerning environmental, technical, social and economic factors. This study emphasizes the implementation of biochar in various soil settings to sustain or enhance agricultural crop output. Biochar is a multi-faceted solution to mitigate climate change, ensure food security, enhance agricultural production, and improve land restoration and waste management mechanisms.

Keywords*: Biochar, Carbon Sequestration, GHGs, Pyrolysis, Crop residue, Climate change*

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Biodegradation of Azo Dyes by Indigenous Bacterial Strains Isolated from Surinsar Wetland: A Phylogenetic and Analytical Approach to Combat Environmental Dye Pollution

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This study focuses on the isolation and characterization of dye-degrading bacterial strains from soil and water samples collected from the Surinsar wetland, located in Jammu, India. Samples were collected from various sites and subjected to physiochemical analysis, including measurements of pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Dissolved Solids (TDS). Microbial isolation was performed using the spread plating method, followed by the identification of potential dye-decolorizing bacteria through plate and liquid culture assays. Six distinct bacterial isolates demonstrated significant dye degradation capabilities, with SS1C2 showing the fastest degradation. The identification of bacterial strains was conducted using morphological, biochemical, and molecular techniques, including 16S rRNA gene sequencing. Phylogenetic analysis was performed using the Neighbor-Joining method, and the sequences were submitted to the NCBI GenBank database for further comparison. Analytical methods such as UV-VIS spectrophotometry and FT-IR spectroscopy were employed to assess the rate of decolorization and changes in functional groups of dyes post-biodegradation. Additionally, GC-MS analysis was conducted to evaluate the chemical composition of the degradation products, providing insights into the potential pathways involved in microbial dye degradation. The study underscores the biotechnological potential of the isolated strains in addressing environmental challenges related to industrial dye pollution.

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Smart Agriculture using Internet of Things (IoT)

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The rapid adoption of technology in agriculture is transforming traditional farming practices. The Internet of Things (IoT) encompasses devices that transmit data via networks, enabling better farm management and reducing production losses. IoT in agriculture leverages robots, drones, remote sensors, and computer imaging, supported by machine learning and analytics, for efficient crop monitoring and field management. IoT encompasses the use of **Robotics** wherein advanced sensors and AI have led to the rise of agricultural robots (Agribots). a) Weeding Robots use image processing to distinguish weeds from crops and remove them or apply targeted herbicides. b) Machine Navigation enables the remote operation of tractors and heavy equipment through GPS. c) Harvesting Robots use image processing and robotic arms to identify and pick fruits, ensuring quality control. The use of **Drones** equipped with cameras and sensors are used for crop monitoring, spraying, soil analysis, and field mapping. These drones provide valuable insights on crop health, irrigation, yield prediction, and more. **Remote Sensing** has aided in sustainable development in agricultural field by installing IoT-based sensors across farms to collect data on weather, soil conditions, and crop health. This data is analyzed to help farmers make informed decisions about crop management. By harnessing the power of **Computer Imaging,** Sensor cameras and drone footage undergo digital image processing to detect anomalies in crop conditions over time. This technology also aids in the sorting and grading of produce and optimizes irrigation schedules based on real-time data.

To conclude, IoT applications in agriculture are designed to optimize conventional farming practices to meet the mounting demands of a growing global population while simultaneously minimizing production losses and ultimately contributing to food security, economic resilience and sustainable development.

Keywords: *IoT, Robotics, Drones, Sensors, Image Processing, Smart Agriculture*

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Scenario of sheep rearing viz a viz its sustainability in Ganderbal District of Central Kashmir

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Sustainable development has become a leading target of scientific research and policy agenda. It refers to a harmonious interplay between environmental, socio-cultural and economic factors. The small ruminant sector must adopt to sustainable practices and principles in order to become more robust and competitive. The present study was carried out in Ganderbal district of Kashmir that consists of nine sheep development blocks. Ganderbal district was divided into three production zones based on the altitude. In each Zone there was presence of three sheep development blocks and from each block 40 sheep farmers were purposively selected for the study. From each Zone 120 sheep farmers were selected that made a total of 360 respondents for the study. The sustainability of the sheep farming was accessed based on the various indicators chosen for the study viz., demographic profile, grazing system, feeding system, health care facilities, genetic resources, marketing, economics and support services. Under every indicator there were certain sub-criteria or variables. Among various sub-indicators under a particular indicator most influencing sub indicator was accessed and there after among all the indicators chosen for the study most influencing indicator on the sustainability of sheep farming was evaluated. Under the various sub-indicators of demographic profile the sub indicator imparting most influence on the sustainability was found to be “total land”. The most influencing sub-indicator on sustainability of sheep farming in case of grazing pattern and genetic resource availability was “production system followed” and “type of sheep

breeds reared by farmers" in the district respectively. With regard to heath care services the sub-indicator "main diseases affecting the flock" was having more influence on the sustainability of sheep farming. As far as sub-indicators under marketing, economics and support services are concerned the major influencing sub-criteria was found to be "place of sale of animals", "price of animals retained per annum" and " linkage with veterinary hospitals" respectively. Among the various indicators chosen for the study the most and least influencing indicator on sustainability of sheep farming in study area was found to be "demographic profile of respondents" and " support services availed" respectively. With regard to three production Zones of the study area most of parameters were ranking high in case of Zone-III i.e., low altitude areas except demographic profile that was having highest score in case of Zone-II and grazing system that was ranking high in case of Zone-I. The Zone-III seems to be more sustainable than other two Zones while as Zone-I needs due attention towards the improvement of major indicators regarding the sustainability of sheep farming. Since the demographic profile imparts a major impact on sustainability of sheep farming in the study area all the present and future sheep rearing and sheep development schemes should be oriented accordingly. Moreover a serious consideration is needed towards improving the support services regarding sheep farming in the study area.

Key words: *Sustainability, feeding resources, production system, economics, support services*

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Initiation of bioinformatics and phylogenetic studies of agriculturally important insects with emphasis on Indian Trichoptera

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Bioinformatics and phylogenetic analysis are increasingly essential in the study of agriculturally significant insects, offering powerful tools for species identification, elucidation of evolutionary relationships, and the development of effective pest management strategies. Insects, encompassing both beneficial pollinators and harmful pests, play a pivotal role in agriculture by directly influencing crop yield and ecosystem stability. Among these, Indian Trichoptera (caddisflies), although primarily aquatic, exhibit crucial ecological interactions with agricultural landscapes. Their role in maintaining water quality for irrigation and regulating freshwater ecosystems indirectly supports agricultural productivity. This paper investigates the application of bioinformatics approaches, such as DNA barcoding and molecular marker analysis, in the phylogenetic study of agriculturally important insects, with a particular focus on Indian Trichoptera. By employing advanced bioinformatics tools, including BLAST, ClustalW, and phylogenetic inference software (e.g., MEGA, BEAST), researchers can decode evolutionary patterns, refine taxonomic classifications, and assess the genetic diversity of these species. Such insights are vital for comprehending their ecological functions, population structures, and the broader impacts of environmental changes on both agricultural ecosystems and freshwater habitats.

Additionally, this study underscores the significance of phylogenetic knowledge in enhancing pest management practices, promoting the conservation of beneficial insect species, and supporting sustainable agriculture. By exploring the evolutionary history of Indian Trichoptera, the paper highlights the broader utility of bioinformatics and phylogenetic analysis in optimizing the management of agriculturally important insects, ultimately contributing to more effective pest control measures and conservation efforts in agro-ecosystems.

Keywords: *Introduction, Bioinformatics, Phylogeny, Agriculture, Trichoptera*

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Phytochemicals as Antimicrobials: Harnessing medicinal Plants for Alternative Therapies to Address Antimicrobial Resistance

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Among all available antimicrobials, antibiotics hold a prime position in the treatment of infectious diseases. However, the emergence of antimicrobial resistance (AMR) has posed a serious threat to the effectiveness of antibiotics, resulting in increased morbidity, mortality, and escalation in healthcare costs causing a global health crisis. The overuse and misuse of antibiotics in global healthcare setups have accelerated the development and spread of AMR, leading to the emergence of multidrug-resistant (MDR) pathogens, which further limits treatment options. This creates a critical need to explore alternative approaches to combat bacterial infections. Phytochemicals have gained attention as a potential source of alternative medicine to address the challenge of AMR. Phytochemicals are structurally and functionally diverse and have multitarget antimicrobial effects, disrupting essential cellular activities. Given the promising results of plant-based antimicrobials, coupled with the slow discovery of novel antibiotics, it has become highly imperative to explore the vast repository of phytocompounds to overcome the looming catastrophe of AMR. This study summarizes the emergence of AMR towards existing antibiotics and potent phytochemicals having antimicrobial activities, along with a comprehensive overview of 123 medicinal plants reported to possess antimicrobial phytocompounds, thus compiling the existing information that will help researchers in the exploration of phytochemicals to combat AMR.

Keywords: *Antimicrobial resistance; Antimicrobials; Multidrug resistance; Phytochemicals; Phytocompounds; Plant secondary metabolites*

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Eriophyoid Mite Fauna and Emerging Threats to Food Security in Karnataka

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Eriophyoid mites are host–specific, important phytovirus vectors, the risk of which on all types of flora is increasing due to their ability to adapt and manipulate their hosts. A survey was conducted during 2022-24 in various agro-ecosystems covering digfferent agro-climatic zones of Karnataka with aim to document the eriophyoid species diversity. The present study recorded fifty eriophyoid mite species from various hosts from agriculture crops to forest plantations. Among the diversity of mites seven species are new records to India *viz., Aceria ficaria* Ueckermann on *Ficus racemose* L.*, Abacarus horseshoex* Lu & Xue and *Abacarus fuzhoubambusae* Lu & Xue and *Knorella gigantochloae* Keifer, 1975 on *Bambusa* sp., *Vittacus bougainvilleae* (Keifer) on *Bougainvillea spectabilis* Willd., *Calacarus flagelliseta* Flechtmann, De Moraes & Barbosa on *Carica papaya* L. and *Jutarus benjaminae* Boczek & Chandrapatya, on *Ficus benjamina* L. Further, two important mite pests, *Aculops lycopersici* (Tryon) causing extensive damage to leaves and fruits of tomato (*Solanum lycopersicum* L.) and *Aceria boisi* (Gerber) causing galls on cinnamon (*Cinnamomum verum* J.Presl) leaves, reducing the leaf quality and marketability were also recorded. In conclusion, timely inventory survey helps in understanding eriophyoid mite's pest fauna and their future threat to food and biosecurity.

Keywords: Biosecurity, Eriophyoid mites, *Aceria*, Tomato, Cinnamon.

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Jute biomass: Optimization of feedstock quality and bioethanol production

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Increased bioenergy demand has emphasized on the use of lignocellulose derived bioethanol as alternate fuel. Jute is an important lignocellulosic bast fibre crop with high biomass production and superior quality. Therefore, addressing its natural recalcitrance is necessary for improving the ethanol yield. In this study, an attempt is made to optimize the biomass quality and production as well as the optimum delignification and saccharification conditions from whole jute biomass using response surface methods. Jute genotypes were screened out to find a suitable genotype for superior quality biomass. Out of 16 diverse germplasm, JROB-2 was found to be superior. Biomass composition of jute revealed cellulose content (66.5%), hemicellulose (13.11%), lignin (19.43%) and pectin (3.03%). We optimized the alkaline pretreatment and from whole jute biomass (*Corchorus olitorius* L cv. JROB-2) using Box Behnken Design. NaOH concentration (%), time (h) and temperature (°C) were used as independent variables with percent delignification as response variable. Maximum delignification obtained (80.42%) when biomass was pretreated with 2.47% (w/v) NaOH concentration at 55.8 °C for 5.9 h. This pretreatment resulted in 79.8 % lignin and 34.2% hemicellulose removal from biomass, thereby increasing cell wall porosity and surface roughness to allow better saccharification. Optimized saccharification condition yielded maximum saccharification (76.48%) when hydrolysis was performed at 6.9% biomass loading with enzyme concentration of 49.52 FPU/g substrate at 51.05 ◦C for 74.46 h. The optimum conditions standardized for both alkali pretreatment was validated and no significant difference was found between the observed and the predicted value.

Keywords: *jute biomass, pretreatment, biomass, response surface methodology.*

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ISOLATION AND SCREENING OF DDT RESISTANT BACTERIA

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Dichlorodiphenyltrichloroethane (DDT) is an organic chlorinated hydrocarbon that has various applications in agriculture but it causes soil and water pollution. Biodegradation is the most effective method to remove DDT and its residues using microbes. In this study, DDT-resistant microbes were isolated from a river water sample that was enriched with DDT by making serial dilution of collected samples. The pure colonies of bacteria were grown on LB agar plates, which had different concentrations of DDT ranging from 1000 - 2000 ppm. The isolates grow up to 1500 ppm and hence were resistant to very high concentrations. These microbes have a minimal inhibitory concentration (MIC) beyond 1500 ppm. Still, they cannot be experimented with because this high concentration of DDT could be very harmful and difficult to dispose of. Three isolates ASP1, ASP2, and ASPK were selected based on their resistant ability. Identification and characterization of isolates were performed based on microscopic studies of shape, form, margin, and color in gram staining. Based on the microscopic study, ASP1 and ASP2 were round, smooth, coccus, and Gram-positive as they showed purple color while ASPK was round, regular, rod, and Gram-negative as it showed red color. Biochemical analysis by the IMViC test series showed that ASP1 was not a member of the Enterobacteriaceae family, while ASP2 and ASPK was a member of the Enterobacteriaceae family. The genomic DNA was isolated from the selected isolates for molecular analysis and sequencing. These resistant microbes' ability to grow in the presence of this chemical compound might be used in the bioremediation process of DDT.

Keywords: *DDT, resistant microbes, gram staining, minimal inhibitory concentration.*

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ISOLATION AND CHARACTERIZATION OF OLIGOTROPHS FROM LANDFILL SITES, LOW-HUMAN-ACTIVITY SOIL, AND POTABLE WATER COOLERS

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This study was associated with the isolation of oligotrophs microbes from landfill sites, low-human-activity soil, and potable water coolers. Agar media was used for the growth of bacteria mainly isolated from soil and landfill sites while a special type of R2A media was used for the isolation of bacteria from potable water. Eight pure isolates were obtained during this work. Further, the identification and characterization of isolates were performed based on microscopic studies like shape, form, margin, and color in gram staining. Based on the gram staining study, it was found that some bacteria were gram-positive and some were negative while mostly they were gram-negative. The size of these isolates was very small and their shapes were varying from coccus to red bacillus. Biochemical analysis by the IMViC test series showed that five isolates were negative in this test and showed that they were not a member of the Enterobacteriaceae family, while three isolates were a member of the Enterobacteriaceae family. The genomic DNA was isolated from the selected isolates for molecular analysis. The result concluded these microbes were grown with negligible nutrients and suggested that these bacteria would be further genetically characterized by sequencing the DNA. These nutrient-resistant microbes might be used for in situ bioremediation.

Keywords: *oligotrophs, R2A media, gram staining, in situ bioremediation.*

Loop-mediated isothermal amplification: A rapid on-site detection method for genetically modified (GM) plants

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In India, *Bt* cotton is the only approved genetically modified (GM) crop and some GM events of cotton and other crops have been imported for research purposes or under confined field trials. As GM crops are gaining raise in approval in other countries, it is crucial to monitor unauthorized entry of GM crops in India through efficient diagnostics. Loop-mediated isothermal amplification (LAMP) is a rapid and efficient tool for GM detection. LAMP-based GMO screening assays have been developed and validated for common promoters, marker genes, and transgenes. The LAMP process involves amplification at a constant temperature (60-68°C) without requirement of separate denaturation, annealing, and extension steps. Four primers are designed using PrimerExplorer to recognize six distinct regions on the target sequence. LAMP can be classified as visual or real-time based on the detection system. In visual LAMP, the reaction is carried out on a thermal cycler/ heating block, and results are seen by a color change from orange to green using SYBR Green dye. Real-time LAMP uses a portable system, making it suitable for on-site GMO testing, where amplification is detected through fluorescence. Specificity of the assays was validated against target and non-target transgenic elements. The assays were found sensitive to detect 0.01-0.1% GM content within 30-60 minutes, depending upon the GM target. To further enhance efficiency, multiplex real-time LAMP was developed to simultaneously detect multiple GM targets by analyzing differences in annealing curves. These assays could be deployed for detecting both approved and unapproved GM events in the country.

Key words: *genetic modification, GM detection, LAMP.*

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Study the Biodiversity of Insect Pests and Management Strategies in Guava

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Insect pests present a significant constraint to the successful cultivation of guava, a fruit crop of increasing international importance due to the expanding trade in fresh fruits and value-added products. The intensification of guava cultivation, characterized by large-scale monoculture and the adoption of advanced agro-technologies, has precipitated the emergence of new and diverse pest challenges. Previously regarded as a hardy crop with limited vulnerability to insect pests, guava has recently become subject to severe infestations, with several minor pests evolving into major threats to production. This study was conducted with the objective of assessing the biodiversity of insect pests infesting guava in the Punjab region. Intensive surveys were carried out across three districts of Punjab between 2021 and 2023, revealing the presence of seven principal insect pests: fruit flies (*Bactrocera* spp.), bark-eating caterpillar (*Indarbela* spp.), mealybug (*Ferrisia virgata*), scale insect (*Pulvinaria psidii*), fruit borer (*Deudori xisocrates*), whitefly (*Aleurodicus dispersus*), and stem borer (*Aristobia testudo*). Among these pests, fruit flies and fruit borers were identified as the most destructive, with infestation rates ranging from 30% to 48% and 4% to 18% respectively, contributing to the greatest crop losses, other were found in field to cause comparatively lower damage (5-15%) but their number found under check of natural enemies. The study also examined the efficacy of various economically viable pest management approaches, such as field sanitation, Male Annihilation Technique (MAT) using methyl eugenol, and the application of bio-pesticides. These methods resulted in a reduction of fruit fly and fruit borer infestations by 10-12% with further improvements observed in subsequent years, reaching a 20% and 15% decrease in fruit fly and fruit borer incidence. The findings underscore the growing threat posed by insect pests to guava cultivation and emphasize the need for targeted and sustainable pest management strategies to mitigate crop losses.

Keywords: *Diversity, Fruit fly, Guava, Management, Pest.*

Acute and Sub-acute Toxicity Profiles of *Anchusa Strigosa* and *Zataria multiflora:* Insights from Wistar Albino Rats

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Objective: The objective of this study is to evaluate the acute and subacute toxicity of the hydro-alcoholic extracts of *Anchusa strigosa* (leaves) and the aerial parts of *Zatariamultiflora*Boiss in Wistar albino rats.

Materials and Methods: The crude extracts of *Anchusa strigosa* (leaves) and the aerial parts of *Zataria multiflora* Boiss were prepared with ethanol at a 70% concentration. Systematic tests for acute toxicity were performed with doses of 100, 250, and 500 mg/kg, while for subacute toxicity doses of 500 mg/kg administered orally to Wistar albino rats.On days 14 and 28, blood samples were collected from cardiac punctures; the liver, spleen, lungs, heart, and kidneys of each animal were collected under anesthesia. At the end of each study (acute and sub-acute toxicity), haematological analysis and biochemical parameters were evaluated. Histopathological examination of the vital organs of the animals was taken for gross findings compared to controls.

Results: There was no significant difference ($p > 0.05$) observed in the relative organs, body weights, haematological and biochemical parameters, or gross abnormalities compared to the control. There were no recorded instances of mortality.

Therefore, analysis of results may lead to the conclusion that the medium-term oral administration of the *Anchusa strigosa* (leaves) and the aerial parts of *Zatariamultiflora*Boiss for 28 days does not cause toxicity.

Keywords: *Acute toxicity, Subacute toxicity, Biochemical analysis, Haematological parameters, Histopathological examination.*

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Next-Gen Gene Editing: The Evolution Beyond CRISPR-Cas9

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The ground breaking success of CRISPR-Cas9 has transformed gene editing by providing unmatched accuracy and ease in genome manipulation. However, recent developments herald a new wave of gene editing technologies that surpass CRISPR-Cas9, addressing its shortcomings and enhancing the available toolkit for scientists and healthcare professionals. This poster delves into next-generation gene editing methods like CRISPR-Cas12, CRISPR-Cas13, base editing, and prime editing. These innovative tools offer greater precision with fewer off-target effects and allow for more intricate genomic modifications, such as directly rewriting specific DNA or RNA sequences without causing double-strand breaks. Base editors allow for single nucleotide changes without triggering extensive genomic alterations, while prime editing combines CRISPR's accuracy with reverse transcription's flexibility to enable precise insertions, deletions, and point mutations. Along with technical breakthroughs, the poster will discuss the ethical considerations and real-world applications of these technologies in gene therapy, agriculture, and synthetic biology. By exploring these next-generation tools, the presentation will offer insights into the future of gene editing and demonstrate their potential to revolutionize genetic research and broaden the range of treatments for genetic disorders.

The poster aims to foster discussion on the influence of these technologies and their role in shaping the future of precision medicine and biotechnology.

Keywords: *CRISPR-Cas, DNA, Genomics, Next-gen Sequencing, RNA.*

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BLOCKCHAIN TECHNOLOGY FOR AGRICULTURE TRACEABILITY

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India a land of agriculture which hold a tremendous amount of 15% GDP in our economy and plays an important role not only in humans also for other living creatures in our surroundings. There is always a demand for food globally for increasing population. There are many tremendous numbers of stakeholders for supplying food products globally such as: Farmers, distributers, retailers, consumers etc. Faith, attributes and security are the most important factors which plays a cojoined factor in food supply chain. By enhancing the finest and shield for food products have become an important factor on the other hand to conserve and improve the consumer health and to gain a better market share. Although traceability is an excellent instrument for ensuring them, putting in place a transparent and functional system is a difficult task. With its decentralized and transparent ledger for tracking agri-food goods, blockchain technology is being viewed as a revolutionary answer to these problems. Real-time monitoring, security, and trust are enhanced by integrating global positioning systems and navigation systems with blockchain-based traceability solutions. An effective layered design for an agri-food traceability system is proposed in this research. The interplanetary file system provides safe, decentralized storage for data, while the blockchain layer handles data management through transactions and smart contracts. A transparent food supply chain could be made possible by blockchain technology, and several initiatives are being made in relation to a wide range of food products and issues. When this technology is included into a more comprehensive AI-based framework, it may be very beneficial.

Keywords: *Blockchain, Zero hunger, Poverty, Traceability, Transparent, Stakeholders.*

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Evaluation of different spawn substrates for production of pearl oyster mushroom (*Pleurotus ostreatus*)

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Pleurotus spp are commonly known as oyster mushroom because of its oyster like structure. Different species of oyster mushrooms have been recorded to possess a number of medicinal properties such as antitumor, antioxidant, antimicrobial activities. Among the different species pearl oyster mushroom (*Pleurotus ostreatus*) is a potential source of protein, minerals and vitamins along with different pharmaceutical properties. Hence, an attempt has been taken to evaluate different spawn substrates for production of *Pleurotus ostreatus*. In the present experiment seven grain substrates along with paddy straw and rice husk were evaluated for mycelial growth and productivity of *Pleurotus ostreatus.* The downward growth of mushroom mycelia in different spawn substrates varied from 22.87mm to 51.33mm on 5th day of inoculation. The substrates such as paddy, maize, ragi, bajra, jowar, wheat and straw exhibited full growth of mycelia (110mm) at 15 days of inoculation. Similarly, the yield of mushroom from spawns prepared using nine different spawn substrates varied from 560.00g to 1526.67g per bag of 2kg substrate. Highest mushroom of 1526.67g was recorded from the bag applied with jowar based spawn with 309.87 numbers of fruit body followed by maize grain (1453.33g with 259.40 numbers of mushroom). The benefit cost ratio (BCR) of different spawn substrates were calculated which varied from 0.73 to 1.74. Maximum BCR was calculated in case of maize grain-based spawn (1.74) followed by jowar (1.70) and paddy (1.63). However, paddy can be recommended as spawn

substrate for preparation of oyster mushroom spawn because of its cheap availability in Odisha instead of maize.

Key words: *Pleurotus ostreatus, spawn substrate and mushroom production.*

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In silico mining and development of genic SSR markers in medicinally important plants of the genus *Gentiana*

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Gentiana, is a genus of around 360 medicinally important species, growing in the temperate alpine and subalpine regions of Asia, America and Europe. Among these around 62–68 species are found in India. Though theses plants are known to be of immense medicinal importance, most of the species are not well characterized and very little genomic information is available. Keeping this in mind, EST sequences of 18 *Gentiana* species were analysed in silico to identify sequences that could be used for the development of robust and reproducible non-redundant SSR markers. A total of 47,490 available EST sequences belonging to different *Gentiana* species were analysed and a non-redundant set of 40,110 singleton sequences was assembled for functional annotation. A total of 5,808 perfect SSRs with an average length of 17 bp and relative abundance of 214 loci/Mb were identified in 4,952 (12.34%) sequences from six species using Krait software, with the trinucleotide repeat motifs found to be the most abundant. 49.14% of the sequences containing trinucleotide and above repeats could be mapped to have known gene ontologies. A total of 2902 primer pairs were successfully designed and 60 of these were validated on a set of *Gentiana kurroo* Royle accessions. Henec a set of novel, functional genic SSR markers has been developed in Gentiana that can be used for molecular systematics, characterization, and conservation studies this group of important medicinal plants.

Keywords: *EST-SSRs, Gentiana, Functional annotation, genic SSR.*

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Exploration of Major QTLs for Grain Number in Basmati Rice

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Basmati rice renowned for its quality, is a gourmet delicacy and pride of the Indian sub-continent. Traditional basmati was tall, low yielding and vulnerable to diseases and insect pests. However, through years of breeding, modern basmati cultivars have evolved to be shorter, resistant to bacterial blight along with improved yield. Despite these advancements, basmati rice still lags behind non-basmati varieties in terms of yield, primarily due to low grain number per panicle (GNPP). With the aim of mapping and transferring QTL for higher GNPP, a cross was attempted between Punjab Basmati 5 (~80 grains/panicle) and a high grain number (~ 250 grains/panicle) non-basmati line, RYT 4050. The F_1 generation exhibited an increased number of indicating presence of dominant QTL(s) in RYT 4050. Five random plants from F_3 progenies of this cross were evaluated for grains number per panicle (GNPP) along with other agronomic traits such as plant height, spikelet fertility and stem thickness (ST). The GNPP ranged from 75.2-305.4, PH from 103-320 cm, spikelet fertility from 44.8-98.1 and ST 2.6-9.7 mm. Frequency distribution analysis showed near normal distribution of GNPP in F_3 population, indicating that trait is controlled by quantitative trait loci. However, presence of large number of progenies with GNPP higher than Punjab Basmati 5 suggests the involvement of major QTL along with minor QTLs. Further, QTLseq a method for mapping QTLs, was employed to identify regions associated with higher GNPP. Based on the data, two populations with fifteen extreme high and extreme low GNPP, has been attained to extract the DNA, whose GNPP ranges from 228-305 and 75-106 respectively. Simultaneously, both bulks were sequenced using next-generation sequencing technology at ~10X read depth. Analysis of 49,293 SNPs, filtered by specific criteria, identified QTLs on chromosomes 1 and 5. Within the identified QTL region, *Gn1a* LOC_Os01g10110, which is known to regulate grain number was identified as a candidate gene. This identification of a significant QTL associated with GNPP, particularly with the involvement of a known regulator *Gn1a*, suggests a potentially important genomic region for

further study and utilization in breeding programs for the development of improved basmati rice varieties with higher yields.

Keywords- *Basmati, Grain number per panicle (GNPP), Gn1a gene.*

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Harvest quality vision (HQV) technology in vegetable production

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Vegetable farming is an important component of global agriculture and food production. There is a growing market for premium vegetables as consumers become more aware of the nutritional content and appearance of the produce they buy. To fulfil this demand and ensure efficient harvesting, modern agriculture has integrated technology into different stages of production. Harvest quality vision (HQV) is one such technology that has revolutionised vegetable farming. HQV technology is a state-of-the-art system that evaluates the quality and ripeness of vegetables during harvesting using computer vision, machine learning and artificial intelligence. It allows for non-destructive, real-time evaluation of produce, giving farmers precise information on when and which vegetables to harvest. In vegetable farming, where timely and precise harvesting is crucial for maintaining product quality and minimising post-harvest losses, HQV technology is very useful. This technology uses advanced imaging systems, including high-resolution cameras and sensors, to capture images of vegetables in the field. These images are then analysed using machine learning algorithms that have been trained to identify several aspects of vegetable quality, including size, colour, shape and ripeness. In addition to distinguishing between ripe and unripe vegetables, this system can also identify defects, diseases and signs of pest damage. Through the integration of this data with other pertinent information like crop growth stage and weather conditions, HQV technology provides farmers actionable insights and facilitates precise decision-making. With ongoing technological advancements and increased adoption, HQV technology is self-confident to become a standard practice in vegetable production, benefiting both farmers and consumers.

Keywords: *Harvest quality vision, vegetable production, artificial intelligence, computer vision, decision making.*

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Efficient Generation of Transgenic Wheat Plants through Biolistic Method on Cultured Immature Embryos

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Wheat (*Triticum aestivum* L.) is among the top three cereals in the world in terms of production and consumption. It serves as a crucial dietary staple food and contributes approximately 20% of the total energy. Despite being a staple food, wheat face difficulties in genetic engineering transformation due to its complex genome, which has lagged behind the other crops such as rice and maize. Transformation has become a powerful tool for gene functional studies and trait discovery and also essential for applied and fundamental studies of wheat. The two major transformation methods are used such as Agrobacterium-mediated and a biolistic-based system. The aim of this study was optimisation of biolistic transformation approach to generate transgenic wheat plants. Biolistic transformation is advantageous to integrate new technologies such as genome editing tools (e.g., CRISPR/Cas9) and to provide a robust platform in the development and recovery of DNA- and marker-free genome-edited plants. The particle size, pressure of the rupture disc, and volume per construct used was optimized for particle bombardment. Tungsten particle coated with Gold of 1.0 µm in diameter carrying the reportergene were used for bombarding into immature embryos which were isolated from six accessions of wheat. After 12 h, the bombarded immature embryos were observed under a fluorescence microscope to check for transient GFP expression. The bombarded embryos weregrown on basal 2,4-D (MS) medium for 2–3 weeks to induce callus formation. Subsequently, a few calli samples were taken for GUS staining. T0 plants were obtained after biolistic transformation and the regeneration efficiency was reported more than 85%. This study suggests that particle size and pressure affect delivery efficiency. The smaller the particle sizeand pressure on the rupture disc, the greater the efficiency of transformation.

Keywords: *Wheat, CRISPR/Cas9, Agrobacterium, Biolistic transformation.*

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Effects of Nanotechnology in Hydrophonics

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Nano-elicitation activates metabolic pathways in plants by employing nanoparticles (NPs) as elicitors. Stimulating these metabolic processes can increase plant productivity and yield while also producing secondary metabolites. Nanoparticles have grabbed the scientific community's interest because of their unusual properties, such as their extremely small size and high surface-to-volume ratio, which make them good elicitors. Hydroponic systems, which optimize growing conditions to maximize plant output, are commonly employed to investigate the effects of elicitors. By combining these two ways, plants' both quantitative and qualitative output can be enhanced while using fewer resources. As the worldwide need for premium crops and bioactive chemicals increases, implementing this synergistic approach with sustainable farming techniques can pave the road for resilient agricultural systems, assuring food security.

Keywords: Nanotechnology, Hydrophonics, Nanoparticles, Agriculture.

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Heavy metals and Microplastic toxicity in ponds, wells and ground water

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The increasing incidence of microplastics (MPs) in many ecosystems has heightened the need for enhanced detection and mitigation measures. MPs are tiny molecules broken down from bigger bits of plastic, have gathered all over the planet. As an inert carbon stream in the aquatic environment, they have been observed to carry heavy metals and exhibit a variety of interaction effects. In this mini-review, a bibliometric analysis in this topic was performed. Their

combined toxic effects and potential risks to human health were also considered. This review summarizes the most recent scientific development in this field including the use of artificial intelligence (AI) and environmental science to improve microplastic detection. The paper focusses on image processing, Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, and hyperspectral imaging (HSI), demonstrating how AI improves the efficiency and accuracy of these approaches. AI-powered image processing automates the detection and quantification of MPs, dramatically lowering the requirement for manual examination.

Keywords: Microplastic, Heavy metals, Contamination, Artificial Intelligence.

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Organic Farming Techniques for Regenerative Agriculture

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Organic farming techniques play a pivotal role in advancing regenerative agriculture, a sustainable approach that restores soil health, enhances biodiversity, and mitigates climate change. By prioritizing natural inputs and ecological balance, these methods reduce the dependency on synthetic chemicals while promoting long-term soil fertility. Key organic techniques include crop rotation, cover cropping, composting, and integrated pest management (IPM). Crop rotation disrupts pest cycles and enhances nutrient cycling, while cover crops improve soil structure and prevent erosion. Composting enriches the soil with organic matter, improving water retention and nutrient availability. IPM leverages natural predators and biological controls to reduce pest pressure. These practices collectively enhance soil organic carbon levels, boosting microbial activity and fostering healthy rhizospheric interactions. Moreover, organic farming's emphasis on minimal tillage reduces soil disturbance, aiding in carbon sequestration and erosion control. Regenerative agriculture further integrates agroforestry and holistic grazing management, contributing to habitat restoration and increased biodiversity. As a result, organic farming is aligned with regenerative agriculture's goals of ecological restoration, climate resilience, and economic

sustainability for farmers. The synergy between these techniques and regenerative principles leads to greater resilience in the face of environmental challenges such as climate variability, ensuring long-term agricultural productivity. This approach not only revitalizes ecosystems but also contributes to food security and carbon neutrality, making organic farming a cornerstone of regenerative agricultural practices.

Keywords :- organic farming, regenerative agriculture, crop rotation, cover cropping, composting, integrated pest management, soil health, biodiversity, carbon sequestration and agroforestry.

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Moringa oleifera: A promising source of bioactive compounds for nutraceutical uses

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Moringa, often referred to as the “drumstick tree” or the “miracle tree”, is a botanical marvel that has drawn the attention of the health and nutrition community as a functional food. Its leaves, pods, and seeds contain a variety of essential phytochemicals that contribute to its high nutritional content. The nutritional content of moringa is a testament to its “superfood” status. Moringa leaves are a rich source of vitamins, including vitamin C, vitamin A (as β-carotene), vitamin K, vitamin B_6 and folic acid. These vitamins are essential for promoting immunological function, maintaining bone health, and regulating energy metabolism. Moringa leaves are also abundant in essential minerals like calcium, potassium and iron, contributing to their nutrient density. Moringa leaf extract has been reported to exhibit antioxidant activity, both *in-vivo* and *in-vitro*, owing to its high flavonoid and phenolic content. Some bioactive compounds, including 4-(α-L-rhamnosyloxy)-benzyl isothiocyanate (BITC), niazimicin, 3-O-(6’-oleoyl-β-D-glucopyranosyl)-β-sitosterol and β-sitosterol and glycerol-1-(9-octadecnoate) that have been isolated from the ethanol extract of the moringa seed, have been shown to be involved in intracellular reactive oxygen species (ROS) scavenging, making moringa a good anticancer agent. As a result, moringa offers a multitude of benefits ranging from its nutritional richness and potential health benefits to its sustainability and

versatility, and represents a natural solution to fight global hunger and malnutrition while also being used in various industrial and community nutrition programmes.

Keywords: *Moringa, drumstick tree, superfood, phytochemicals, functional food.*

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General combining ability studies for yield traits in brinjal (*Solanum Melongena* L.).

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The experimental material consists 4 females and 8 males and these and a commercial check variety created the material for the present investigation. The plants were planted in a randomized complete block design with three replications in three environments. The data for yield characters reveled that variance estimations of general combining ability (GCA) effects was found highly significant for all the characters, showing the influence of gene action effects. Further the outcomes of this investigation revealed that the female parent PR-5 and PLR-1 was found to be good general combiner for all the traits under study, whereas, among male parents BCB-464, BCB71-1, CO-2, and Swarna Mani exhibiting good GCA effects for all the traits. These parents may be extensively used in crossing programme to accumulate desirable genes of qualitative characters leading to gene pyramiding, which may have immense value as pre-breeding material and for heterosis breeding.

Keywords: *Brinjal, heterosis breeding, gene, yield*

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Ichthyofaunal Diversity of Balasore Coast and Its Adjacent Coastal Areas

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Fishes exhibit remarkable diversity in terms of their biological characteristics andtheir preferred habitats. This study aimed to investigate the fish diversity in the vicinity of the Balasore coast and its adjacent coastal areas. Fish are a vital resource, not only for their significance as a food source but also for their economic importance. However, many fish caught by local fishermen, deemed non-economically valuable, are often discarded as by-catches. These by-catches encompass not only various fish species but also a range of other aquatic organisms, including crabs, squilla, lobster, gastropods, bivalves, sea cucumbers, sea anemones, octopuses, squids, hermit crabs, and jellyfish. The study spanned from January 2022 to May 2024, totalling 851 days. Throughout this period, samples were collected periodically. The research findings reveal a staggering diversity of 256 fish species belonging to 111 genera, 59 families, and 36 orders. Notably, seven previously unrecorded fish species for the Odisha coast were documented within the study area. This investigation encompasses commerciallyvaluable species and those with little to no economic importance, often overlooked for human consumption. Non-commercial fish species can be transformed into value-added products, opening up opportunities for marketing and participation in the live ornamental fish trade, thereby enhancing the livelihoods of local fishermen. The ongoing collection of data on fish diversity at the Balasore coast and its adjacent coastal areas contributes to our growing understanding of the region's aquatic biodiversity.

Keywords: *Ichthyofauna, Fish diversity, Coastal biodiversity, By-catch management, Ornamental fish trade, Economic importance of fish*

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Development of Paan flavoured Milk Drink

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The present study entitled was carried out during the year 2022-23 to 2023-24 in the RABL College of Agriculture and Research Station, Chhuikhadan KCG (C.G.). The experiment was laid out in Completely Randomized Design (CRD) with 03 replications, 08 treatments. The result revealed that the chemical and nutritional evaluation of pH, TSS acid ratio and non reducing sugar was significantly superior in the treatment FM1 (1%). While total sugar, reducing sugar**,** Total soluble solids and acidity was significantly superior in the treatment FM8 (8%). The quality and sensory evaluation like colour, appearance, taste, flavour and overall acceptability significantly superior in the treatment FM5 (5%). The economic parameters like cost of production, gross returns, net returns and B:C ratio (1.84) was superior in the treatment FM5 (5%). While the lowest B:C ratio (0.63) found in treatment FM1 (1%). Therefore, it may be conducted that treatment FM5 (5%) may be selected for making best quality betelvine beverage.

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Attitude of Farmers Towards Kisan Farm Pond Scheme

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The study was conducted in Bhilwara district of Rajasthan. 120 respondents were selected for the study. In the study, develop and standardize the reliable and valid scale, to measure attitude of farmers towards Kisan Farm Pond Scheme. An appropriate statistical method 'Scale product method' was used. A panel of 5 judges was requested to assign the score for each selected statement for judgments on three-point continuum viz. agree, undecided and disagree for all the statements. Based on the scale 26 statements were finally selected to

constitute attitude of farmers towards Kisan Farm Pond Scheme. From the data it can be revealed that majority 66.67 percent of the farmers had medium level of attitude, followed by high (14.17%) and low level (19.17%). From this, it can be concluded that majority of the farmers had medium level of attitude.

Keywords: *Farmers, attitude, kisan farm pond scheme.*

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Study of soil fertility status of different type soil of Bundelkhand region of utter Pradesh India

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A study for evaluation of soil fertility was conducted in four districts of the Bundelkhand region of Uttar Pradesh during 2024. Composite soil samples were collected from the farmers who practiced multiple cropping systems. The soil samples were processed and analysis with the standard protocols. Irrespective of the districts, results revealed that the majority of soils were clay loam and loamy (villages) in texture; pH was neutral, while electrical conductivity indicated the non-saline of soils. Nutrient index rating indicated that the soils were low in available nitrogen, phosphorus and sulpher medium for available organic carbon exchangeable potassium The status of micronutrients was medium to high in studied area. Thus, soils of studied villages were found overall moderate in soil fertility.

Key words: *Bundelkhand region, Nutrient index, Soil fertility*

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Importance of *Butea monosperma* for the restoration of degraded lands in Bundelkhand

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The Bundelkhand region in central India is situated in the semi-arid tropical zone. Due to the region's susceptibility to climate change and lack of resources, agricultural output is poor and the risks associated with production are consequently higher. The region is experiencing a shortage of fodder and fuelwood due to intense biotic pressure on forests, community lands, and a decline in vegetation cover. *Butea monosperma* (Lam.) Taubert is a medium-sized deciduous tree belongs to family Fabaceae and sub-family Papilionaceae is a native tree of tropical and subtropical climate. It is considered as one of the largest families of flowering plants, numbering 630 genera and 18,000 species. It is found in drier parts, often gregarious in forests, open grasslands and wastelands. It can grow on poor soil such as swampy drained, water logged, black cotton soil, in high saline conditions and can even adapt into low availability of water. Additionally, the fast turnover and decomposition of nutrient rich leaf litter of Butea increases the soil fertility by increasing the soil organic carbon (SOC). Butea forests have ecological and environmental functions in term of soil erosion control, land rehabilitation, water conservation and soil carbon sequestration. The rapid increase in the rate of deforestation makes Butea an ideal investment or choice for plantation. Biological characteristics and growth habits of Butea make it more important in solving the problem of degraded lands, like for erosion control and carbon sequestration. *Butea monosperma* has significant impact on the soil quality with the emphasis on its role in eco-restoration of degraded lands so that policy makers may be encouraged to more actively conserve indigenous Butea trees and include Butea in sustainable land management strategies especially for dry tropics.

Keywords: *Butea monosperma, land rehabilitation, deforestation, Bundelkhand*

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Economics of *Melia dubia-Lens culinaris* based agroforestry in Bundelkhand

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Melia dubia is an important fast-growing agroforestry tree species for arid and semi-arid regions. It is one of the promising fast-growing multipurpose trees of dry areas due to its ability to grow well with less rainfall and in strong light conditions. It is the tree species of industrial utility. An experiment was carried out in the semi-arid region of Bundelkhand during the Rabi season of 2023-24 to evaluate the influence of different tree spacing to study economic attributes of lentil varieties intercropped under *Melia dubia*. During the experiment, three different spacing were studied: 5m × 3m, 5m × 4m and 5m × 5m. In addition, three different cropping systems specifically sole cropping, intercropping and sole tree were examined in relation to *Melia dubia*. The data analysis revealed that highest gross returns of Rs. 4,56,655 ha^{-1} were obtained under *Melia dubia* + *Lens culinaris* (IPL 316). In contrast, *Lens culinaris* (L 4727) sole cropping, exhibited the lowest gross return of Rs. 66,424. The highest net return obtained from *Melia dubia* + *Lens culinaris* (L 4727) of Rs 3,17,640 per hectare. *Lens culinaris* (L 4727) sole cropping, demonstrated the lowest net profit of Rs 25,468 per hectare. Among the different treatments, *Melia dubia* (5 m × 3 m) sole tree, has the greatest benefit-cost ratio of 3.27. However, the intercropping system that achieved the greatest benefit-cost ratio (3.28) is *Melia dubia* (5 m × 3 m) + *Lens culinaris* (IPL 316). Conversely, treatment the sole cropping of *Lens culinaris* (L 4727), provides the lower benefit-cost ratio of 1.62. Tree spacing had a significant impact on the economic attributes of Melia-lentil based agroforestry. The tree species has the capacity to bring significant benefits and adaptability to the development and prosperity of the Bundelkhand region in the semi-arid portions of India.

Keywords: *Lentil, Spacing, Melia dubia, Agroforestry, Bundelkhand*

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Impact of micronutrients on growth and quality of strawberry in semi- arid climatic conditions of Bundelkhand

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Strawberries are being grown in the Bundelkhand region of Uttar Pradesh, and the crop is proving to be profitable for farmers. The study examined the impact of micronutrient treatments on vegetative growth, floral biology, and quality parameters of strawberry plants, with notable improvements seen in treatments with $FeSO_4$ @ 0.4% and $ZnSO_4$ @ 0.4%. $FeSO_4$ @ 0.4% consistently showed the highest values in vegetative growth parameters, including plant height (16.76 cm), leaf count (36.44), leaf area (113 cm^2), and chlorophyll content (SPAD units). In terms of flowering, $FeSO_4$ @0.4% significantly reduced the days to first flowering (44.00 days) and increased the number of flowers per plant (34.73) and fruit set percentage (74.34%). Boric acid @ 0.4% had the highest pollen viability at 76.95%. For physical attributes, $ZnSO_4$ @0.4% produced the longest (4.74 cm) and widest (3.67 cm) fruits, highest fruit weight (25.34 g), and yield per plant (625.53 g), while $FeSO_4$ @ 0.4% yield the highest number of fruits per plant (25.82) and a total yield of 604.80 g. The highest yield per hectare was recorded in $ZnSO_4$ @ 0.4% (41.70 t/ha) followed by $FeSO_4$ (40.32 t/ha). Biochemically, $ZnSO_4$ @0.4% showed the highest total soluble solids (6.85 °Brix), reducing sugars (4.30 %), total sugar content (6.25 %), and ascorbic acid content (67.67 mg/100 g), while it also had the lowest titratable acidity (0.56%) and the highest TSS:Acid ratio (12.16). $ZnSO_4$ also had the highest anthocyanin content (64.21 mg/100 g), supporting improved photosynthesis and sugar production.

Keywords: *Strawberry, Micronutrients, Bundelkhand*

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Effect of different spacings of *Melia dubia* intercropped with *Lens culinaris* varieties on soil characteristics in Bundelkhand

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Melia dubia is an important fast-growing agroforestry tree species for arid and semi-arid regions. It is a short rotation species with great utility as a raw material for pulp wood, plywood industry, and high-quality timber for multiple uses. It is the tree species of industrial utility. An experiment was carried out in split plot design with four levels of growing condition (G1, G2, G3 and G4) under main plot and two levels of lentil varieties (V1 and V2) with three replications in the semi-arid region of Bundelkhand during the Rabi season of 2023-24 to evaluate the influence of different tree spacing on the soil parameters. The initial and final values for pH in G1 treatments were 7.05 and 7.09 whereas in agroforestry (G2, G3, and G4) it ranged from 6.86-6.96. The initial and final values for EC in G1 treatments were 0.14 dS m^{-1} and 0.16 dS m^{-1} whereas in agroforestry (G2, G3, and G4) it ranged from 0.16 dS m^{-1} – 0.21 dS m^{-1}. The highest soil organic carbon (%) was analysed in treatment G4 (0.5) whereas the lowest soil organic carbon (%) was analysed in treatment G1 (0.4%). Similarly, the available nitrogen and potassium was highest in G4 (189.26 kg ha^{-1} and 9.13 kg ha^{-1}). The available phosphorus was recorded significantly highest G3 (9.13 kg ha^{-1}). The significantly highest available sulphur (mm/kg) was observed in treatment G4 (8.45 mm/kg). For all the parameters of soil, lentil varieties did not significantly affect the soil. Intercropping lentil varieties with *Melia dubia* trees positively impacted soil parameters, enhancing soil fertility and nutrient availability. The tree species has the capacity to bring significant benefits and adaptability to the development and prosperity of the Bundelkhand region in the semi-arid regions of India.

Keywords: *Melia dubia, Agroforestry, pulpwood, Bundelkhand*

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Evaluation of different chironji [*Buchanania cochinchinensis* (Lour.) Almeida] accessions for seed nutritional analysis in the Bundelkhand region

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Chironji is a significant tree species indigenous to the Bundelkhand region of India, renowned for its edible seeds and various ecological benefits. This region, characterized by its arid climate and dry deciduous forests, supports the growth of chironji, which serves as a vital resource for local communities. The chironji seed contains a fair amount of nutritional content such as a fat (59%), protein (19–21.6%), starch (12.1%), fiber (3.8%), calcium (279 mg), phosphorus (528 mg), iron (8.5 mg), thiamine (0.69 mg), vitamin C (5 mg), riboflavin (0.53 mg), niacin (1.50 mg), and fatty oil (34–47%). The study was done on "Evaluation of different chironji [*Buchanania cochinchinensis* (Lour.) Almeida] accessions for seed nutritional analysis in the Bundelkhand region ". It was performed to evaluate the nutritional composition in seed between various chironji accessions. The average nitrogen content was 4.02 g/100g, which ranged from 2.70 (CH-28) to 5.01 g/100g (CH-24), average phosphorus content was 273.09 mg/100g, ranging from 176 (CH-9) to 435 mg/100g (CH-10), average potassium content was 48.78 mg/100g, which ranged from 37.4 (CH-33) to 75 mg/100g (CH-5), average calcium content was 4.85 mg/100g, which ranged from 3.8 (CH-10) to 9 mg/100g (CH-30), average iron content was 24.63 mg/100g and ranged from 17.99 (CH-15) to 29.37 mg/100g (CH-32), average zinc content was 8.49 mg/100g, with values ranging from 7.03 (CH-15) to 11.41 mg/100g (CH-7), and average copper content was 2.59 mg/100g, which ranged from 2.11 (CH-40 and CH-32) to 3.41 mg/100g (CH-7).

Keywords: *Chironji, Genetic variation, nutritional analysis Bundelkhand*

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Climate Change: A Comprehensive overview of Cause and Consequences

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Global climate change poses perhaps the most formidable challenge to humanity's ongoing struggle for survival. Earth's climatic systems, among the most intricate and dynamic phenomena in the natural world, remain largely enigmatic despite decades of study. The present climatic conditions, characterized by their unprecedented variability, stand in stark contrast to those of the past, introducing novel complexities to the field of climatology. Indeed, human actions serve as significant contributing factors, subtly altering natural climatic processes and giving rise to the concept of global warming. It is imperative to distinguish between climate change and global warming, although they are closely intertwined. Observable phenomena such as glacier retreat, coral bleaching, shifts in tree lines, rising sea levels, and erratic precipitation further underscore the reality of these changes. It reflects on the gradual realization of the environmental consequences of human activities, prompting introspection and calls for action to safeguard our planet. The implications of climate change are particularly salient in the realm of agriculture and crop production, which form the bedrock of human sustenance. The repercussions of changing climatic conditions on agricultural systems are multifaceted, necessitating proactive measures to ensure food security and agricultural sustainability in the face of ongoing environmental shifts. In summary, this chapter serves as a contemplative exploration of humanity's journey towards acknowledging and grappling with the reality of climate change and global warming. It underscores the urgent need for collective action to mitigate these phenomena and protect the fragile ecosystems that sustain life on Earth. By engaging in critical discourse and implementing innovative solutions, we can strive towards a more resilient and sustainable future for generations to come.

Keywords: *Agriculture, Climate change, Global warming, Greenhouse gas*

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Phenotypic screening of chickpea genotypes for heat stress

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The chickpea (*Cicer arietinum* L.) is a self-pollinating true diploid (2n=2x=16) cool season legume crop that comes in second place to the common bean among food grain legumes worldwide (FAOSTAT, 2011). It is primarily cultivated for its seeds, which are abundant in protein. Additionally, chickpea seeds are a good source of fiber, unsaturated fatty acids, beta-carotene, and minerals like calcium, potassium, phosphorus, magnesium, iron, and zinc. Chickpea was reported as an important tool in prevention of bronchitis, cholera and constipation. Besides, regular consumption of legumes like chickpea may prevent diabetes and reduce the risk of heart diseases. Phenotyping of 1620 entries received from ICAR-NBPGR under DBT Chickpea project titled "Characterization of Chickpea Germplasm Resource to Accelerate Genomics- Assisted Crop Improvement" was conducting under delayed planting condition. Delayed sowing was done on 17th January 2024 to coincide the reproductive stage with the high temperature. Raised bed was covered with paddy straw soon after sowing for enhancing the early germination. Desi chickpea variety JG 14 and IPC 2006-77 and Kabuli chickpea variety RLBGK -1 used as a check in this experiment. One bed consists of 50 genotypes and 3 checks. Observations on various yield attributes including filled and unfilled pods were recorded total 35 promising accessions viz., IC 5117, IC 5172, IC 372, IC 403, IC 571, IC 2271, IC 2909, IC 2912, IC 3552, IC 3714, IC 6804, IC 6811, IC 6947, IC 7554, IC 9608, IC 9619, IC 12176, IC 12307, IC 12437 and IC 19091 exhibiting heat tolerance identified for detailed study. Out of these IC 5117 and IC 5172 was found most heat tolerant germplasm accessions.

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Turmeric-Neem Agroforestry System: Exploring New Dimensions in Sustainable Cropping

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Turmeric *(Curcuma longa*) is grown under the canopy of neem *(Azadirachta indica)* in turmeric-neem-based agroforestry systems (TNAS), which can be a financially viable way to manage land use. The neem tree that has been widely prevalent almost in every part of India can be a suitable tree species for agroforestry. This system leverages the complementary interactions between these species to enhance both crop yield and environmental benefits. Turmeric, a rhizomatous herbaceous plant valued for its bioactive compound curcumin, is cultivated as an understory crop under the canopy of neem. Neem is a tree species renowned for its insecticidal and antimicrobial properties. In the present study, five different varieties of turmeric, namely NDH 98, BSR 1, NDH 3, Pratibha, and Azad 1, have been planted under the neem canopy and in open conditions to evaluate the effect of shade and other interactive factors on the turmeric yield and quality parameters and to recommend the suitable varieties of turmeric for the TNAS system in subtropical regions. The shade provided by neem trees ameliorate temperature extremes, reducing water requirement and promoting favourable microclimatic conditions for turmeric crop. Furthermore, the nutrient-rich leaf litter and pruning's serve as valuable organic inputs, enriching soil fertility and improving crop yields.

Keywords: *Neem, Agroforestry, Shade, Turmeric, Variety*

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Effect of Tree Spacing on the Growth and Yield performance of Black Gram (*Vigna Mungo* L.) under Kadam (*Neolamarckia Cadamba* Roxb.) based Agroforestry System

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Agroforestry represents a sustainable and environmentally conscious land-use strategy that integrates the cultivation of agricultural crops, forest trees, and/or livestock on the same land unit through the application of appropriate management practices. The present study, titled "Effect of Tree Spacing on the Growth and Yield Performance of Black Gram (*Vigna mungo* L.) under Kadam (*Neolamarckia cadamba* Roxb.) based Agroforestry System", was conducted during the Kharif season of 2022-23 at an established two-year-old plantation located at the Forestry Research Farm, RLBCAU, Jhansi. The experimental design comprised three distinct tree spacings-S1: 5 m × 5 m, S2: 5 m × 4 m, and S3: 5 m × 3 m arranged in a randomized block design with four treatments, each replicated five times. The results indicated that sole cropping of black gram exhibited superior performance, with greater plant height (77.44 cm), a higher number of leaves and branches (6.38 and 5.32, respectively), increased dry matter accumulation (17.05 g/plant for above-ground and 2.12 g/plant for below-ground biomass), larger leaf area (2183.06 cm^2), and a higher number of root nodules (11.54). It also recorded significantly enhanced yield attributes, such as the number of pods per plant (27.28), seeds per pod (5.82), test weight (36.73 g), grain yield (0.79 t ha^{-1}), straw yield (1.78 t ha^{-1}), biological yield (2.57 t ha^{-1}), harvest index (30.63%), and grain-to-straw ratio (0.44), compared to intercropping treatments. Among the agroforestry treatments, the combination of *Neolamarckia cadamba* at a spacing of 5 m × 5 m with *Vigna mungo* outperformed the closer spacing configurations (5 m × 4 m and 5 m × 3 m). Therefore, wider spacing is recommended for achieving higher economic returns compared to denser planting arrangements. Overall, this research

provides significant insights into optimizing tree-crop interactions in agroforestry systems to improve productivity and sustainability.

Keywords: Agroforestry, Tree Spacing, Neolamarckia cadamba, Black Gram.

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Development and Performance Evaluation of an electro-mechanic seed-metering unit of sweet corn planter

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Sustainable development in Precision agriculture is a farming technique that uses agricultural technology to increase farm production while minimizing environmental impact with enhanced crop performance. There are various types of planters which have different types of seed metering mechanisms which are working by attached with ground wheel; these mechanisms are of mechanical type and they use drive through gears, chains or belts from the ground wheel and while transmitting power, there exists some transmission losses. Due to continuous friction between moving parts, these components are subjected to wear and tear. The sensor system in the machine helps in proper metering of seeds and thus further reduces the losses. The metering unit would be synchronized with the D.C motor with the help of proximity sensor and micro controller. Thus, the precision farming can be achieved with the help of smart metering mechanism by avoiding multiple seed dropping and missing voids, keeping row to row and seed to seed distance constant. By keeping the above points in view, an effort is made to develop a battery-operated corn planter based on electronic sensor metering mechanism.

A photo electronic sensor based instrumentation system was developed to Battery operated seed planters to quickly assess the seed metering rotor performance. The data thus collected and logged using instrumentation system without manual interference while in operation could quickly subjected to analysis, to identify defects in critical components, so that such machine components be redesigned to improve precision. Inclined and horizontal rotor plate metering mechanisms were test using a grease belt test

rig in laboratory conditions fitted with the instrument system. The developed electronic sensor based instrument seed counting accuracy ranged between 96.88 to 99.55 percent of the actual seeds metered. The mean number of seeds counted by the sensor at different forward speeds from 257.54 to 253.88, 267.45 to 265.82 for incline and horizontal rotor plates respectively, Seeding rate obtained for horizontal and inclined plate at forward speed of 3.5 km h were 11.13 and 11.18 seeds Seed spacing interval observed for horizontal rotor at the forward speed of 3.5 km h- was 201.33 mm for maize and Horizontal metering plate recorded more consistent seed to seed spacing interval when compared with the other mechanism. Sensing the seeds flowing through the seed tubes helps the operator to observe functioning of the planter

Keywords: *photo electronic sensor, horizontal plate, inclined plate, seed tubes, planter*

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Development of Headgear with Air Circulation Mechanism

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India comprises geographical area of around 329 M Ha, with variations in climatic conditions and temperature varied with regions. Summers are extremely hot in certain regions of the country, Moreover, temperature exceeds over 45°C. The head, face, and neck are most susceptible to direct sunlight, making them vulnerable to heat-related disorders such as heatstroke, resulting in protective measures for neurological health. There are numerous methods for mitigating heat stress in regions with high temperatures. The use of headgear is one of the mitigating measures to protect the head from the heat waves of sun. Generally, farmers using towel, cotton caps etc. to protect themselves from heat waves but they cannot cover the whole portion of head therefore headgear will be most effective alternative in covering whole top most layer of head. Previous studies state the usage headgears made of white pagdi, bamboo hat, hat with

95 mm brim width and solar fan type headgears effectively protected the heat stress to labour comfort levels. But they couldn't regulate the sweat therefore the workers are subjected to dehydration, muscular cramps and quick fatigue. Therefore, the present study of "twin fan solar powered head gear" was developed to mitigate the sweat circulation and to enhance the comfortless of the operator. The field results showed that heat Stress and sweat generation significantly over other head gears.

Keywords- *Headgear, heatstroke, twin fan head gear, dehydration, fatigue and heat stress*

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CFD for Gasifier Start-up and Transient Behavior

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The start-up and transient behavior of gasifiers are critical phases that impact their overall efficiency, operational stability, and longevity. Computational Fluid Dynamics (CFD) plays a vital role in understanding and optimizing these dynamic processes. This study focuses on the application of CFD to simulate the transient thermal and fluid flow behavior in gasifiers during start-up and operational fluctuations. By modeling the temperature distribution, fluid flow patterns, and reaction kinetics under varying conditions, CFD provides insights into the time-dependent development of key parameters such as heat transfer, syngas composition, and pressure distribution. The research explores how different start-up strategies, such as preheating and fuel injection rates, influence the ignition and steady-state achievement of the gasifier. Additionally, transient phenomena like load changes and shutdown processes are analyzed to predict system responses and ensure smooth transitions. CFD-based simulations enable better control strategies and reactor designs that reduce start-up times, minimize energy losses, and improve operational stability, contributing to more efficient and reliable gasification systems for bioenergy production.

Keywords: *CFD, Gasifier, Start-up, Transient Behavior, Temperature Distribution, Fluid Flow, Heat Transfer, Syngas Composition, Reaction Kinetics, Operational Stability, Bioenergy, Gasification Systems.*

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Effect of Silica and Dashparni on Yield of Parthenocarpy Cucumber

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This study investigates the effects of silica and dashparni on the yield of parthenocarpic cucumbers (Cucumis sativus). Parthenocarpy, the development of fruit without fertilization, is an important trait for enhancing cucumber production. The experiment was designed to assess the individual and combined effects of silica and dashparni on plant growth, fruit development, and overall yield. Cucumbers were treated with varying concentrations of silica and dashparni throughout the growing season. Parameters measured included plant height, number of fruits per plant, fruit weight, and total yield. Results indicated that both silica and dashparni significantly improved growth metrics and yield compared to control plants. The combined application showed the highest increase in fruit set and overall yield, suggesting a synergistic effect. Silica enhanced root development and stress resilience, while dashparni improved nutrient uptake and growth vigor. The findings underscore the potential of these treatments to optimize the cultivation of parthenocarpic cucumbers, providing insights for sustainable agricultural practices. Further research is recommended to explore the underlying mechanisms and to refine application methods for maximum benefit.

Keywords: *Dashparni, Plant growth promoters, Fruit set without pollination, Sustainable agriculture, Yield enhancement techniques*

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Analysis of Wet and Dry Patterns over Banas River Basin using SPI and SPEI

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The Banas River Basin, located in the arid Rajasthan state of India, is prone to frequent droughts due to its semi-arid climate. This study aims to comprehensively assess meteorological drought conditions in the basin using a standardized precipitation index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI) approach. Historical rainfall data from multiple stations within the basin were analyzed to calculate SPI values at various time scales (1, 3, 6, 9,12 and 24 months). The resulting SPI maps and time series provide valuable insights into the spatial and temporal variability of drought events. Key findings include Drought intensity and frequency vary significantly across the basin, with certain regions experiencing more severe and frequent droughts than others. Analysis of long-term SPI and SPEI data reveals both short-term fluctuations and potential long-term trends in drought occurrence and severity. The study identifies periods of severe and moderate droughts, highlighting the basin's vulnerability to water scarcity. Understanding the characteristics of meteorological drought in the Banas River Basin is crucial for effective water resource management, agricultural planning, and disaster preparedness. The results of this research can inform policy decisions and support the development of drought mitigation strategies.

Key Words:- *Semi-arid, SPI, SPEI, Water resource management, meteorological drought, Drought intensity and Frequency etc.*

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Development of an Experimental Plot Corn Harvester

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Maize is one of the most important cereal crop in the world next to rice and wheat. In India, the cultivated area of corn in 2020-2021 was 9.8 million hectare with an average productivity of 3199 kg ha^{-1} and in Haryana, it was six thousand hectares with an average productivity of 2.83 t ha^{-1}. The scientist community *viz.* agronomist, soil scientist, breeders, are working on maize crop. The scientist laydown experiments on small plots which are to be harvested. In the experimental design, the plots are small and scientists demand for small corn harvester. However, for the scientific research, there is requirement of the machines for collection of data multiple times. Harvesting is one of the most crucial task in maize farming. Manual harvesting operations typically require 8 to 10 persons to pick cobs from one acre area between 8 and 10 h which is very costly, tedious and time consuming. Thus, this study was undertaken to develop an experimental plot corn harvester. The corn harvester was developed and constitutes of feeding cum snapping unit, corn cob collection bucket, power transmission unit and main frame. The power was transmitted from PTO of the power tiller to the chain-sprocket mechanism and the gear assembly which rotated the feeding cum snapping unit as per required rpm. The power tiller was operated as per speed required in experimental design. The corn stalk entered the feeding cum snapping unit smoothly and the cob was later snapped by the snapping roller after which the cob was collected in the collection bucket. It was evaluated under the operating parameters: three forward travel speed (0.47 km h^{-1}-0.70 km h^{-1}, 1.12 km h^{-1}-1.60 km h^{-1} and 1.83 km h^{-1}-2.27 km h^{-1}), three level of inclination angle (0^0, 10^0 and 20^0) and three rotational speed of feeding cum snapping rollers (400 rpm, 500 rpm and 600 rpm).

The optimum parameters were obtained as forward travel speed 1.34 km h^{-1}, rotational speed of feeding cum snapping rollers 500 rpm and inclination angle of feeding cum snapping unit zero degree. The Corn cob picking efficiency, cut corn cob percentage and corn cob damage percentage of corn harvester were 97 %, 1.27 % and 0.97 % respectively. Actual field capacity of the harvester was found 0.046 ha h^{-1} with field efficiency of 76.67 %. The cost of operation was Rs 7586.11 ha^{-1}. Thus, it saved 77.78 % of labour requirement for harvesting in one

hectare area in comparison to manual method of harvesting. The break-even point was found 90.93 h yr^{-1}. The payback period was found 0.39 years and benefit cost ratio was 1.32.

Keywords: *Corn harvester, Picking efficiency, Corn cob, Power tiller, Feeding cum snapping unit.*

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Modeling Groundwater Dynamics in Southern Rajasthan through MODFLOW for Enhanced Water Management

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Groundwater is a vital resource in Southern Rajasthan, supporting agriculture, industry, and domestic needs, particularly in areas with limited surface water. However, rapid population growth, agricultural expansion, and industrial development have led to unsustainable groundwater extraction, causing a decline in water tables and increased stress on aquifers. This study utilizes the MODFLOW model to simulate groundwater flow and assess current and future trends in the region's groundwater resources. A comprehensive model was developed by integrating data from geological surveys, well monitoring, and climatic variables to reflect the region's diverse hydrogeological conditions. The model was calibrated with historical data to ensure accurate simulations and sensitivity analysis was conducted to identify key parameters influencing groundwater dynamics. Future scenarios were modeled under different management strategies, such as unrestricted extraction, artificial recharge, and regulated pumping, revealing severe depletion in some areas and identifying potential zones for enhancing recharge. The study provides a detailed map of over-extraction hotspots and offers actionable insights for policymakers to implement sustainable water management practices. Without intervention, the region faces a severe risk of water scarcity. This research emphasizes the need for integrated management approaches, including artificial recharge and regulated extraction, to protect and sustain Southern Rajasthan's groundwater resources in the long term.

Keywords: *MODFLOW, groundwater modelling, hydrological parameters, subsurface flow, sustainable water resources.*

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Enhancing Food Security through Smart Crop Monitoring in Flood-prone Regions

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Flood-prone regions face significant challenges in ensuring food security due to recurrent risks of crop damage, loss of arable land, and disrupted agricultural cycles. In such areas, traditional farming practices are often inadequate to predict and mitigate crop losses effectively. This paper explores how smart crop monitoring technologies can enhance food security in these vulnerable regions by providing real-time, data-driven insights for farmers and policymakers. The integration of sensor technologies, remote sensing, and predictive analytics allows for continuous monitoring of key agricultural parameters such as soil moisture, crop health, and flood progression. These tools enable farmers to make informed decisions on crop selection, planting schedules, and irrigation management, minimizing the impact of floods on agricultural output. Additionally, advanced crop models, combined with historical flood data, help predict potential crop damage, facilitating early interventions and adaptation strategies. This study highlights the effectiveness of smart crop monitoring in reducing crop vulnerability and promoting sustainable agricultural practices. Case studies illustrate the transformative role of digital platforms, drones, and IoT sensors in making traditional farming systems more resilient and adaptive. By leveraging these technologies, farmers can enhance yield predictability, reduce crop losses, and ultimately improve food security in flood-prone areas. The findings suggest that smart agriculture, coupled with climate-resilient strategies, offers a viable solution for sustaining crop production in the face of increasing flood risks due to climate change. This research contributes to the broader discussion on climate-smart agriculture and the use of digital tools for enhancing food security in vulnerable regions.

Keywords: *Food security, Smart crop monitoring, Flood-prone regions, Predictive analytics, Climate-smart agriculture.*

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Effect of Deep Tillage on Soil Physical Properties and Wheat Yield in Rice Wheat Cropping System

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The effects of tillage practices and soil depth on soil physical properties and wheat yield in rice wheat cropping system was studied during rabi season of 2022-23. The deep tillage practices significantly reduces soil resistance (kPa) in 15-60 cm soil depth. The conventional, rotary and conservation tillage practices do not have any impact on soil resistance (kPa) at any soil depth. The deep tillage practices significantly decreases bulk density (g cm-3) at all soil depth, however no effect of other tillage practices was observed on bulk density at any depth. The deep tillage resulted in significantly improvement in soil moisture content (%) in deeper soil layer (45-90 cm) as compared to other tillage practices. The deep tillage resulted in significantly improvement in water infiltration rate (cm min-1), mainly in 15-30 cm soil depth as compared to other tillage practices. The yield of deep tillage practice (59.18 q ha-1) was significantly higher than conventional (51.76 q ha-1), rotary tillage practice (52.97 q ha-1) and conservation tillage (56.70 q ha-1) practice. The straw yield of deep tillage practice was 19.1, 16.4 and 8.7 per cent higher than conventional (62.11 q ha-1), rotary (63.56 q ha-1) and conservation tillage (68.04 q ha-1) practice, respectively. The cost of cultivation of deep tillage (Rs 73596 ha-2) practice was 9.3, 7.0 and 14.7 per cent costlier than conventional (Rs 67343 ha-2), rotary (Rs 68769 ha-2) and conservation tillage (Rs 64139 ha-2) practice. The deep tillage treatment gives 15.7, 13.0 and 5.6 per cent higher gross returns over conventional, rotary and conservation tillage practice. The net returns of deep tillage practice were Rs. 93739 ha-1, which was almost as par with conservation tillage practice (Rs. 94338ha-1). The maximum B:C ratio was observed in conservation tillage (2.47) followed by deep tillage (2.27) and conventional and rotary tillage (2.15).

Keywords: *bulk density, infiltration rate, moisture content, soil resistance, tillage, yield*

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Navigating Radiation Challenges in Advanced VLSI Technologies: A Comprehensive Overview

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Radiation effects on Very-Large-Scale Integration (VLSI) circuits have emerged as a critical area of study due to the increasing reliance on electronic devices in high-radiation environments, such as space exploration, nuclear reactors, and medical equipment. As semiconductor technology advances and devices become more complex, they exhibit heightened susceptibility to the detrimental impacts of ionizing radiation. This review categorizes the primary radiation effects into Total Ionizing Dose (TID), Single Event Effects (SEE), and Displacement Damage (DD), each contributing to circuit degradation, data corruption, and potential catastrophic failures. In particular, advanced technologies like FinFETs, Silicon-on-Insulator (SOI), and 3D Integrated Circuits (ICs) face new vulnerabilities in these environments. Mitigation strategies, including Radiation Hardening by Design (RHBD), Radiation Hardening by Process (RHBP), error correction techniques, and shielding, are essential to enhance the resilience of VLSI circuits. Additionally, the review provides a detailed historical perspective on SEEs, encompassing Single-Event Transitions (SETs) and Single-Event Upsets (SEUs). The recognition of SEEs began in the 1960s, with the formal introduction of the term "Single-Event Upset" in the 1970s, emphasizing the vulnerability of memory circuits to ionizing radiation. Over the decades, researchers have systematically classified SEEs and explored their underlying mechanisms, particularly critical charge. The advancements in testing and simulation during the 1990s enhanced understanding of soft error rates and radiation interactions with semiconductor materials, while the 2000s saw an increased focus on radiation-hardened designs and error mitigation strategies. More recently, the study of SEEs has broadened to encompass new technologies such as FinFETs and 3D ICs. Researchers are actively exploring innovative solutions for mitigating soft errors, including Radiation Hardening by Design (RHBD) and advanced simulation techniques. Recent studies have expanded to include innovative solutions for soft error mitigation, stressing the importance of predicting

future vulnerabilities as technology evolves. This comprehensive overview underscores the significance of ongoing efforts to ensure the reliability of VLSI circuits in radiation-prone environments.

Keywords: *Radiation Effects, Total Ionizing Dose (TID), Single Event Effects (SEE), FinFETs, Silicon-on-Insulator (SOI), 3D Integrated Circuits (ICs), Radiation Hardening by Design (RHBD), Radiation Hardening by Process (RHBP)*

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Current status of Garlic Cultivation and Production in India

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Garlic (*Allium sativum*) is a one of the vital spice crop in India, renowned for its extensive culinary, medicinal, and industrial applications. This article provides a comprehensive overview of the area of cultivation and production of Garlic in India. India ranks second in cultivation area and production followed by china. The area and production of garlic in India during the year 2022-23 were 431.22 thousand ha and 3523.44 thousand MT with an average yield of 8.17 MT/ha. Garlic is grown in large quantities in the states of Madhya Pradesh, Rajasthan, Gujarat, Orissa, Karnataka, Tamil Nadu, Maharashtra and Bihar. Study observed that the area and production of garlic is increasing in most of the states. The production and productivity of garlic in India are very low compared to many other countries. Unawareness of farmers about improved planting technique, timeliness of sowing, improved varieties, climate, soil and agro-techniques, diseases and pest damaging the crops and their control

measures as well as post-harvest management are though main reasons, inadequate market support is also responsible for limiting the production and productivity indirectly.

Key Words:- *Garlic cultivation, production*

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Phytoremediation Potential of *Eruca sativa* cultivars and Role of Various Plant Parts in Phytoextraction of Heavy Metals

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Heavy metals like Pb, Cu, Zn, Ni, Fe, Cd, Cr, Hg are of great concern to human health as far as their side effects on our body are concern. Not only to human health, these heavy metals are harmful to plants and animals life when present in air, water or soil. Their ill effects on human and non human biota are many, therefore environmental scientist all over the world feel concern about pollution due to heavy metals and find out ways to remove heavy metal pollution particles from the three components of ecosystem. Phytoremediation is one such novel, cost effective and greener technology where heavy metal pollution is reduced from air, water and soil using certain crops which have higher biomass. One such crop is *Eruca sativa* or TARAMIRA, an oil yielding plant, used to remove the heavy metal pollution from agriculture soil. In present study, seeds of different cultivars of *Eruca sativa* are sown in cemented pots for 60 days. Various doses of $CdCl_2$ md $PbCl_2$ are provided as 0, 10, 20, 50, 100 ppm. Effect of these metal doses were observed on all plants of *Eruca*. Changes in the biochemical parameters of plants like Chlorophylts, Protein md Carbohydrates of leaves were also noticed. Biochemical studies were compared with plats grown in control i.e. O ppm. After maturity the plants were uprooted and effects of various doses of heavy metals were also observed in roots, stem md leaves, using Acid Digestion technique. Estimation of heavy metals were calculated using AAS Atomic Absorption Spectrophotometer technique and Phytoremediation potential of all the cultivars of *Eruca sativa* were calculated. It has been found that roots have the maximum accumulation potential for absorption of heavy metals, followed by stem and leaves. Both the heavy metals

show reduction in Chlorophyll, Protein and Carbohydrate contents at higher doses of 50 ppm and 100 ppm. At 10 md 20 ppm the effects of heavy metals are minimum.

Keywords : *Phytoremediation, Phytoextraction, Heavy metals, Eruca, Lead, Cadmium*

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Antimicrobial peptide profiling of *Pediococcus acidilactici* NCDC 252

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Lactic acid bacteria (LAB) are economically important because of their fermentative aptitude and they also confer health and nutritional benefits. Pediococcus acidilactici NCDC 252 (NCDC 252) is potential probiotic with novel genome that exhibited all in-vitro probiotic attributes, colonization in intestine and survival in conditions that mimic gastric, intestinal and vaginal fluid. Genome was screened for its ability to produce antimicrobial peptide (AMP). AMP from NCDC 252 was isolated and purified against indicator strain (Escherichia coli). AMP production was optimized in MRS broth at 32 °C, pH 6 and up to 36 h of incubation under both aerobic and anaerobic conditions. Tricine SDS-PAGE and LC/MS studies confirmed it to be a low molecular weight peptide. AMP was stable over pH range of 3 to 9 and temperature range of 40 °C to 100 °C. Enzymatic treatment inactivated the AMP whereas, detergent treatment enhanced its activity.

Additionally, biopreservation potential of purified AMP and whole NCDC 252 cells was studied by incubating them with some dairy products, apple juice, apricot pulp and pre-pasteurized wine over 72 h. Bacterial growth in AMP treated food products reduced significantly after 72 h. Viable cell count decreased to approximately half in both purified AMP treated and NCDC 252 treated food products. Purified AMP demonstrated exceptional resistance to heat treatment over a wide pH range, enabling it to establish itself as a biopreservative. Studies on biopreservation potential revealed NCDC 252 derived AMP to be effective even at low concentrations and it can be utilized to extend the shelf life of food goods.

NCDC 252 exhibited strong anti-inflammatory properties and moderate antioxidant and antihyperglycemic activities in vitro, suggesting potential therapeutic applications for conditions like inflammation and diabetes. Further in vivo studies are needed to confirm its efficacy.

Keywords: *Pediococcus acidilactici, antimicrobial peptide, LC/MS, biopreservation, antioxidant, antihyperglycemic and anti-inflammatory.*

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Status of Medicinal Plants in India: Challenges and Conservation Efforts

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India's rich biodiversity has long been a source of medicinal plants, forming the backbone of traditional healthcare systems such as Ayurveda, Siddha and Unani. However, the status of medicinal plants in India is increasingly threatened due to various challenges including habitat loss, overexploitation and climate change. This paper explores the current status of medicinal plants in India, highlighting the challenges they face and the conservation efforts aimed at their preservation. Through an analysis of existing literature, governmental reports and conservation initiatives, this paper aims to provide insights into the complex issues surrounding medicinal plant conservation in India and suggests strategies for sustainable management.

Key words*: Medicinal Plants, Challenges, Conservation.*

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Agro-Silviculture System in Haryana: Using Mahaneem (*Ailanthus excelsa* Roxb.) to increase Cowpea Fodder Yield

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A basic requirement for livestock and other animals is fodder. India has noticed an increase in the scarcity of fodder in recent decades as due to of numerous problems including population expansion, deforestation, climate change, global warming, and migration of people towards urban areas. In India's arid and semi-arid areas, mahaneem (*Ailanthus excelsa* Roxb.) provides a vital source of fodder. Large numbers of this type of multipurpose tree are planted in these resilient settings since it is known to provide tiny ruminants with a high-protein, nutrient-dense meal. At the Regional Research Station, Bawal, CCS Haryana Agricultural University, four different spacing configurations of 10 × 20 m, 10 × 10 m, 10 × 6.5 m, and 10 × 5 m for Mahaneem trees were planted in March 2013 to meet the demand for fodder. Two popular cowpea varieties were interplanted under Mahaneem-based agri-silviculture systems with varying spatial arrangements in order to determine the best intercrop with tree crop combination to reduce the scarcity of fodder in semi-arid and arid regions of Haryana, India. Two cowpea cultivars, Pusa Sukomal and Pusa Dharni, were intercropping in four different spatial arrangements of mahaneem. During the two-year trial (2020–21 and 2021–22), the maximum yield from green and dry *Ailanthus* fodder was obtained under planting spacing of 10 x 5 m. However, the highest production of cowpea fodder was recorded when *Ailanthus* plants were spaced 10 × 10 m apart. Following the cowpea variety, *Ailanthus* trees were intercropping at varying intervals with Pusa Dharni. The maximum seasonal fodder output was recorded at 10 x 5 m planting spacing when cowpea types were the only ones planted. Farmers in the arid and semi-arid parts of Haryana are therefore, advised to plant Mahaneem in 10 x 5 m spacing with the intercropping cowpea variety Pusa Dharni in order to increase yields of both green and dry fodder.

Keywords: *Climate change, fodder scarcity, Mahaneem, cowpea and tree spatial arrangements*

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Variation In Physico-Chemical Wood Properties of *Dalbergia Sissoo* ROXB. EX DC. in Rajasthan

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The present investigation entitled as "Variation in physico-chemical wood properties of *Dalbergia sissoo* roxb. ex DC. in Rajasthan" was carried out in the Department of Forest Products & Utilization, College of Horticulture & Forestry, Jhalawar during November 2021 to March 2022. The wood samples of *D. sissoo* T_1-T_{12} (Shisham) were collected from twelve district locations of Rajasthan viz. Baran (T_1), Barmer (T_2), Bhilwara (T_3), Bikaner (T_4), Jaipur (T_5), Jhalawar (T_6), Kota (T_7), Nagaur (T_8), Rajsamand (T_9), Sikar (T_{10}), Sri Ganganagar (T_{11}), and Tonk (T_{12}). Chemical analysis was carried out by employing TAPPI (Technical Association of Pulp and Paper Industry) standard methods. The results revealed that maximum value of specific gravity was found from T_1 (Baran) district of Rajasthan. The moisture content (12.510 %), maximum moisture content (57.710 %), vessel length (0.195 mm), vessel diameter (0.153 mm), fibre length (1.017 mm), fibre diameter (20.237 mm), cold water soluble extractives (2.663 %), hot water soluble extractives (6.727 %), alcohol-benzene extractives (4.830 %), holocellulose (68.037 %) and ash content (2.080 %) were found to be significant and observed to be highest from Jhalawar district in Rajasthan T_6. Among locations, the no. of vessels and klason-lignin content were found to be significant and recorded to be highest value (7 mm^2) from T_8 in Nagaur district and from T_1 in Baran district of Rajasthan (27.170 %). The texture wood variation, mainly two categories has been seen i.e., medium and coarse has been found from all the different districts of Rajasthan whereas, the maximum medium texture wood variation has been found from T_1 (Baran), T_4 (Bikaner), T_5 (Jaipur), T_7 (Kota), T_9 (Rajsamand), T_{10} (Sikar) and T_{12} (Tonk) and minimum coarse texture wood variation has been found from T_2 (Barmer), T_3 (Bhilwara), T_6 (Jhalawar), T_8

(Nagaur) and T_{11} (Sri Ganganagar) districts of Rajasthan; the colour variation mainly two categories highest has been seen i.e., reddish yellow to very pale brown in wood samples are T_2 (Barmer), T_5 (Jaipur), T_8 (Nagaur) and T_{10} (Sikar) and very pale brown in wood samples are T_4 (Bikaner), T_6 (Jhalawar) and T_{12} (Tonk). The Shisham wood variation in different districts of Rajasthan, when compared showed better properties in wood of Jhalawar district (T_6) and was appropriate to be used in wood industry and, further projections.

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Insect-resistant transgenic crops

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Genetic engineering has brought about a significant transformation in agriculture through the development of improved crop varieties that are resistant to insect pests. The main source of genes resistant to insects has been Bacillus thuringiensis (Bt). Other from Bt endotoxins, other non-Bt genes and lectins from diverse sources have also been incorporated into economically significant agricultural plants. Since being introduced to the market, the insect-resistant crops have had a significant economic influence on the entire globe. Pollution of the environment has decreased and crop yield increased as a result of the adoption of insect-resistant varieties.While the commercialization of insect-resistant crops has been permitted with due regard for biosafety protocols, these crops still have a long way to go before they are widely embraced and approved. Antibiotic resistance, effects on nontarget insects or species, Bt protein degradation rates, horizontal and vertical gene flow, and a few additional unforeseen effects have all been mentioned and explored. The debate is still going strong even though there is currently no hard data demonstrating that genetically modified crops pose a serious risk. It is necessary to completely operationalize impartial and expertly trained regulatory systems for the assessment of transgenic crops, including insect-resistant varieties.

Key words:*Transgenic Bt crops, adaptation, economic impact, safety assessment*

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Genomics tools for breeding heat tolerance in Rice

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Agricultural productivity is being severely impacted by the effects of climate change; consequently, improving crop resilience is crucial.Elevated temperatures worldwide are one of the factors driving climate change.By 2050, temperatures are expected to rise by 2°C, causing significant agricultural damages pursuant to the Intergovernmental Panel on Climate Change (IPCC).Rising temperatures exert a significant impact on rice's delicate stages, from anthesis to grain filling, which regulates plant reproduction.Essential features involving early morning flowering, pollen fertility, pollen shedding percentage, stigma receptivity, and spikelet fertility came to light while investigating strategies to reduce heat tolerance in rice.Identifying resources of germplasm with heat-tolerance traits and then utilizing them in climate-resilient rice breeding are the most important tasks. It encourages the development of more tolerant cultivars as a recommended adaptation strategy by a number of simulated crop models.The Oryza2000 crop model was utilized in several places to assess the susceptibility of rice crops to elevated temperatures and CO_2 concentrations in the context of climate change scenarios.In line with genetic research on heat tolerance in rice throughout the heading and flowering stages, heat tolerance is a quantitative trait with a high degree of broad-sense heritability.By eliminating the obvious consequences of heat stress, short-duration or early morning flowering features are typically chosen as indirect aims to lessen the financial loss in breeding lines.The genetics, physiology, and cellular responses of heat tolerance still need to be better understood in light of biotechnology's advancements.Breeding is accelerated using marker-assisted selection (MAS), which makes use of particular genetic markers linked to desired characteristics.Quantitative trait loci (QTL) mapping locates genome regions linked to traits like grain filling rate and plant vigour.High-density genotyping and predictive algorithms are used in genomic selection (GS) to select for characteristics including spikelet fertility under heat stress and yield stability.Chlorophyll concentration and membrane stability are two phenotypic features that genetic variants are correlated with in genome-wide association studies (GWAS), which contribute

to identifying loci connected to heat tolerance.Genes involved in heat shock protein production and reactive oxygen species scavenging are among the precisely modified genes that contribute to heat tolerance that can be accomplished via the utilization of CRISPR/Cas9 genome editing technology.RNA sequencing-based transcriptome analysis uncovers genes with variable expression in response to heat stress, providing information about the processes controlling protein homeostasis and photosynthesis.Studies on epigenomics, including assessing histone modifications and DNA methylation, shed light on the regulatory processes that underlie heat tolerance.By comparing the genomes of vulnerable and heat-tolerant cultivars, comparative genomics reveals potential genes. Through combining these genomics methods, it is possible to create rice varieties that can tolerate heat stress and maintain food security in the face of climate change in a comprehensive manner.

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Use of Microbial Biocontrol Agent for Pest Control

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A suitable substitute for chemical pesticides is the use of microbial biocontrol agents (MBCAs). They are the natural enemies that are destroying the pest population without affecting the environment or human health. Because of their wide host range, pathogenicity, and capacity to suppress both chewing pests like aphids and mosquitoes as well as sap-sucking pests like aphids, entomopathogenic fungi hold a significant position among all biocontrol agents. However, their share of the insecticide market is still relatively small. Improvements are required to meet the standards for a large market share. When it comes to the mode of infection, entomopathogenic fungi are different from other microorganisms in that they enter the insect hemocoel directly through an opening in the cuticle, whereas other microbes enter by the mouth and subsequently cause disease. Chitin and protein make up the majority of an insect's cuticle, which is enclosed in a layer of lipids, wax, or fatty acids. Cuticle-

degrading enzyme secretion is the primary initiator of fungal pathogenesis. Chitinase, protease, and lipase are a few significant and well-known enzymes that break down the chitin, protein, and lipid components of the cuticle, respectively. The process of insect pathogenicity of entomopathogenic fungi and to find ways to improve the virulence of wild strain fungi to shorten the killing time of the pest and to commercialize the entomopathogenic fungi. In this way, the market share of the fungal entomopathogenic fungi will increase and a decrease in the usage of synthetic chemical pesticides will automatically follow.

Key words: *Microbial biocontrol agents, Entomopathogenic fungi, Biocontrol agents, Enzymes.*

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Protected Cultivation of Floriculture

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Protected cultivation of floriculture entails growing flowering plants in controlled conditions, such as greenhouses and shade houses, to improve growth, yield, and quality. This approach has various benefits, including protection against unfavorable weather conditions, pests, and diseases, which reduces the need for chemical inputs. The application of current technology such as climate control systems, hydroponics, and automated watering improves growth conditions and resource efficiency. Protected horticulture also provides for longer growth seasons and better market timing, meeting consumer demand for high-quality flowers year-round. As sustainability becomes more essential, this strategy can encourage ecologically friendly behaviors like water conservation and integrated pest management. Overall, protected cultivation presents significant opportunities for enhancing the floriculture industry, driving economic growth, and meeting global floral demand while minimizing ecological impact.

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Insect is a vector of Plant Pathogen and their Integrated Management

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A vector is an organism that can transfer infections from one host to another. Insect vectors are the most significant plant pathogen transmission agents, and they are responsible for the spread of a wide range of plant diseases in crops. The best-characterized insect vectors that transmit plant viruses are aphids, thrips, leafhoppers, planthoppers, and whiteflies. Insect vectors are generally dangerous since a small number of vectors can disseminate the virus across the entire field or to new locations. A multifaceted approach should be used while these are challenging to manage. Insect vectors of plant pathogens must be carefully managed; that involves careful timing of chemical applications, integrated treatment with vector sampling, estimation of the threshold level of vectors, assessment of pathogen infection at different times of the year, and combination of insecticides with other control methods like natural enemies, inclusion of plant products, resistant cultivars, cultural practices, biocontrol agents etc.

Key words: *Insect vector, whiteflies, biocontrol agents, Management etc.*

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Innovative Adaptation Strategies in Climate-Smart Agriculture: Enhancing Resilience and Sustainability

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The production of food and agriculture is extremely susceptible to climate change. Severe weather conditions like droughts, heat waves, and flooding may have a significant impact on reducing poverty and ensuring access to food, particularly in rural areas where a large number of small-scale farmers rely heavily on rain-fed agriculture for their food and livelihoods. Because of reduced productivity and crop failure, climate change is predicted to diminish staple crop yields by as much as 30%. Furthermore, as the world's population is expected to expand, diets in emerging nations will shift to include more meat and dairy products, placing greater strain on natural resources and raising the need for food production and food insecurity. Farmers must adapt their production and farm management techniques to the changing climate. Some of these practices include rearranging planting dates, adding irrigation when needed, intercropping, implementing conservation agriculture, gaining access to short- and long-term crop and seed storage infrastructure, and switching to more climate-resilient crop varieties. Climate change poses significant challenges to global agriculture, impacting crop yields, food security, and rural livelihoods. In response, climate-smart agriculture (CSA) has emerged as a crucial framework aimed at transforming agricultural systems to support food security under changing climate conditions. A range of adaptation strategies, including the development and deployment of drought-resistant crop varieties, implementation of advanced irrigation techniques, and integration of agroforestry practices within the CSA framework, focusing on enhancing resilience and sustainability. The effectiveness of these strategies in improving water efficiency, reducing greenhouse gas emissions, and increasing crop productivity. the necessity of a multi-faceted approach that combines technological innovation, sustainable practices, and robust policy frameworks to achieve the goals of climate-smart agriculture.

Keywords: *Resilience, Sustainability, Food Security, Climate Change, Rural Livelihood*

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Optimizing Post-Harvest Processing through Precision Agriculture: Enhancing Efficiency and Reducing Food Losses

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The integration of precision agriculture with post-harvest processing offers a promising approach to reducing food losses and improving overall agricultural efficiency. Precision agriculture technologies, such as remote sensing, IoT-based sensors, and data analytics, provide real-time monitoring of crop conditions, which can be leveraged to optimize post-harvest processes. By utilizing detailed data on crop maturity, moisture content, and environmental conditions, farmers and processors can make more informed decisions about harvesting, storage, and processing, ensuring that crops are handled at their peak quality. This paper explores how precision agriculture can enhance the efficiency of post-harvest processing by minimizing delays between harvesting and processing, optimizing storage conditions, and reducing energy consumption in drying and packaging processes. It also highlights how the use of smart technologies can ensure better sorting and grading of produce, leading to reduced wastage and improved quality of processed products. Case studies from various agricultural sectors demonstrate the potential of integrating precision farming data into automated processing systems. For example, real-time moisture data can trigger automated drying processes, ensuring that crops are dried at optimal levels to prevent spoilage. The analysis shows that this integrated approach not only reduces post-harvest losses but also promotes sustainability by reducing resource use and energy consumption. By combining precision agriculture with innovative post-harvest processing techniques, the agricultural sector can achieve higher yields, improved food security, and reduced environmental impact. This research underscores the importance of adopting digital agriculture solutions to address the growing demand for sustainable and efficient food production systems.

Keywords: *Precision agriculture, Post-harvest processing, Food losses, IoT sensors, Crop quality optimization, Agricultural efficiency.*

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Enhancing Climate-Smart Agriculture through Farmers' Perceptions of the PM-KUSUM Scheme in Rajasthan: Adaptation Strategies for Sustainability

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Energy is a vital driver of economic activity and plays a key role in improving living standards. A country's energy consumption is often seen as an indicator of its development. Globally, India ranks third in energy consumption. The country set ambitious targets to boost renewable energy, aiming to generate 175 GW by 2022, with plans to increase this capacity to 500 GW by 2030. These initiatives highlight India's commitment to sustainable energy and reducing its reliance on non-renewable sources. The study titled "**Enhancing Climate-Smart Agriculture through Farmers' Perceptions of the PM-KUSUM Scheme in Rajasthan: Adaptation Strategies for Sustainability**" evaluated the perceptions of farmers regarding the benefits derived from the PM-KUSUM scheme, with a focus on social, environmental, and economic dimensions. Rajasthan was purposively selected due to its status as a renewable energy leader and rapid growth in solar power capacity. The study was conducted in three districts- Sri Ganganagar, Hanumangarh, and Jaipur- where 120 farmers were interviewed using a standardized scale to assess their attitudes towards the scheme. Data were analyzed through frequency distribution, arithmetic mean, standard deviation, and regression analysis. The perceived benefits of beneficiary farmers were measured using a well-framed schedule, focusing on economical, social, and environmental factors. Results revealed that social benefits were ranked the highest by farmers, followed by environmental and economic benefits. Social benefits included enhanced rural livelihoods and community development, while environmental benefits related to reduced carbon emissions and improved sustainability practices. Economical benefits though ranked lower, encompassed long-term cost savings on energy and farming operations. The study underscores the PM-KUSUM scheme's potential as a valuable adaptation strategy for climate-smart

agriculture, contributing to rural development, environmental sustainability, and agricultural resilience. These findings highlight the significance of renewable energy schemes in transforming the agricultural landscape by fostering sustainable practices in response to climate change.

***Keywords*:** Climate smart agriculture, Economical benefits, Environmental benefits, PM-KUSUM scheme, Perception, Social Benefits, sustainability.

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Isolation and Screening of DDT Resistant Bacteria

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Dichlorodiphenyltrichloroethane (DDT) is an organic chlorinated hydrocarbon that has various applications in agriculture but it causes soil and water pollution. Biodegradation is the most effective method to remove DDT and its residues using microbes. In this study, DDT-resistant microbes were isolated from a river water sample that was enriched with DDT by making serial dilution of collected samples. The pure colonies of bacteria were grown on LB agar plates, which had different concentrations of DDT ranging from 1000 - 2000 ppm. The isolates grow up to 1500 ppm and hence were resistant to very high concentrations. These microbes have a minimal inhibitory concentration (MIC) beyond 1500 ppm. Still, they cannot be experimented with because this high concentration of DDT could be very harmful and difficult to dispose of. Three isolates ASP1, ASP2, and ASPK were selected based on their resistant ability. Identification and characterization of isolates were performed based on microscopic studies of shape, form, margin, and color in gram staining. Based on the microscopic study, ASP1 and ASP2 were round, smooth, coccus, and Gram-positive as they showed purple color while ASPK was round, regular, rod, and Gram-negative as it showed red color. Biochemical analysis by the IMViC test series showed that ASP1 was not a member of the Enterobacteriaceae family, while ASP2 and ASPK was a member of the Enterobacteriaceae family. The genomic DNA was isolated from the selected isolates for molecular analysis and sequencing. These resistant microbes' ability to grow in the presence of this chemical compound might be used in the bioremediation process of DDT.

Keywords: *DDT, resistant microbes, gram staining, minimal inhibitory concentration*

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Isolation and Characterization of Oligotrophs from Landfill Sites, Low-Human-Activity Soil, and Potable Water Coolers

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This study was associated with the isolation of oligotrophs microbes from landfill sites, low-human-activity soil, and potable water coolers. Agar media was used for the growth of bacteria mainly isolated from soil and landfill sites while a special type of R2A media was used for the isolation of bacteria from potable water. Eight pure isolates were obtained during this work. Further, the identification and characterization of isolates were performed based on microscopic studies like shape, form, margin, and color in gram staining. Based on the gram staining study, it was found that some bacteria were gram-positive and some were negative while mostly they were gram-negative. The size of these isolates was very small and their shapes were varying from coccus to red bacillus. Biochemical analysis by the IMViC test series showed that five isolates were negative in this test and showed that they were not a member of the Enterobacteriaceae family, while three isolates were a member of the Enterobacteriaceae family. The genomic DNA was isolated from the selected isolates for molecular analysis. The result concluded these microbes were grown with negligible nutrients and suggested that these bacteria would be further genetically characterized by sequencing the DNA. These nutrient-resistant microbes might be used for in situ bioremediation.

Keywords: *oligotrophs, R2A media, gram staining, in situ bioremediation*

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Agroecology and Organic Farming

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This review examines the integration of agroecological principles into agricultural systems to foster sustainability and resilience in the face of contemporary environmental challenges. With the increasing urgency of climate change and resource depletion, it is imperative to develop farming methods that harmonize food production with ecological conservation. Through a comprehensive analysis of current literature, traditional practices, and socioeconomic factors, this review identifies effective agroecological strategies that enhance biodiversity, reduce dependence on synthetic inputs, and promote ecosystem resilience. Key practices such as permaculture, which mimics natural ecosystems, optimize resource use. Additionally, innovative techniques like companion planting, agroforestry, and polycultures improve soil fertility and mitigate pest pressures.

Furthermore, the review highlights the dynamics of organic farming, emphasizing its commitment to soil health and animal welfare. By avoiding synthetic fertilizers and pesticides and adopting practices such as crop rotation, composting, and biological pest management, organic farming promotes biodiversity and fosters ecological balance. The review also addresses humane livestock management, advocating for outdoor access and organic feeding while eschewing artificial hormones and GMOs. Overall, this paper underscores the critical importance of embracing agroecological and organic practices as viable solutions for cultivating resilient agricultural systems that can meet future food demands while safeguarding environmental health, contributing valuable insights for researchers, practitioners, and policymakers in the field.

Keywords: *permaculture, sustainability, polyculture, biodiversity, genetically modified organisms (GMOs)*

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Mapping Phenome Distribution, Diversity & Clustering Pattern AmongInbred lines of Maize (*Z. mays* L.) based on *k*-Means, Hierarchical & Multidimensional Scaling (MDS) Algorithms

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Phenotypic and genotypic trait mining, mapping and feature extraction among maize inbred lines is an essential *pre-requisite* for accelerated heterosis maize breeding. The methodology helps in the elucidation of available phenome range and its distribution across maize germplasm adaptation groups. In the present investigation leveraging a multifaceted approach, the study used both unsupervised and supervised machine learning techniques to decipher inherent patterns within the diverse maize germplasm. Phenomic characterization was performed which forms the cornerstone, meticulously quantifying diverse agronomic traits critical for breeding purposes. Using agro-morphological trait parameters, advanced statistical algorithms, including *k*-means and hierarchical clustering were used to delineate elite maize inbred lines into clusters and sub-clusters with intricate phenotypic landscape. In *k*-means algorithm gap-static & within sum of squares model parameters were used to conduct bootstrapping for arriving at optimal number of clusters, which reaffirmed and validated the broad classification of maize germplasm into 3 distinct adaptation groups including temperate mid-altitude, tropical lowland and temperate highland. Both *k*-means & hierarchical algorithmsidentified 4-clusters among 75 maize inbred lines based on 19-phenome features. The distribution and range of features is mapped in the present investigation. For further dimensionality reduction and visualization, multidimensional scaling (MDS) was used. This

geometric mapping technique empowers a visual representation of high-dimensional data, allowing intuitive exploration of relationships between the inbred lines based on their multifarious phenotypic traits. By synergistically integrating these cutting-edge methodologies, this study offers a comprehensive understanding of the phenotypic architecture within elite maize germplasm. The derived classification systems hold immense potential for targeted breeding efforts, facilitating the selection of parent lines with complementary profiles for hybrid development.

Keywords: *Zea mays L., Phenome, Multidimensional scaling (MDS), k-means clustering,Hierarchical clustering, inbred line*

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Impact of Earthworm Heavy Metal Pollution

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Heavy metal pollution poses a significant threat to soil ecosystems, with earthworms serving as a critical indicator species for soil health. This review synthesizes current research on the impact of heavy metals—such as lead (Pb), cadmium (Cd), arsenic (As), and mercury (Hg)—on earthworm physiology, behavior, and ecological functions. Elevated heavy metal concentrations disrupt earthworm health by impairing growth, reproduction, and survival rates. These metals accumulate in earthworm tissues, leading to oxidative stress, enzyme inhibition, and alterations in metabolic processes. Consequently, affected earthworms exhibit reduced burrowing activity, which negatively impacts soil aeration and nutrient cycling. The implications of these disruptions extend to broader soil ecosystem functions, affecting plant growth and microbial communities. This abstract highlights the urgent need for effective remediation strategies to mitigate heavy metal pollution and protect soil biodiversity.

Keywords: *Metal pollution, Earthworm, Agriculture*

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Molecular Phylogenetics of Major Carps of Meerut Region, Up, India

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The present study was conducted on 3 species of Major Carps, *Catla catla*, *Cirrhinus mrigala* and *Labeo rohita*. DNA isolation was done and gel electrophoresis was carried out. The study was carried out on mitochondrial DNA (*viz*. COI gene). The region of taxonomic importance (COI gene) was analyzed. The sequencing was done and analyzed through BLAST. The sequences were submitted to NCBI and The Phylogenetic analysis of all the sequences were performed using software MEGA 7.0. The results revealed that the molecular data based on COI was close to topotype population. Cryptic samples were also found during the study. The Molecular Phylogeny revealed that the same species of as the DATA available on NCBI. The cryptic samples and other fish were identified and characterized based on gene studies viz. COI showed maximum similitude to gene sequences of gene sequence available on NCBI and hence considered as the same.

Keywords- *Molecular Phylogenetics, Taxonomic importance, DNA isolation, COI genes.*

AFTEFS/SKUAST-K/AG/2024/303

Knowledge Level of Agricultural Input Dealers about Agro Services in Southern Rajasthan

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The present investigation was carried out in southern Rajasthan. Rajasthan is India's largest state by area. It is situated in the western part of country. The study conducted in MPUAT service area. Seven districts namely Udaipur, Rajsamand, Bhilwara, Dungarpur, Banswara, Partapgarh and Chittorgarh comes under MPUAT service area. Two districts of this area were selected on the basis of maximum number of input dealers. District Bhilwara and Udaipur having maximum number of input dealers 330 and 309, respectively. hence selected for this study. District Bhilwara comprises 11 tehsils out of which Mandal, Kotri, Jahajpur and Shahpura were selected on the basis of maximum number of input dealers. Similarly, Udaipur comprises 10 tehsils among which Bhindar, Mavli, Salumbar and Girwa tehsils were selected on the basis of same criteria. Thus, total 8 tehsils selected from two identified districts. Data were collected from the input dealerss by using interview schedule. The collected data was categorized, analysed by using appropriate statistical measures in computer and tabulated for the convenience. The results were presented along with the proper citations of prior studies. Study indicates that among all selected input dealers, majority of input dealers (64.17 %) had medium knowledge. Whereas, 20.00 per cent input dealers had low knowledge and remaining 38 (15.83 %) input dealers possessed high level of knowledge about agro services.

AFTEFS/SKUAST-K/AG/2024/304

Nutraceuticals : current trends and future Perspectives

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Nutraceuticals, derived from herbal products, dietary supplements, and processed foods like cereals, soups, and beverages, are increasingly recognized for their dual role in nutrition and medicine. These products not only provide essential nutrients but also enhance health, boost immunity, and delay aging. With their antioxidant properties, nutraceuticals are instrumental in preventing chronic diseases and potentially extending life expectancy. Dietary fibers and omega-3 polyunsaturated fatty acids are particularly recommended, alongside physical exercise, for the prevention and treatment of cardiovascular diseases. Various nutraceuticals like ginseng and astaxanthin offer specific health benefits, such as anti-inflammatory effects and heart protection against oxidative damage. Additionally, green tea extract and 5-hydroxytryptophan are known to aid in weight loss. Spirulina, a nutrient-dense algae, is an exceptional source of vitamins, minerals, and proteins, including vitamin B12, making it a valuable non-animal source. It is currently under extensive study for its potential antiviral, anticancer, antibacterial, and antiparasitic properties, and is already used in treating conditions like allergies, ulcers, and anemia. The current trends and future perspectives in the nutraceutical market indicate a growing interest in their health benefits, highlighting the importance of continued research and development in this field.This paper comprises of marketed nutraceuticals, its extraction from plants, benefits and applications in health sector.

Keywords *: Nutraceuticals, dietary supplements, fatty acids, probiotics*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/305

Robotics and Automation in Agriculture

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The advent of robotics and automation in agriculture is revolutionizing traditional farming practices, significantly enhancing productivity, efficiency, and sustainability. This paper provides an overview of cutting-edge technologies in agricultural robotics, such as autonomous tractors equipped with GPS and AI for precision farming, drones utilized for aerial imaging and real-time crop health monitoring, and robotic systems designed for planting, weeding, and harvesting. These innovations allow for the optimization of resource use—minimizing water, fertilizers, and pesticides—thereby reducing environmental impact.

We delve into case studies highlighting successful implementations of these technologies in various agricultural settings, emphasizing improvements in yield and labour efficiency. Additionally, we discuss the economic implications, including initial investment costs and the potential for long-term savings through increased productivity and reduced labour reliance. Challenges associated with the adoption of agricultural robotics are also addressed, such as the need for robust infrastructure, training for operators, and navigating regulatory frameworks. Furthermore, we examine the implications of data privacy and cybersecurity, given the increasing reliance on digital technologies in farming.

In conclusion, the integration of robotics and automation in agriculture not only holds promise for meeting the growing global food demand but also fosters a shift towards more sustainable agricultural practices. Continued research and investment in this field are essential to overcome existing challenges and fully realize its potential.

AFTEFS/SKUAST-K/AG/2024/306

Effect of foliar application of Borax and Zinc sulphate on growth, yield and quality of Guava (*Psidium guajava* L.) cv. Gwalior-27"

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The experiment entitled, **"Effect of foliar application of Borax and Zinc sulphate on growth, yield and quality of Guava *(Psidium guajava* L.) cv. Gwalior-27"** was carried out at the Agrotechnology Park of Krishi Vigyan Kendra, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) during 2016-2017**.** The experiment comprised of 9 treatments and 3 replications. Systemic findings on these aspects are being summarized here.

(A) Effect of borax

The mean maximum tertiary shoot length (6.43 cm), number of leaves per shoot (24.77),maximum number of fruits per plant (322), fruit weight (142.28 g), fruit yield per tree (46.08 kg), yield per hectare (127.96 q), polar diameter (7.03 cm), radial diameter (6.49 cm), pulp weight (250 g), minimum acidity (0.20 %), maximum taste score (7.20), colour and appearance score (6.33), aroma score (6.40), over all acceptibility score (6.53), minimum physiological loss in weight is recorded 5.30% at 4 days, Minimum Spoilage % were observed (3.68 %) , (11.43 %) and (20.96%) on the 5th day , 10th day , and 15th day of storage, maximum shelf life of fruit was recorded 4.00 days were recorded under the treatment B_2 (Borax @ 0.4%) and maximum seed weight were recorded under control (B0). Increased shoot diameter (0.34 cm), maximum TSS (13.7^{0}Brix) was recorded under B_1 (Borax @ 0.2%).

(B) Effect of Zinc sulphate

The maximum tertiary shoot length (7.19 cm), increased shoot diameter (0.36 cm), max. number of leaves per shoot (23.78), maximum number of fruits per plant (322.5), fruit weight (142.72 g), yield per plant (46.25 kg) and yield per hectare (128.42 q), polar diameter (6.57 cm), radial diameter (6.5 cm), minimum acidity (0.24), maximum taste (7.03), maximum colour and appearance (6.23), maximum aroma (6.28), maximum over all

acceptability score (6.44), minimum physiological loss in weight was recorded 4.90 per cent at 4 days, Minimum Spoilage % were observed (3.23 %),(11.12%)and (20.56%) on the 5th day , 10th day , and 15th day of storage were recorded under the treatment Z_2 (ZnSo4 @ 0.6%) , The maximum pulp weight (217 g), maximum TSS (11.89^{0}Brix) under treatment Z1 (ZnSo4 @ 0.4), and maximum seed weight (2.56 g) under control (Z0).

(C) Interaction effect of Borax and Zinc sulphate

The maximum tertiary shoot length (8.08 cm), maximum shoot diameter (0.38 cm), maximum number of leaves per shoot (26.30), maximum number of fruit (322.5), higher fruit weight (147.83 g), fruit yield per tree (48.71 kg), fruit yield per hectare (135.29 q), polar diameter (7.33 cm), pulp weight (297.00 g), minimum seed weight (1.69 g), maximum TSS (13.7^{0}Brix), minimum acidity (0.43), maximum taste score (7.30) were noted under B_2Z_2 (Borax @ 0.4% & ZnSo4@ 0.6 %), The maximum radial diameter (6.83 cm) was recorded under the treatment B_1Z_2 (Borax @ 0.2% & ZnSo4@ 0.6%) and the maximum pulp weight (297.00 g) was recorded under the treatment B_2Z_1 (Borax @ 0.4% & ZnSo4@ 0.4%). maximum colour and appearance score (6.33) was recorded under treatment B2Z0 (Borax @ 0.4 % & Zinc sulphate 0%). maximum aroma score (6.50), maximum over all acceptibility score (6.70), minimum physiological loss in weight is recorded 5.50%, minimum spoilage % (4.11 %), (11.11%) and (20.77%) was recorded with treatment B2Z2 (Borax @ 0.4 % + ZnSo4@ 0.6 %) at 5th, 10th and 15th day of storage respectively. The maximum shelf-life days fruit was recorded 7.10 per cent at 4 days under control (T_1).

Key words: *Borax, Zinc sulphate, Growth, Yield quality, Guava.*

AFTEFS/SKUAST-K/AG/2024/307

Loop-mediated isothermal amplification: A rapid on-site detection method for genetically modified (GM) plants

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In India, *Bt* cotton is the only approved genetically modified (GM) crop and some GM events of cotton and other crops have been imported for research purposes or under confined field trials. As GM crops are gaining raise in approval in other countries, it is crucial to monitor unauthorized entry of GM crops in India through efficient diagnostics. Loop-mediated isothermal amplification (LAMP) is a rapid and efficient tool for GM detection. LAMP-based GMO screening assays have been developed and validated for common promoters, marker genes, and transgenes. The LAMP process involves amplification at a constant temperature (60-68°C) without requirement of separate denaturation, annealing, and extension steps. Four primers are designed using PrimerExplorer to recognize six distinct regions on the target sequence. LAMP can be classified as visual or real-time based on the detection system. In visual LAMP, the reaction is carried out on a thermal cycler/ heating block, and results are seen by a color change from orange to green using SYBR Green dye. Real-time LAMP uses a portable system, making it suitable for on-site GMO testing, where amplification is detected through fluorescence. Specificity of the assays was validated against target and non-target transgenic elements. The assays were found sensitive to detect 0.01-0.1% GM content within 30-60 minutes, depending upon the GM target. To further enhance efficiency, multiplex real-time LAMP was developed to simultaneously detect multiple GM targets by analyzing differences in annealing curves. These assays could be deployed for detecting both approved and unapproved GM events in the country.

Key words: *genetic modification, GM detection, LAMP*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/308

Glyphosate induced neurodegeneration in the *Caenorhabditis elegans* Model system

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Moringa oleifera known as drumstick. Is an antioxidant and protects cells from the damage, helps to decrease inflammation and reduce pain.With the knowledge of this herb the aqueous extract was prepared and fed to *Caenorhabditis elegans* where the Dopamine transporter were labeled with Green fluorescent protein to visualize the Dopamine neurons. Upon treatment with the neurodegenerative agent Glyphosate these neurons get degenerated on exposure from 4h to 24 h duration. In the present study L2 staged worms were exposed to (0, 2.5, 5 and 10mM Glyphosate) and aqueous extract of *Moringa oleifera* 20ul/1.5ml was fed with and without Glyphosate. The worms were imaged after exposure for 24h duration and the images were recorded and analyzed for the Neurodegeneration by counting number of kinks, blebs and degenerated neurons. It was found that the upon treatment with *Moringa oleifera* 75% Neuroprotection was observed. Hence this study concludes that *Moringa oleifera* has the Neuroprotection activity for the dopamine neurons. Further study on its functional aspects is in progress.

Key words: *Moringa, Dopamine neurons, aqueous extract, neuroprotection and Neurodegeneration.*

AFTEFS/SKUAST-K/AG/2024/309

Effect of plant extracts against *Caenorhabditis elegans* by using Microtiter plate

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The sixteen plant extracts were investigated for the mortality of *Caenorhabditis elegans* at concentrations ranging from 1000, 10000, 20000, 30000 and 50000 ppm with a time period of maximum 3 days for incubation. The microscopic observations were recorded for mortality at different time intervals *viz.,* 4, 12, 24 and 72 h. Five different concentrations (1000, 10000, 20000, 30000 and 50000 ppm) of plant extracts resulted in correspondingly higher levels of mortality than the control. After 4 h of exposure, seaweed natural exhibited the highest mean mortality of 19.73 per cent, followed by *ajwain* (16.93 %), brown seaweed (16.07 %), turmeric (15.00 %), brown algae (11.80 %), cinnamon bark and green algae (10.33 %), cinnamon leaf (10.13 %), chilli and single cell protein (8.20 %). The mortality percentage of nematode increased as the concentration increased. Among the five concentrations, 50000 ppm showed maximum mortality (31.67 %) followed by 30000ppm (27.33 %), 20000 ppm (21.67 %), 10000 (14.67 %) and 1000 ppm (3.32 %). The least mortality was observed at 1000 ppm (0.00 %) in cumin, clove, fennel, black pepper, chilli and cinnamon leaf.

Key words: *Caenorhabditis elegans, plant extracts, microtiter plate.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/310

Effect of integrated nutrient management on yield contributing characteristics and economics in turmeric (*Curcuma longa* L.)

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Turmeric (*Curcuma longa* L.) is a perennial herb native to Southeast Asia, characterized by its rhizomatous growth. Integrated Nutrient Management (INM) enhances its yield and productivity, which combines organic and inorganic fertilizers that boosts yield and enhances the soil's physical, chemical, and biological properties. This approach improves soil fertility, productivity, and water retention. Vermicompost is rich in beneficial microorganisms and nutrients which serves as an excellent organic fertilizer for growing turmeric. This study was carried out at research farm of the department of vegetable science, regional research station, Karnal during summer season of 2022-23 in Randomized-block Design. The results showed plant weight of mother rhizomes per plant (70.12 g), weight of primary rhizomes per plant (108.68 g), weight of secondary rhizomes per plant (64.18 g) and yield (182.80 q/ha) were recorded highest with application of 75 % recommended dose of fertilizer (RDF) + vermicompost @ 5 t/ha. Highest gross returns (Rs 3,65,600) were observed with application of 75 % recommended dose of fertilizer (RDF) + vermicompost @ 5 t/ha, whereas highest net returns (Rs 2,30,449) and benefit-cost ratio (1.90) were observed with application of recommended dose of fertilizer (N:P:K-100:50:50).

***Keywords**: turmeric, nutrient, organic, vermicompost, rhizomes*

AFTEFS/SKUAST-K/AG/2024/311

Integrated Nutrient Management in Guava (*Psidium guajava* L.): A Comprehensive Review

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Guava (Psidium guajava L.) is a widely cultivated tropical fruit, known for its nutritional value, adaptability to diverse environmental conditions, and economic importance. Despite its resilience, guava productivity can be significantly enhanced through optimal nutrient management. Conventional nutrient management practices often rely heavily on chemical fertilizers, which, although effective, can lead to soil degradation, nutrient imbalances, and environmental pollution. Integrated Nutrient Management (INM) presents a sustainable alternative by combining organic and inorganic fertilizers, along with biofertilizers, to meet the crop's nutritional needs, improve soil health, and enhance fruit quality. Integrated Nutrient Management (INM) is a holistic approach that combines the use of organic and inorganic fertilizers to sustain and enhance the productivity of crops, while maintaining soil health and minimizing environmental impact. This review examines the application of INM in guava (*Psidium guajava* L.), an important tropical fruit crop. The discussion covers the nutrient requirements of guava, the role of organic and inorganic fertilizers, the benefits of biofertilizers, and the combined effects of these nutrient sources on guava growth, yield, and quality. This review also addresses the impact of INM practices on soil health and the environment and provides insights into future research directions for optimizing nutrient management in guava cultivation.

Keywords: *Integrated Nutrient Management, Guava, Organic Fertilizers, Inorganic Fertilizers, Biofertilizers, Soil Health, Sustainable Agriculture*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/312

Study on the Effects of Nanoparticles on Microorganism and Plant Pathogen

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Plant pathogens, including bacteria, fungi, viruses, and nematodes, cause significant losses in agricultural productivity worldwide. Traditional methods of controlling these pathogens often involve the use of chemical pesticides, which can have adverse environmental effects and lead to the development of resistant pathogen strains. Nanotechnology offers a promising alternative through the use of nanoparticles (NPs), which possess unique properties due to their small size and high surface area. Nanotechnology, a rapidly advancing field, holds significant potential for agriculture, particularly in managing plant pathogens. This research paper explores the effects of nanoparticles on plant pathogens, focusing on their mechanisms, efficacy, and potential implications for sustainable agriculture. This paper review the types of nanoparticles used in combating plant pathogens, Examine the mechanisms through which nanoparticles affect plant pathogens and evaluate the efficacy of nanoparticles in controlling various plant diseases.The study also discuss the potential advantages and challenges associated with the use of nanoparticles in agriculture. The study reviews various types of nanoparticles, their interactions with plant pathogens, and the outcomes observed in recent experiments. The findings suggest that nanoparticles can offer effective, environmentally friendly alternatives to traditional chemical pesticides, though further research is needed to fully understand their long-term impacts and optimize their application in agricultural settings.

Keywords: *Nanotechnology, Microorganism, Phytopathogens, Nanopesticides*

AFTEFS/SKUAST-K/AG/2024/313

Effects of Volcanic Action on Land Fertility

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Volcanic action plays a significant role in shaping land fertility, often creating some of the most productive soils on Earth. Volcanic eruptions release a mix of minerals and nutrients, such as potassium, phosphorus, calcium, and magnesium, which enrich the soil as volcanic rock and ash decompose over time. These nutrients are essential for plant growth, leading to highly fertile agricultural areas in regions near active or dormant volcanoes. In areas like the Andes, Japan, and Hawaii, volcanic soils, known as andisols, support dense vegetation and are used extensively for crops. The process, however, is gradual, as volcanic material initially has limited organic matter. Over time, the breakdown of volcanic deposits, combined with biological activity, creates rich, fertile soils. Despite the benefits, volcanic action can also pose risks; eruptions can temporarily devastate local ecosystems and communities. Nevertheless, the long-term impact of volcanic activity on land fertility is generally positive, creating conditions that support agriculture, biodiversity, and sustainable land use in many volcanic regions worldwide. This interplay between destruction and renewal highlights the dual nature of volcanic action on land fertility and its essential role in the Earth's ecosystem dynamics.

Keywords: *Earth, Volcanic, land Fertility, Minerals etc.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/314

Role of different micronutrient on plant height, number of leaves and plant spread of broccoli (*Brassica oleracea* var. *italica*) cv. green magic

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Broccoli (*Brassica oleracea* var. *italic*) which is one of the exotic vegetable introduced in India of the curciferae family is believed to be the first of the crops to evolve from the wild species of kale or cabbage and was cultivated by Romans. A Broccoli consists of immature flowering buds which would commonly contain the energy for a plant to fruit it is very high nutrients and often termed as super- food. A field experiment was conducted at Vegetable Research Field, Central Orcherd, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture Technology and Sciences Allahabad (U. P.) India to find out the effect of different micronutrient on vegetative growth of broccoli (*Brassica oleracea* var. *italica*) cv. Green Magic during *Rabi* season (17 September to 25 January) 2015-16. The experiment was laid out in Randomized Block Design (RBD) with 10 treatments and each replicated thrice. There were four treatment B, Mo, Mn and Zn micronutrients which applied @ of (3:0.5:2:2.5 kg/ha) in plot single and combination during season. The maximum plant height was found in T_5 (B + Mn + Zn) with 14.80 cm, 36.06 cm followed by T_7 (B + Mo + Mn +Zn) with 13.70 cm T6 (Mo + Mn) with 34.82 cm, at 20 DAT, 40 DAT respectively as compare to control. At 60 DAT the maximum plant height was significantly recorded in T_5 (B + Mn + Zn) with 52.23 cm. followed by T_7 (B + Mo + Mn + Zn) with 49.89. The maximum number of leaves were found in T_5 (B + Mn +Zn) with 7.83/plant, 13.25 /plant and 26.06/plant followed by T_8 (B +Zn) with 6.83/plant, T_6 (Mo +Mn) with 13.25 /plant and T_9 (Zn) with 23.09/plant at 20 DAT, 40 DAT and 60 DAT, respectively as compare to control. The maximum plant spread was found in T5 (B + Mn + Zn) 14.98 cm, 36.20 cm and 55.25 cm followed by T_6 (Mo +Mn) with 14.25 cm, T9 (Zn) with 34.15 cm, T_9 (Zn) with 50.03 cm at 20 DAT, 40 DAT and 60 DAT respectively as compare to control during the crop season.

***Keywords**: Broccoli, micronutrients, vegetative growth*

AFTEFS/SKUAST-K/AG/2024/315

Studies on White Leaf Hopper in Different Rice Ecosystem and Correlation with Weather Parameters

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Field experiment was conducted at research farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur using midland SRI rice ecosystem (MSR) and midland normal transplanted rice ecosystem (MNT), lowland conventional rice ecosystem (LLC) and lowland organic rice ecosystem (LLO). The results revealed that the white leaf hopper, *Cofana* spp. was appeared very low from 31 SMW of July with 0.25 adult/25 sweeps in MNT and LLC, similarly from 33, 34 SMW of August with 0.25 adult/25 sweeps in LLO and MSR respectively than it increase and reached peak in 36, 37, 37 and 37 SMW of September with a population of 0.50, 0.50, 1.00 and 1.75 adult/25 sweeps in MSR, MNT, LLO and LLC respectively. Pest disappears after 38-40 SMW of September-October month with 0.25 adult/25 sweeps. The mean population varied from 0.00 to 1.75 adult/25 sweeps in rice agro-ecosystem. Among the ecosystem maximum adult population (overall mean) was observed in LLC (0.25 adult/ 25 sweeps) followed by LLO (0.16 adult/25 sweeps), MNT (0.10 adult/25 sweeps) and MSR (0.07 adult/25 sweeps). The correlation studies revealed that maximum temperature, minimum temperature, average temperature, morning relative humidity (RH-I), evening relative humidity (RH-II), average relative humidity (Avg. RH) and rainfall showed non-significant positive correlation while sun shine hours showed non-significant negative correlation with white leaf hopper at 1 and 5 per cent level of significance in both LLO and LLC.

Key words: *white leaf hopper, rice ecosystem and weather parameters.*

AFTEFS/SKUAST-K/AG/2024/316

Global barley (*Hordeum vulgare* L.) collection from ICARDA: genome-wide association studies for heat tolerance

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Barley (*Hordeum vulgare L.*) is an important cereal crop grown in many regions of the world for food, feed and industrial uses. Heat stress in grain development period, causes significant decrease in grain yield and quality especially in the malt barley crop in northern India.Identification of heat tolerant genotypes from global genetic diversity and understanding genetic basis foradverse effect on the quantity and quality of grain under late heat stressis essentially required to develop novel cultivars with heat tolerance.A global panel of 316 different barley genotypes (AM2017), received from ICARDA was evaluated in two consecutive seasons, 2017-18 and 2018-19, at CCSHAU, Hisar and during 2018-19 at ICARDA Amlaha Platform, under timely (normal) and late sown (heat stress)conditions. The staggered sowing was practiced to coincide the flowering for uniform heat stress pressure on both sowing times. Observations on seven agro-morphological, four physiological and five grain malting quality traits were recorded. The 50 K iSelect Illumina Barley SNP array genotypic data of the AM2017 panel were used to estimate marker-trait associations (MTAs). The phenotypic data revealed a significant decrease in trait performance under the late sown condition, while several genotypes were observed as tolerant with minimum heat susceptibility indices. A total of 307 Putative QTL were identified as being linked with these traitsanalyzed based on the estimated MTAs and linkage disequilibrium (LD) degradation seen in the genome. In all 21 most robust QTL for traits like heading days(5), maturity days (3), plant height (2), spike length (1), spikelets/spike (1), 1000gw (3), tillers/M (1), relative water content (1), hectolitre weight (1), % protein (1), and starch (2) were found under both normal and heat stressed conditions. Several new QTL were also found which are not yet reported.The combination of SNP studies and changes in physiological characteristics generated valuable information on genetic areas involved in heat stress tolerance.

Keywords: *Barley, heat tolerance, molecular markers, malting quality, yield components, physiological traits*

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Robotics and Automation in Agriculture

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Agriculture is oldest and most significant economic sector, providing the food and fuel required for survival. With the world's population anticipated to reach 9 billion by 2050, agricultural productivity must quadruple to fulfil rising demand for food and bioenergy. Given limited land, water and labour resources, it is predicted that agricultural productivity efficiency must increase by 25% to accomplish that target while limiting agriculture's environmental impact. Robotics and automation in agriculture are fast changing the way farming is done, assisting in addressing issues such as labor shortages, growing food demand, and the need for sustainable techniques. key applications of robotics and automation in agriculture mainly includes the autonomous tractors and machinery in which with GPS, sensors, and artificial intelligence (AI), self-driving tractors and harvesters enable accurate field operations that lower labor costs and increase efficiency. Crop circumstances, soil health, and moisture levels are all tracked by automated systems, which include sensors, drones, and robots. These systems guarantee the best possible use of herbicides, fertilizers, and water. lowering trash and its negative effects on the environment. A few of the most important uses are drone and aerial surveillance, automated irrigation systems and automated seeding and planting. Agriculture is undergoing a revolution thanks to the use of robotics and automation, which is increasing farming's productivity, sustainability, and ability to satisfy the world's expanding food needs. Future expansion will still be significantly impacted by issues including high costs, a lack of technological adoption, and the requirement for qualified staff to manage these systems.

Keywords: *Agriculture, Artificial Intelligence, Automation, Productivity, Robotics*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/AG/2024/318

Climate-Smart Agriculture: Pathways to Resilience and Adaptation

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Climate change poses significant challenges to global agriculture, threatening food security, livelihoods and ecosystem stability. Climate-Smart Agriculture (CSA) emerges as a transformative approach to address these challenges by integrating sustainable practices, adaptation strategies and mitigation efforts. CSA provides the pathways to resilience and adaptation, emphasizing its role in enhancing productivity, improving resilience to climate variability and reducing greenhouse gas emissions. The key strategies include adopting climate-resilient crops, improving soil health, utilizing precision agriculture technologies and implementing water-efficient irrigation systems. Additionally, CSA emphasizes capacity building, knowledge sharing and policy support to empower farmers and communities. The synergistic integration of traditional knowledge with modern innovations offers a holistic pathway to sustainable agricultural practices. The usefulness of CSA in creating resilient agricultural systems that can tolerate climatic disruptions can be highlighted by looking at case studies and best practices from various geographical areas. Further, there is a need for collaborative efforts among stakeholders, including governments, researchers and farmers, to scale up CSA initiatives globally. Adopting CSA is pivotal to achieving sustainable development goals, ensuring food security and building climate-resilient communities in an era of unprecedented environmental change. The CSA is not just an option but a necessity for transforming global agriculture into a sustainable and resilient sector capable of supporting both present and future generations.

Keywords: *Climate-Smart Agriculture (CSA), Climate change, Food security, Resilience, Sustainable practices*

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Evaluation of wheat genotypes for seedling resistance to stripe rust (*Puccinia striiformis* f. sp. *tritici*) pathotypes under controlled environmental conditions

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Stripe rust (*Puccinia striiformis* f. sp. *tritici*) poses a significant threat to wheat production worldwide. To evaluate seedling resistance, 115 wheat genotypes were screened against ten stripe rust pathotypes (46S119, 110S119, 238S119, 78S84, 111S68, 110S84) under controlled environmental conditions at the Indian Institute of Wheat and Barley Research, Regional Station, Shimla. Among these genotypes, three—SABWGPYT-2044, SABWGPYT-2016, and WH-896—exhibited resistance to all pathotypes. Six genotypes, including SABWGPYT-1030 and SABWGPYT-2019, showed resistance to all pathotypes except 238S119. Similarly, eight genotypes, such as WH-1105 and SABWGPYT-1039, displayed resistance to all pathotypes except 238S119 and 110S119. Conversely, SABWGPYT-1014 was found to be susceptible to all tested pathotypes. The majority of the remaining genotypes exhibited susceptibility to highly virulent pathotypes, particularly 238S119, 110S119, and 46S119. This study identifies key genotypes with potential for breeding programs aimed at improving resistance to stripe rust, emphasizing the importance of evaluating germplasm under controlled conditions to mitigate the impact of this destructive pathogen.

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Analysis of forty maize (*Zea mays* L.)inbred lines for heat stress tolerance under Normal vs. Late Spring sowing conditions

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An experiment was carried out to compare growth and yield data of spring maize for normal and late sown conditions at the field area of CCS RRS, Karnal during 2023 using forty inbred lines with two replications under RBD design. During the experiment, data obtained for two sowing conditions i.e.,1st fortnight of February (normal)and 2nd fortnight of march (late sown) spring was recorded to study various morpho-physiological traits. The significant effect of sowing season has been observed on growth and yield patterns of different inbred lines under study. Under normal sown conditions all the inbred lines performed very well and reported yield ranged between 18-65 g/plant with seed setting percentage ranged between 27-89%.Anthesis silking interval was only 2-3 days under normal sown conditions, however it get extended upto 6-7 days under stress conditions resulting in yield loss. However, delayed anthesis and reduced yield was observed for late sown conditions.Additionally, the plant suffered from high temperature stress conditions during their vegetative and reproductive stages resulted in yield ranged from 4 to 33 g/plant with seed setting percentage from 3 to 34%. Few inbred lines such as HKI 327 T, HKI L287, HKI 288-2 and HKI 1128 experienced severe issues such as tassel blast, leaf firing and barrenness. Conversely, the inbred linesHKI 161, HKI 163, HKI 1558-4, HKI 1653 ER-4, HKI 1659 and HKI 1344 demonstrated comparatively better performance under late sowing conditions showing greater resilience to temperature stress and higher overall productivity.

Keywords: *Maize, anthesis-silking interval, grain yield per plant, normal spring and late spring.*

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Quality of Early Childhood Care and Education (ECCE) centre Environmenton Social and Emotional Development of Preschool Children

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The study was conducted in Dharwad taluk of Karnataka state during the year 2018-20. Total sample of 208 children of age between 3-6 years of children attending different ECCE centers in rural and urban areas of Dharwad taluk. The study investigated the following objectives: To study the quality of ECCE centers on social and emotional development of children. Transdisciplinary Play Based Assessment-2 tool was used to assess the social and emotional development of children. Early Childhood Environment Rating Scale-III (ECERS-III) was used to assess the quality of ECCE centres. The qualitative approach involved naturalistic observation method to document, analyze and study the impact of play- based activities on social and emotional development. Naturalistic observation was made during children involved in free play through video recording which was complemented with participant observation which included by taking field notes. Results revealed that the comparison of social and emotional development of children by quality of ECCE environment in both rural and urban areas showed the significant difference. Children attending medium teaching learning environment centre had significantly higher scores on social and emotional development (36.13) as compared to children from low teaching learning environment (22.04) in rural and (26.38) in urban area. With regard to the domains of social and emotional development of children by quality of ECCE environment in both rural and urban area showed significant difference under emotional expression, emotional adaptability, regulation of emotions, and arousal states, behavioral regulation, sense of self, emotional themes in play andsocial interaction.

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Efficacy of bioagents on the gowth inhibition of *Klebsiella aerogenes* causing stem rot in pearl millet

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Pearl millet [*Pennisetum glaucum* L.] is the staple food of a vast population of developing and subtropical countries of the world. The pearl millet crop succumbs to various abiotic and biotic stresses at various stages of growth. Pearl millet stem rot caused by *Klebsiella aerogenes* is a very destructive and novel disease in major pearl millet growing areas. The present investigation was undertaken to evolve an effective management strategy of stem rot through bioagents. Five bioagents *viz., Trichoderma viride, Trichoderma harzianum*, *Trichoderma asperellum*, *Bacillus subtilis* and *Pseudomonas fluorescens* were tested for their efficacy under *in vitro* conditions by using dual culture technique against *Klebsiella aerogenes.* All the bioagents tested were differed significantly with respect to the inhibition of growth of the pathogen. The maximum inhibition of growth of the test pathogen was observed in *Trichoderma asperellum* (27.50 %) followed by *Trichoderma harzianum* (25.61 %) and *Pseudomonas fluorescens* (22.22 %) with zone of inhibition measuring 24.75, 22.50 and 20.00 mm respectively. The minimum inhibition of growth was observed in *Bacillus subtilis* (15.21 %) with 13.50 mm zone of inhibition. Biocontrol agents offer great potential in managing the disease. Biocontrol agents can represent a great strategy for the prophylactic treatment of bacterial diseases and reduce the application of environmentally toxic approaches.

Keywords: *Pearl millet, Klebsiella aerogenes, Stem rot, Bioagents, Dual culture technique, and Zone of inhibition.*

AFTEFS/SKUAST-K/AG/2024/323

Differential Response of Wheat Genotypes to *P. triticina* Pathotype 12-5 at Seedling Stage

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Leaf rust, caused by *Puccinia triticina*, is one of the most destructive foliar diseases in wheat. The development of resistant cultivars remains the most sustainable approach for its management. The frequent emergence of new virulent pathotypes has rendered many previously resistant cultivars , posing a serious threat to wheat productivity. Therefore, identifying and characterizing resistance at the seedling stage is critical for breeding durable leaf rust-resistant varieties. The present study aimed to evaluate wheat genotypes for seedling resistance to the virulent leaf rust pathotype 12-5 under controlled conditions. A total of hundred diverse wheat genotypes representing advanced breeding lines were screened against pathotype 12-5. The experiments were conducted under glasshouse conditions at the seedling stage using a standardized inoculation procedure. The infection types (ITs) were recorded after 14 days of inoculation using the modified 0–4 scale where ITs 0 to 2+ were considered resistant, and 3 to 4 were considered susceptible. The results revealed substantial variation in resistance among the evaluated genotypes. Out of hundred genotypes, six exhibited highly resistant (HR) to resistant (R) infection types, suggesting the presence of effective seedling resistance genes. These included promising entries such as SABWGPYT-1025, SABWGPYT-1054, SABWGPYT-1055, SABWGPYT-2028, SABWGPYT-2016 and SABWGPYT-2028. Additionally, 22 genotypes displayed moderately resistant reactions, indicating partial effectiveness of resistance genes at the seedling stage. In contrast, 11 genotypes showed moderate susceptibility, while 60 genotypes were classified as highly susceptible, exhibiting ITs of 3+ to 4. However, one genotype shows heterogenous reaction. The resistant genotypes identified here can serve as potential donors in future wheat breeding programs for leaf rust resistance.

Keywords: *Wheat, Leaf rust, Infection types (ITs), Wheat genotypes, leaf rust resistance*

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Machine Learning-Based Hazard Identification in Agricultural Machinery Operations

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Agricultural machinery operations pose significant risks to farmers, workers, and bystanders. Effective hazard identification is crucial to preventing accidents and ensuring a safe working environment. This study proposes a machine learning-based approach to hazard identification in agricultural machinery operations.

Using a combination of machine learning algorithms and sensor data from agricultural machinery, our model identifies potential hazards and predicts the likelihood of accidents. We evaluate the performance of our model using a dataset of real-world agricultural machinery operations and demonstrate its effectiveness in identifying hazards and preventing accidents.

The results of this study contribute to the development of intelligent safety systems for agricultural machinery, enhancing the safety and well-being of agricultural workers. The proposed approach can be applied to various agricultural machinery operations, providing a valuable tool for hazard identification and risk mitigation.

Keywords: *agricultural machinery, hazard identification, machine learning, safety, risk mitigation.*

AFTEFS/SKUAST-K/AG/2024/325

Integrating microbial culture with nitrogen application for improving wheat production in conservation agriculture in Indian Punjab

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In-situ microbial degradation of rice residue in Happy Seeder seeded wheat under field circumstances with integrated nitrogen management, very little is known. It is difficult to find sustainable methods for raising wheat productivity in the rice-wheat system without endangering the ecosystem. Hence, field trials were carried out in the current study at Punjab Agricultural University (PAU), Ludhiana and University Seed Farm (USF), Ladhowal to show the potential of a microbial-based consortium to identify the microbes with faster decomposition of rice residue in combination with recommended rate of synthetic fertilizers for sustainably enhancing wheat production during two *rabi* seasons. It was discovered that the number of cellulose decomposing bacteria was substantially larger at 60 days after sowing in comparison to other time periods. In N150 (25% of total N through FYM+ 75% N via urea), a larger population of bacteria that break down cellulose was seen over a range of time periods. Because of this, applying *Delftia* sp. and treating with 150 kg N/ha, which includes a 3% urea spray after paddy harvest may hasten the breakdown of rice residue and increase wheat grain yield. Maintaining wheat crop resilience and productivity in the face of changing climate conditions is largely dependent on optimizing nitrogen management and using microbial cultures.

Keywords: *Cellulose, microbial culture, nitrogen, rice residue, wheat*

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Impact of Climate Change on Flowering, Fruit Set, and Yield in Major Fruit Crops

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Climate change has emerged as one of the most significant threats to fruit-crop phenology, particularly affecting flowering, fruit set, and yield stability. Rising temperatures, declining winter chill, and increased frequency of heatwaves disrupt the physiological mechanisms governing floral induction and reproductive success. For instance, long-term regional analyses show that winter chill accumulation in apple-growing belts has declined by 15–30% over the past two decades, directly causing delayed or incomplete bud break. In peach and plum orchards, insufficient chill has reduced effective flowering rates by 20–45%, resulting in poorer fruit set. In tropical and subtropical species such as mango and citrus, heat stress during anthesis and early fruit-set stages has been shown to reduce pollen viability by 35–60% and stigma receptivity by 25–40%. Temperatures exceeding 38°C for more than 3–4 hours/day during flowering increased flower drop by 28–35%, significantly affecting final fruit retention. Similarly, erratic rainfall and unexpected pre-monsoon showers have caused pollination disruption in litchi orchards, decreasing fruit set by 20–30% across multiple growing seasons. Extreme weather events—frosts, hailstorms, and heatwaves—further compound yield losses. Model simulations published in some journals indicate projected yield declines of 10–25% in apple, 8–20% in citrus, and 12–30% in mango by mid-century under moderate warming scenarios (RCP4.5). These impacts are exacerbated by climate-driven shifts in pest and disease prevalence, shortening of flowering windows, and loss of synchrony between pollinators and floral phases. Adaptation strategies highlighted in research include use of low-chill cultivars, regulated deficit irrigation to mitigate heat stress, protected cultivation structures, and microclimate management through mulching and canopy modification. While promising, their success is region-specific and requires integrated orchard-level climate adaptation planning. Overall, the compiled evidence underscores the urgency of climate-smart fruit production systems to safeguard phenology and yield stability in the coming decades.

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Enhancing Shelf Life and Quality of Ber (*Ziziphus mauritiana* L.) cv. Gola through Postharvest Treatments under Ambient Storage

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The present study investigated the efficacy of selected postharvest treatments in improving the storage life and quality of ber (*Ziziphus mauritiana* L.) cv. Gola under ambient conditions. Uniform, freshly harvested fruits were treated with lemongrass oil (0.1%), sesame oil (2%), Aloe vera gel (100%), salicylic acid (1 mM), calcium chloride (2%), citric acid (0.5%), and sodium nitroprusside (1 mM), along with an untreated control. Treated fruits were stored at 25 ± 2 °C and evaluated at regular intervals.

Key physiological and biochemical parameters, including physiological loss in weight (PLW), decay incidence, firmness, colour, sensory acceptability, total soluble solids (TSS), titratable acidity, and ascorbic acid content, were monitored throughout the storage period. All treatments significantly reduced PLW and decay incidence compared to the control. Calcium chloride and salicylic acid were particularly effective in maintaining fruit firmness and delaying senescence, thereby reducing postharvest losses. Aloe vera gel treatment notably preserved surface colour, visual appeal, and overall sensory quality. Furthermore, treated fruits exhibited better retention of nutritional attributes, including ascorbic acid and acidity balance, compared to untreated fruits.

The results clearly demonstrate that the application of suitable postharvest treatments can effectively extend the marketable life and maintain the physicochemical and sensory quality of ber fruits under room temperature storage conditions.

Keywords- *Ambient storage; ber; postharvest treatments; fruit quality*

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Effect of grafting method on various parameters in low chill peach cv Shan-i-Punjab in Haryana

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This investigation was carried out with the objectives to evaluate the best grafting method for low chill peach cv. Shan-e-Punjab under Haryana condition. The experiment was conducted under semi-arid irrigated ecosystem of Haryana at CCSHAU, Hisar during 2018-19. Experiment consists of three grafting methods i.e. Tongue grafting, wedge grafting and whip grafting. Results concluded that tongue grafting had significantly increased all parameters recorded viz., sprouting (69.32%), graft success (62.77%), plant height (148.86 cm), number of leaves (165.61), leaf area (35.56 cm^2), percent increase in scion and rootstock diameter (4.08% and 4.48% respectively), shoot fresh and dry weight (259.89 g and 175.04 g respectively), root fresh and dry weight (89.83 g and 51.42 g respectively), relative water content (69.33%), leaf nitrogen (3.02%), phosphorus (0.25%) potassium content (2.10%) and total chlorophyll content (1.32 mg/g of fresh weight) over wedge grafting and whip grafting. However, days taken for first and complete sprouting (29.21 and 51.00 respectively) were decreased significantly when tongue grafting was performed over wedge grafting and whip grafting. Hence, it can be concluded from above experiment that tongue grafting method is superior over wedge and whip grafting method for low chill peach cv Shan-i-Punjab under Haryana condition.

Keywords: *Tongue grafting, sprouting, Shan-i-punjab, rootstock*

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Association studies of biochemical traits in upland cotton with whitefly

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The research was carried out to find association of various biochemical traits of upland cotton with whitefly. One hundred twenty-five (*Gossypium hirsutum* L.) germplasm lines were evaluated in the augmented design, at the Farm Research Area of Cotton Section, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar. Correlation coefficient analysis revealed that whitefly population had a significant and positive association with total sugar content (r = 0.369**), indicating that genotypes with higher leaf sugar content favoured greater whitefly infestation, sugar acting as a phagostimulant for the insect. In contrast, whitefly population exhibited a significant and negative correlation with tannin content (r = -0.573**), gossypol content (r = -0.654**) and total phenol content (r = -0.687**), the strongest negative association being with total phenol, followed by gossypol and tannin content. This suggests that these phenolic and terpenoid secondary metabolites confer antibiosis-based resistance against whitefly by adversely affecting its feeding, survival and reproduction. Soluble protein content, on the other hand, showed a positive but non-significant correlation with whitefly population (r = 0.029), indicating that protein content had little direct bearing on whitefly incidence in the genotypes studied. Overall, these results indicate that genotypes with lower total sugar but higher gossypol, tannin and total phenol content are likely to possess stronger antibiotic resistance to whitefly, making these biochemical traits particularly total phenol and gossypol content useful selection criteria in whitefly resistance breeding programmes.

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Spatio-Temporal Assessment of Water Quality in Gosikhurd Reservoir, Maharashtra, India

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This study assessed the physicochemical characteristics of Gosikhurd Reservoir on the Wainganga River, a major tributary of the Godavari (India's largest peninsular river), from June 2022 to May 2023. Spatial variation was mapped using Inverse Distance Weighted (IDW) interpolation, and seasonal differences were tested with one-way ANOVA followed by Tukey's post hoc test. All parameters showed statistically significant seasonal variation ($p < 0.05$). Total phosphorus peaked during the monsoon (0.10 ± 0.007 mg L^{-1}) and was lowest in winter (0.060 ± 0.003 mg L^{-1}). Secchi disk depth was highest in winter (2.59 ± 0.08 m) and lowest during the monsoon (0.58 ± 0.03 m). Chlorophyll-a reached its highest value in summer (5.42 ± 0.20 mg m^{-3}) and its lowest value post-monsoon (1.62 ± 0.03 mg m^{-3}). Water temperature, pH, total dissolved solids, dissolved oxygen, electrical conductivity, alkalinity, and hardness also exhibited clear seasonal patterns, with monsoon conditions generally associated with higher turbidity, nutrients, and conductivity, and winter conditions linked to clearer, better-oxygenated water. Fish abundance showed strong positive correlations with both total phosphorus ($r = 0.77$, $p < 0.001$) and electrical conductivity ($r = 0.72$, $p < 0.001$). Total dissolved solids correlated strongly with electrical conductivity, total phosphorus, temperature, and chlorophyll-a, while Secchi disk depth showed strong negative correlations with electrical conductivity, total dissolved solids, and total phosphorus. These results highlight pronounced seasonal controls on water quality and their potential influence on fish abundance in the reservoir.

Keywords: *Gosikhurd Reservoir, Physico-chemical parameters, Seasonal variation, Water quality, Inverse Distance Weighted (IDW), Fish abundance*

AFTEFS/SKUAST-K/AG/2024/331

Emerging Tilapia Lake Virus in Indian Aquaculture: Integrating Molecular Diagnosis, Pathobiological Evidence and Risk-Based Biosecurity

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The emergence of Tilapia Lake Virus (TiLV), associated with substantial mortality in farmed tilapia, represents a growing challenge to aquaculture sustainability, aquatic animal health, and biosecurity. This study investigated suspected TiLV infections in farmed tilapia from aquaculture regions of Andhra Pradesh, Tamil Nadu, and West Bengal using molecular diagnostics and complementary pathobiological investigations. Moribund fish exhibiting lethargy, skin erosion, and exophthalmia were screened using reverse transcription-polymerase chain reaction (RT-PCR) to investigate the presence of TiLV. Histopathological examination revealed hepatic and neurological lesions consistent with systemic viral disease, while transmission electron microscopy was used to investigate ultrastructural alterations in affected tissues. Experimental infection assessments were conducted to evaluate the potential for horizontal transmission under the study conditions. Sequence analysis targeting Segment 3 of the TiLV genome was used to characterize the detected viral sequences and investigate their genetic relatedness to reference strains. The reported nucleotide identity of 95% highlights the importance of comparative genomic analysis for understanding TiLV diversity and epidemiological relationships. Collectively, the diagnostic and pathobiological approach underscores the value of integrated disease investigation for early detection and risk assessment in Indian tilapia aquaculture. The findings support strengthened seed-health screening, broodstock quarantine, movement controls, and coordinated disease surveillance as components of a risk-based biosecurity framework. Further genomic and epidemiological investigations are essential to clarify transmission pathways and inform evidence-based strategies for minimizing TiLV-associated losses and protecting the sustainability of India's expanding tilapia sector.

Keywords: *Tilapia Lake Virus, Tilapia tilapinevirus, RT-PCR, histopathology, molecular epidemiology, tilapia aquaculture, biosecurity.*

SECTION-B

AFTEFS/SKUAST-K/MED/2024/A

Targeting Iron-Induced Cofilin Activation and Neuroinflammation in Microglia: Therapeutic Potential of Deferoxamine and a Novel Cofilin Inhibitor

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Neuroinflammatory conditions associated with iron dysregulation present significant challenges in the progression of neurodegenerative diseases. Iron-loaded microglia have been observed in the brains of patients with various neuroinflammatory disorders; however, the precise mechanisms by which iron overload impacts microglial function and contributes to neuroinflammatory processes remain unclear. The present study explores the connection between excess iron, cofilin activation, and microglial function, providing insights into potential therapeutic strategies. Iron overload was induced in HMC-3 microglial cells using ferrous sulfate (FeSO4), and the expression of ferritin heavy chain (FTH), ferritin light chain (FTL), Divalent Metal Transporter 1 (DMT-1), cofilin, phosphorylated cofilin (p-cofilin), Nuclear Factor-κB (NF-κB), and several inflammatory cytokines was examined using real-time quantitative polymerase chain reaction (RT-qPCR), immunocytochemistry, Western blotting, and enzyme-linked immunosorbent assay (ELISA). The results demonstrated a significant increase in the expression of cofilin, NF-κB, and pro-inflammatory cytokines following iron overload. Treatment with deferoxamine (DFX), an iron chelator, and a novel cofilin inhibitor (CI) synthesized in our laboratory showed reduced iron-induced cofilin expression. DFX and CI also effectively reduced the inflammatory effects of iron overload, including the expression of pro-inflammatory cytokines and NF-κB activation. These findings indicate that DFX and CI have potential as therapeutic agents to reduce microglia-driven neuroinflammation by targeting both iron and cofilin dysregulation. Overall, this study enhances our understanding of iron-induced cofilin activation and microglial activation and highlights potential therapeutic approaches for neuroinflammatory conditions related to iron dysregulation in neurodegenerative diseases.

Keywords: Iron overload; Microglial activation; Cofilin activation; Neuroinflammation; NF-κB

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Impact of Hyperchloremia and Hypernatremia on Microglial and Neuronal Survival During Oxygen-Glucose Deprivation/Reperfusion

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Hyperchloremia and hypernatremia is associated with increased mortality in ischemic stroke patients, however, their direct role in shaping ischemic brain injury remains unclear. This study investigates the effects of high levels of sodium chloride and sodium acetate [0.9% sodium chloride (NaCl) and 0.9% sodium acetate (CH_3COONa)] and their combinations on the survival of microglial (HMC-3) and neuronal (differentiated SH-SY5Y) cells under oxygen-glucose deprivation/reperfusion (OGD/R), an in vitro model mimicking ischemic stroke. Additionally, the effect of hyperchloremia- and hypernatremia-treated HMC-3-conditioned media on neuronal cells was assessed. Cell viability/toxicity, nitric oxide (NO) production and the expression of apoptosis-related proteins, caspase-1 and caspase-3, were analyzed. Results showed that exposure to both NaCl and CH_3COONa, as well as their combinations, significantly reduced the survival of both HMC-3 and SH-SY5Y cells under normal and OGD/R conditions. Neuronal cells exhibited further vulnerability when exposed to HMC-3-conditioned media treated with NaCl or CH_3COONa. Additionally, hyperchloremia and hypernatremia altered caspase-1 and caspase-3 expression, indicating an increase in apoptotic activity. Notably, NO production was reduced in HMC-3 cells under these conditions, suggesting an impaired cellular stress response. These findings suggest that hypernatremia and hyperchloremia exacerbate ischemic injury by reducing neuronal and microglial survival and increasing apoptotic signalling, potentially explaining the higher mortality observed in stroke patients with these electrolyte imbalances. This study underscores the importance of managing electrolyte disturbances in ischemic stroke care.

Keywords: Hyperchloremia, Oxygen-Glucose Deprivation/Reperfusion

AFTEFS/SKUAST-K/MED/2024/C

After Effects of Pharmaceuticals and Personal Care Products (PPCPs) on the Biosphere and their Counteractive Ways

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Pharmaceuticals and Personal Care Products (PPCPs) as emerging pollutants have attracted revelatory recognition from research organizations for two decades due to their consistent presence in wastewater. Such ubiquitous contaminants have received alarming apprehension globally for their persistence and potential peril to the health status of organisms and the natural atmosphere**.** These looming toxins often exist in low concentrations and have complicated structures, making it challenging for wastewater treatment plants to eliminate them; hence, highly efficient and novel eco-friendly technologies are essential for their elimination. This review discusses the source, occurrence, and fate and is followed by a comprehensive analysis of the adverse effects on aquatic biota as well as human well-being. The toxicity analysis with multiple bioassays has also been summarised in this paper. This review covers the multiple remedial technologies, like phytoremediation, and advanced treatment technologies, viz., membrane filtration, adsorption, the photo-Fenton process, and ozonation, that can be adopted in sewage treatment unit processes. We also reviewed the regulatory aspects and risk mitigation policies that are being implemented and are needed now. Thus, the goal of this paper is to provide insight into the aftermath consequences of PPCPs and offer more research that should be focused on the remedial measures of these emerging pollutants and risk-mitigating strategies.

Keywords: Drug resistance, Personal Care Products (PPCPs), Advanced Oxidation Methods (AOPs), Ferrous Ions (Fe2+), Carbon Nanotubes (CNTs), Laboratory Information Management System (LIMS), CRISPR/Cas9.

Anticancer Potential of Polyphenol-Rich Extracts from *Ipomoea pes-caprae* Against Breast Cancer: In-Vitro and In-Silico Investigations

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Ipomoea pes-caprae (IPE) has long been utilized in traditional medicine for treating various conditions. This salt-tolerant beach plant is commonly found in tropical and subtropical areas. The current research examined the impact of polyphenol-rich extracts from IIPE on breast cancer. In vitro, assays demonstrated that IPE exhibited antiproliferative effects on estrogen-dependent MCF-7 and estrogen-independent MB-MDA-231 breast cancer cells, with IC_{50} values of 56 and 68 µg/ml, respectively, while showing no toxicity toward normal cells. In silico toxicity, assessments indicated that nine molecules within the extract displayed favorable drug-like characteristics. Chlorogenic acid, neochlorogenic acid, and isochlorogenic acid demonstrated strong binding affinities with key drug targets, as shown in molecular docking analyses. These results suggest that IPE holds significant potential as a medicinal plant for cancer treatment. The molecular docking outcomes further reinforced the in vitro findings. Based on these insights, it can be concluded that IPE is a rich source of bioactive anticancer compounds, warranting further investigation through in vivo experiments.

Keywords: *ipomoea pes-caprae*; Breast cancer; Polyphenol-rich extracts; Antiproliferative effects; Molecular docking; Chlorogenic acid

AFTEFS/SKUAST-K/MED/2024/E

Phytochemical, Antimicrobial, Antioxidant, and Anticancer Potential of Aqueous Extract of *Ficus Carica* Leaves Grown in the United Arab Emirates

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The bioactive properties of fig leaves (*Ficus carica*) have harvested attention for their potential therapeutic uses. The present study focuses on qualitative and quantitative phytochemical and biological analysis in bark and leaf extracts of *Ficus carica (fig) leaves* growing in Ras Al Khaimah United Arab Emirates. The leaves were extracted using advanced aqueous extraction techniques, such as ultrasound-assisted extraction (UAE). The use of water as a solvent not only aligns with green chemistry principles but also enhances the extraction efficiency of polar phytochemicals. Phytochemical screening identified the presence of flavonoids (25 mg/g), phenolics (18 mg/g), and tannins (12 mg/g), which are known to contribute to biological activity. Elemental analysis revealed high concentrations of calcium (2.1%), potassium (1.3%), and magnesium (0.9%). The antioxidant capacity of the leaf extract was evaluated through DPPH and FRAP assays, with IC_{50} values of 60 µg/mL for DPPH and a total antioxidant capacity of 450 µmol Fe^{2+} /g in the FRAP assay, indicating strong radical scavenging activity. Antimicrobial activity was assessed against *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans*, and *Pseudomonas aeruginosa* using the agar well diffusion method. The fig leaf extract exhibited significant zones of inhibition, with diameters of 18 mm for *S. aureus*, 15 mm for *E. coli*, 12 mm for *C. albicans*, and 10 mm for *P. aeruginosa* at a concentration of 200 µg/mL, demonstrating moderate to strong antimicrobial efficacy. The anticancer potential of the fig leaf extract was evaluated against human breast cancer (MCF-7) and colon cancer (HT-29) cell lines using MTT assays. The extract exhibited dose-dependent cytotoxicity, with IC_{50} values of 70 µg/mL for MCF-7 and 85 µg/mL for HT-29, suggesting promising anticancer properties. This comprehensive study highlights the potential of fig leaves as a source of natural bioactive compounds with significant antimicrobial, antioxidant, and anticancer activities, making them valuable for pharmaceutical and nutraceutical applications.

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AFTEFS/SKUAST-K/MED/2024/01

A modified non-toxic trypan assay for long-term viability, fluorescence and FACs applications

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Trypan is one of the oldest and most widely used dyes for the assessment of cell viability. It is broadly used due to its cheaper nature and on-the-go rapid results ability. However, problems associated with trypan such as toxicity, sluggish dye entry into live cells, and ambiguous staining patterns can lead to significant variations. We found that conventional trypan blue (CTB) significantly changes cell viability with time and our study for the first time demonstrated that this effect was more pronounced in pre-drug treated cells, where at the highest drug concentration CTB leads to more than 20% change in cell viability within 10 minutes. Therefore, we have developed an alternative method to the CTB called dilution-cum-trypan (DCT) assay to overcome the problems associated with CTB. DCT significantly removed the toxicity associated with CTB, and cell viability remained consistent until 35 minutes of staining. We discovered that DCT removed the discrepancies associated with trypan, making it more reliable to establish trypan as a viability assay for short and long-term as well as for pre-drug treated groups. Furthermore, this might open the trident door of morphology, fluorescence, and FACs for trypan dye.

Keywords - *Trypan, viability, assay, pre-drug treatment, secondary staining.*

AFTEFS/SKUAST-K/MED/2024/02

Medicinal and aromatic plants in agroforestry systems through socioeconomic Practices in Rajasthan, India

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A large number of people in developing countries have traditionally depended on products derived from plants, especially from forests, for curing human and livestock ailments. Additionally, several aromatic plants are popular for domestic and commercial uses. Collectively they are called medicinal and aromatic plants. About 2000 plant species documented are reported to have medicinal values; but only a few are known to be in cultivation. With dwindling supplies from natural sources and increasing global demand will need to be cultivated to ensure their regular supply as well as conservation. Medicinal and aromatic plants contain the chemical constituents first used by humans as medicines for healing, as flavoring agents for food and drink, and as mental stimulants for mystic interactions with super natural gods. These plant materials continue to play positive roles in human life, as sources of modern pharmaceuticals to treat medical problems, as herbs and spices to tempt the palate, and in a multitude of other applications. Demand and trade for these plant materials initiated globalization that spread new ideas, new diseases, and new settlements along with native resentment. This chapter presents a detailed and thorough review of plant metabolites used in modern and conventional medicine and those providing spices and condiments. A Research attention on a topics ranging from propagation methods, harvesting and processing techniques and genetic improvement to quality control and market trends. They are now being progressively cosmetics, foods and teas, as well as alternative medicines. The growing interest in herbs and their ability to offer economical uses is a part of the movement towards greener economics and life styles. This movement is based on the belief that the plants have a vast potential for their use as a curative medicine. Medicinal and aromatic plants will also maintain their importance in the search for new, valuable sources of drugs and lead compounds.

Keywords *- Herbal medicine, Home-gardens, Demand and trade, pharmaceuticals, Forest products.*

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AFTEFS/SKUAST-K/MED/2024/03

Functions of Different Catalysts in Biomass Transformation Methods

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There has been a significant interest of researchers towards catalytic conversion of biomass derived feedstocks into industrially important chemicals from past few decades. The industries are still facing many challenges to commercialize biomass conversion technologies at a large scale. However several catalytic technologies are emerging but companies are still having struggled to reach them at commercial scale. Here we have studied about the factors affecting the reactions during catalytic conversion and role of different types of catalysts in conversion techniques of biomass feedstocks.

Keywords: *Biomass, Acid, Catalysis, Zeolite, Base, Catalyst.*

AFTEFS/SKUAST-K/MED/2024/04

Gluten intolerance in children with failure to thrive and our experience in a paediatric hospital of Kashmir

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Background; Celiac disease (CD) is an autoimmune gastrointestinal disease caused by intolerance to gluten and dietary proteins present in wheat, rye, and barley. Celiac disease is an important cause of failure to thrive in children. In addition to intestinal and extra intestinal clinical features, the diagnosis of CD is based up on resolution of symptoms on exclusive gluten free diet, specific serum antibody levels, histological findings in duodenal or jejunal biopsies, which may present in various forms. Gluten free diet is defined as foods with gluten 20 ppm or less. **Methods;** The study was a prospective observational, cohort study, including all children between 2 – 18 yrs. of age presented with failure to thrive fulfilling criteria of study. The patients with increased levels of IgA anti tTGA were selected for upper gastrointestinal endoscopy and duodenal biopsy. The aim of study is to study the prevalence and clinical profile of CD in children with failure to thrive. **Results;** A total of 66 cases of failure to thrive/short stature were enrolled, with prevalence of 24.2%. of CD. Male: Female ratio was 1:1 in children with CD. Clinical features include weight loss (62.5%), diarrhoea (37.5%), Anaemia (37.5%),. On biopsy 87.5% cases of failure to thrive had Marsh grading of grade 3 and 12.5% had Marsh grade 2. **Conclusion:** Failure to thrive patients with diarrhoea and anaemia should be evaluated upfront for celiac disease and advise exclusive gluten free diet.

Keywords; *failure to thrive, anti-tTG antibodies, gluten free, anaemia, gluten intolerance.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/05

Exploring the phytochemical, antioxidant, and anti-microbial activity of buttermilk fortified with Chia seeds

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The current research work has been done on the buttermilk fortified with *Chia Seeds* to evaluate its antioxidant, phytochemical and antimicrobial properties. Buttermilk is a fermented dairy beverage that has been praised for its creamy texture and acidic flavor. When chia seeds are added to buttermilk, the combination of their health advantages and the sweetness of the buttermilk results in a wholesome and nourishing drink. Chia Seeds comes under the category of superfoods. With particular health benefits like enhancing immunity, supporting heart health, and lowering the risk of chronic diseases, consuming these nutrient-dense superfoods with a wide range of naturally occurring bioactive compounds may contribute to improve one's general wellness. The chia seeds fortified buttermilk assessed against DPPH exhibited remarkable IC_{50} values in a concentration-dependent manner proving it as a potential antioxidant. The activities of the extract assessed against DPPH was concentration dependent with IC_{50} value of 204.354 µg/ml at 517 nm. The phytochemical analysis were also assessed by spectrophotometric method. The phenolic content was found to be 44.548 mg/ml at 765 nm. Carotenoid content and Vitamin A was evaluated as 22.6 µg/ml and 12.5 µg/ml. The value of antimicrobial activity evaluated against the microbes, E.coli, Total plate count and Yeast and mould count is $1.0\times10_6$, $2.3\times10_R$ and $7\times10_5$ respectively. The activity was evaluated by the method of Agar Well Diffusion Method. The results of this study demonstrated the potent antioxidant, phytochemical and antimicrobial properties of buttermilk fortified with chia seeds, which can counteract free radicals, reduce oxidative stress, and lower the risk of chronic diseases. As a result, the chias seeds fortified buttermilk may find useful applications in nutraceutical and therapeutic applications to treat a wide range of disorders.

Keywords: *buttermilk, Chia Seeds, phenolic content, antioxidant, antimicrobial*

AFTEFS/SKUAST-K/MED/2024/06

Oral Presentation

Bioaerosol assessment in the outdoor atmosphere of Public garden at Nampally area of Hyderabad district, Telangana state, India

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The present work deals with the ongoing aerobiological studies of the aerospora present in the outdoor atmosphere of the Public garden situated in Nampally area of Hyderabad district of Telangana state, India during March - June 2024. Air sampling was done by using a gravimetric aeroscope and qualitative and quantitative analysis of the aerospora was carried out. Out of various bioaerosols recorded, the present work focuses on airborne pollen and spores. A total of sixteen pollen types referable to eleven families were recorded and the study highlights the dominance of *Azadirachta indica* pollen type followed by *Delonix regia, Grass pollen, Ricinus communis and Peltophorum pterocarpum*. The pollen grains encountered showed diversity in morphological characters viz. size, shape, polarity, apertural pattern, Exine ornamentation etc. Five fungal spores viz *Ravenalia, Alternaria, Drechslera, Nigrospora and Curvularia* were recorded along with other bioparticles viz. plant particles, Epidermal shreds, and Insect & Insect parts etc. The qualitative and quantitative analysis of the aerospora studied is useful in allergology and studies related in treating allergic patients.

Key words: *Outdoor atmosphere; Aeroscope; Bioaerosols, Airborne allergens, Pollen grains; Fungal spores; Public gardens; Hyderabad; Telangana; India.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/07

Prevention and Control of Zoonotic Diseases: An Integrated Approach to Reducing Spillover Risk

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Zoonotic diseases, which transmit from animals to humans, pose significant public health threats and demand innovative strategies for effective management. These diseases can emerge from a diverse range of animal reservoirs, including wildlife and domestic species, and have the potential to cause widespread health crises. A multifaceted approach is essential to mitigate these risks, beginning with sophisticated surveillance systems that leverage molecular diagnostics and epidemiological modeling to detect and track zoonotic pathogens. Public health initiatives should focus on interdisciplinary research to elucidate the ecological and evolutionary drivers of zoonotic diseases, thereby informing targeted interventions. Enhancing biosecurity measures, such as strict animal husbandry practices and habitat management, plays a crucial role in minimizing disease spillover. Additionally, fostering community engagement through participatory health education and outreach programs helps in raising awareness and promoting safe practices. International collaboration among researchers, health organizations, and policymakers is pivotal in developing global strategies and sharing best practices. By integrating these diverse approaches, we can advance our understanding of zoonotic diseases and improve our capacity to respond to emerging health threats.

Keywords: *Zoonotic, Surveillance, Biosecurity measures, Interdisciplinary research and Disease spillover*

AFTEFS/SKUAST-K/MED/2024/08

Expression analysis of Cox 2 in Gastric Cancer in the Kashmiri Population

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Gastric cancer is the most common cancer in Kashmir and one of the common cancers worldwide, it is fourth leading cause of cancer related mortality. **Aim of the study**: To evaluate Comparative cyclooxygenase 2 (cox 2) expression in Gastric cancer tumor tissues and hyperplastic polyps' tissues to relate its significance to prognosis, diagnosis and in therapeutics. **Materials and Methods**: This study was done in Government medical college and its associated hospitals. A total of 100 patients were taken in study, where 50 were surgical gastric cancer patients (taken as cases) and 50 were endoscopic hyperplastic polyp (taken as controls) patients. The monoclonal cox 2 antibody were used to detect the immunoreactivity by using the technique immunohistochemistry. **Results:** The Gastric cancer patients showed overexpression (76%) of cox 2 where hyperplastic polyp patients showed incredibly low (20%) expression. The correlation shows highly significant ($p<0.001$) relations where additionally, a pattern was noted that indicated a correlation between low overall survival and cox 2 overexpression. **Conclusion**: These findings suggest that cox2 may serve as a prognostic, diagnostic and a potential target for therapeutic intervention in gastric cancer in Kashmiri population.

Key words: *Cox2, gastric cancer, diagnosis, prognosis, polyps, monoclonal antibody, Therapeutics, IHC*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group

AFTEFS/SKUAST-K/MED/2024/09

Comparative Antimicrobial Efficacy of Kashmir's Medicinal Plants

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The development of resistance to antimicrobial medications used to treat human infections is a significant risk to the human civilisation and a major cause of concern. Because of its inherent resistance to most clinically-used antibiotics and its extraordinary ability to acquire and transfer resistance genes—often through horizontal gene transfer—*E. coli* poses a serious risk of emerging infections. Currently the emergence of resistance far exceeds the development of novel drugs. Therefore, innovative medication combinations and formulations are urgently required to address this crisis. Conventional medicine offers a remarkable opportunity to improve the effectiveness of existing medications without leading to resistance. Owing to its unique geography and climate, the medicinal plants from Kashmir are abundant in phytoconstituents, which include alkaloids, phenols, coumarins, and terpenoids. Therefore, there is unrealised promise in exploring the natural antimicrobial compounds from the medicinal plants of Kashmir Valley. Using *Escherichia coli* (*E. coli*) as a model organism, this study aimed to compare and contrast the antibacterial activities of several medicinal plants known to have antimicrobial characteristics. A considerable variation in antimicrobial activities from various medicinal plants/plant parts was found. We are further refining our findings and currently purifying the active principles from the most promising candidates. The study will be extended to pathogenic and drug-resistant pathogens to explore novel antibiotic candidate development.

AFTEFS/SKUAST-K/MED/2024/10

Phytochemical Analysis and Antimicrobial Activity of *Azadirachta indica*

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Medicinal plants have been utilized for centuries in traditional medicine for their therapeutic properties. Phytochemicals, the bioactive compounds found in these plants, play a crucial role in their medicinal efficacy, offering potential treatments for various ailments. This study investigates the phytochemical constituents and antimicrobial activity of medicinal plants, specifically *Azadirachta indica* and *Plectranthus amboinicus*. Through various tests, the presence of alkaloids, flavonoids, and saponins was confirmed, indicating their potential health benefits. The extracts demonstrated significant antimicrobial effects against common pathogens, suggesting these plants could serve as effective alternatives in herbal medicine and warrant further research for therapeutic applications. Ethyl acetate extracts exhibited significant antibacterial activity against pathogens like E. coli, while aqueous extracts showed no inhibition, highlighting the potential of these plants in developing natural antimicrobial agents. Further research on the isolated bioactive compounds may lead to new therapeutic options for clinical use, emphasizing the importance of phytochemical analysis in understanding the medicinal value of these plants.

Key Words: *Phytochemicals, Azadirachta indica, Plectranthus amboinicus, Antimicrobial activity, Alkaloids, Flavonoids, Saponins, Herbal medicine, Natural remedies, Pathogenic bacteria*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group

AFTEFS/SKUAST-K/MED/2024/11

Investigating the neuronal circuits mediating Orbital Motioninduced sleep in *Drosophila melanogaster*

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Drosophila commonly known as fruit fly has been widely used to understand neural and genetic basis of sleep. Subtle motions, like riding in bus, baby cradling is well known to induce sleep in humans. Likewise, orbital motion-aided mechanosensory stimulation promotes sleep of male and female *Drosophila*, independent of the circadian clock, but controlled by the homeostatic system. Mechanosensory neurons expressing a TRPV channel Nanchung, located in the antennae and chordotonal organs, mediate orbital motion-induced sleep by communicating with antennal mechanosensory motor centers. AMMC zone B is responsible for OMD phenotype. Here we report interneurons transmit the sleep-inducing signals mediated by orbital motion (OMD) from AMMC zone B to the sleep centers of the brain. aPN1 among interneurons mediate this sleep induction: flies in which these neurons are either silenced or ablated display significantly reduced sleep induction on mechanosensory stimulation. Transient activation of the aPN1 neurons also enhancessleep levels, confirming the role of these neurons in sleep inductions. The expression showed projections of aPN1 lies in close proximity to AMMC zone B and wedge area of brain suggesting a potential role in conveying information to brains wedge area. These results reveal a critical pathway for orbital motion induced sleep in male and female flies, in which aPN1 mediate sleep. The pathways arising from these neurons likely serve as a critical neural substrate for sleep in *D. melanogaster.*

Keywords:- *Mechanosensory stimulation, Chordotonal organs, aPN1 interneurons,AMMC Zone B, Sleep induction.*

AFTEFS/SKUAST-K/MED/2024/12

Biomedical Applications of Polyhydroxyalkanoates in Tissue Engineering and Drug Delivery System: A Review

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Polyhydroxyalkanoates (PHAs) are sustainable, bio-compatible and versatile thermoplastic polymers that are suitable for biomedical applications. They are produced by a wide range of bacterial species along with fungi, plants and carbon sources via fermentation under nutrient stress conditions. PHAs are stored within cell in the form of granules as energy reservoir. They have properties quite similar to those of synthetic plastics. The unique properties, which make them desirable biomaterial for applications in soft and hard tissue repair and regeneration to replace damaged or diseased and in drug delivery system are biodegradability, biocompatibility of their *in vivo* degradation products, non-toxicity and thermo-processibility. PHAs do not induce thrombosis or antigenic response even being in contact with blood for longer time. Due to the wide range of monomers, they exhibit a high degree of structural diversity. Inherent characteristics along with pharmacological activities such as anti-inflammatory, antioxidant, antimicrobial, non carcinogenic, and wound healing effects, make PHAs promising biomaterial. Three dimentional biodegradable and porous scaffolds are often used in this area to mimic the structure and function of extracellular matrix. Additionally, they have potential for modifications through blending with various other polymers or fillers and theirby broadening their functionality and usefulness. Their tunable physico-chemical properties and degradation profile, make them suitable for developing various medical devices such as sutures, wound dressings, cardiac patches, blood vessels, bone and cartilage scaffolds; implantable devices such as heart valve, stents, nerve guidance conduits; and as drug carriers.characteristics. This review provides a brief overview of the fabrication of PHA-based biomaterials for the synthesis of tissue engineered scaffolds, *in vivo* studies and achievements of PHAs in medical field. It also covers PHA- based nano- carriers used for controlled release of pharmaceutical substances. It addresses challenges such as limitations in mechanical properties and higher production costs while also exploring the opportunities for tissue engineering and controlled release of bioactive molecules. Overall, this review article highlights the promising role of PHAs as sustainable and versatile biomaterials for tissue engineering and drug delivery system.

Key words: *Polyhydroxyalkanoates, Tissue regeneration, Bioengineered-scaffolds, Medical implants, Drug delivery system.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/13

Quality of Early Childhood Care and Education (ECCE) centre Environment on Social and Emotional Development of Preschool Children

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The study was conducted in Dharwad taluk of Karnataka state during the year 2018-20. Total sample of 208 children of age between 3-6 years of children attending different ECCE centers in rural and urban areas of Dharwad taluk. The study investigated the following objectives: To study the quality of ECCE centers on social and emotional development of children. Transdisciplinary Play Based Assessment-2 tool was used to assess the social and emotional development of children. Early Childhood Environment Rating Scale- III (ECERS-III) was used to assess the quality of ECCE centres. The qualitative approach involved naturalistic observation method to document, analyze and study the impact of play- based activities on social and emotional development. Naturalistic observation was made during children involved in free play through video recording which was complemented with participant observation which included by taking field notes. Results revealed that the comparison of social and emotional development of children by quality of ECCE environment in both rural and urban areas showed the significant difference. Children attending medium teaching learning environment centre had significantly higher scores on social and emotional development (36.13) as compared to children from low teaching learning environment (22.04) in rural and (26.38) in urban area. With regard to the domains of social and emotional development of children by quality of ECCE environment in both rural and urban area showed significant difference under emotional expression, emotional adaptability, regulation of emotions, and arousal states, behavioral regulation, sense of self, emotional themes in play and social interaction.

AFTEFS/SKUAST-K/MED/2024/14

Ultrasonographic and Computed Tomography Evaluation of Prostatic Carcinoma in Canine Patients: A Diagnostic Study"

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Two intact male dogs presented at the Veterinary Clinical Complex (VCC), College of Veterinary and Animal Science (CVAS), Bikaner, were diagnosed with large prostatic masses located in the caudal abdomen. This study aimed to evaluate prostatic tumors in dogs using ultrasonography (USG) and computed tomography (CT). Both cases exhibited clinical signs such as abdominal pain, altered sitting posture, weight loss, pus discharge during urination, and defecation difficulties. Digital rectal palpation was performed to assess the prostate's shape, size, texture, lobe symmetry, and tenderness. Ultrasonography was used to measure prostatic dimensions and evaluate echogenicity, revealing significant variations in size, echotexture, delineation, margins, capsule integrity, and lobe symmetry. Computed tomography provided detailed imaging of the prostate. Histopathological examination confirmed the diagnosis of primary prostatic carcinoma. This study highlights the diagnostic value of USG and CT in assessing canine prostatic disorders and documents rare cases of primary prostatic carcinoma in dogs.

Keyword - *Canine prostatic tumors, Ultrasonography, Computed tomography, Prostatic carcinoma, Digital rectal palpation, Veterinary diagnostic imaging.*

AFTEFS/SKUAST-K/MED/2024/15

Radio-protective and Chemo-protective effect of glutathione based metal complex

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Glutathione based metal complexes have been studied for their potential radio-protective and chemo-protective effects, particularly in the context of cancer therapy. These effects stem from the antioxidant properties of glutathione (GSH) and the ability of metal complexes to enhance its protective function through reactive oxygen scavenging activities. DNA damage and inhibition of DNA damage produced on irradiation with ^{60}Co gamma source as well as with an oxo-peroxo 8-quinolinato molybdenum complex, $[MoO(O_2)(QO)_2]$ were characterized by fluorescence spectroscopy The fluorophore for this experiment is ethidium bromide (EB). EB was added to the experimental solutions and incubated at 37^0C for 30 min to bind well with CT-DNA and the emission spectra were recorded from 510 to 700 nm by excitation at 500 nm. D_{50} (radiation dose at which 50% DNA damaged) was calculated from the dose response curve and the time required for it was also determined. The DNA damage protection by glutathione (GSH) and its novel molybdenum glutathione (MoG) complex were employed. The percentage of DNA damage protection was calculated from fluorescence intensity curve. The present study showed that in both cases, MoG complex has more ability in protecting the DNA damage in vitro compared to reduced form of glutathione (GSH).

Keywords: *Radio-protector, Chemo-protecting agent, Fluorescence intensity, Dosimetry.*

AFTEFS/SKUAST-K/MED/2024/16

Platinum-based Drugs for Cancer Therapy

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The application of inorganic chemistry to medicine is a rapidly developing field, and novel therapeutic and diagnostic metal complexes are now having an impact on medical practice. Advances in biocoordination chemistry are crucial for improving the design of compounds to reduce toxic side effects and understand their mechanisms of action. Platinum-based drugs cisplatin, carboplatin, and oxaliplatin are widely used for chemotherapeutic eradication of cancer. However, the side effects of platinum drugs, such as lack of selectivity, high systemic toxicity, and drug resistance, seriously limit their clinical application. With advancements in nanotechnology and chemical synthesis, Pt-based anti-cancer drugs have made great progress in cancer therapy in recent years. Many strategies relied on the anti-cancer mechanism similar to cisplatin and achieved some success by modifying existing platinum drugs. Pt-based nanodrugs, such as platinum nanoclusters, have novel anti-cancer mechanisms and great potential in tumor-targeted therapy and have shown promising results in clinical application. In this review, the recent development of first-line platinum chemotherapy drugs in the clinic and their anti-cancer mechanisms has been explored.

Key words: *Platinum complex, Coordination, Cancer*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/17

Chitooligosaccharide: Synthesis and antioxidant potential

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Chitooligosaccharide (COS), derived from the breakdown of chitosan, is a potential compound being explored in different biological domains. It increases the efficacy of the chitin family with its low molecular weight and benefits such as increased solubility, antioxidant activity, antibacterial capabilities, growth-stimulating properties, etc. In the current work, oxidative hydrolysis of chitosan was performed while considering some crucial parameters to develop COS. The developed COS was characterized by analyzing its reducing ends, size reduction and FESEM imaging. Chitosan's molecular weight decreased from 175 kDa to 5–10 kDa. Moreover, FTIR analysis was performed to verify the conserved structural similarity between the developed COS and chitosan, confirming that the COS is a lower molecular weight-derived product of chitosan. Considering chitooligosaccharide's remarkable antioxidant qualities, DPPH, TAA, ABTS, and MCA tests showed encouraging outcomes. Therefore, this study is helpful in demonstrating the superiority of this biomolecule, opening the door for more research into it in the field of agricultural sciences.

Keywords: *Chitooligosaccharide, oxidative hydrolysis, FTIR, FESEM, antioxidant*

AFTEFS/SKUAST-K/MED/2024/18

Detection of drug resistance pattern of Mycobacterium tuberculosis by CBNAAT IN SOUTH KASHMIR, INDIA

bushra yousuf peerzada, shah aamina samreen

Introduction: Tuberculosis is a communicable disease that is a major cause of ill health and it is the 10th cause of death world wide.India has the highest TB burden in the world and has more new cases annually than any other country globally. Drug resistant TB continues to be a public health threat with North zone of India as second highest MDR TB prevalent zone after West zone of India.

Material and method: It is a retrospective study conducted at GMC Anatnag, and data was analysed from august 2021 to sep 2022.

Results: Of the total 1104 clinically suspected tuberculosis specimens collected, 81% (893) were pulmonary and 19% (211) were extra pulmonary samples collected from different anatomical sites. Maximum number of cases were in age group of 15 to 40 years. out of total 1104 samples 119 were positive by CBNAAT. In which90% (107) were pulmonary and10% (12) were extrapulmonary. Out of 119 cases 15% (19) were rifampicin resistant for pulmonary samples and 4% (5) were rifampicin resistant for extra pulmonary cases. Average positive percentage rate was 10.7 %.

Conclusion Detecting the drug resistance is need of the hour among TB cases in order to improve clinical outcomes, interrupt transmission and control emerging epidemic.

AFTEFS/SKUAST-K/MED/2024/19

Zoonotic Disease Prevention and Control

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Zoonotic diseases, infections transmitted between animals and humans, pose significant public health challenges worldwide. Various diseases, such as viral, bacterial, parasitic, and fungal infections, may arise as a result of interactions between humans, animals, and the environment, often worsened by agricultural activities, urbanization, and climate change. Prevention and control methods aim to decrease human contact with zoonotic pathogens by

enhancing the monitoring of zoonotic diseases with modern techniques like remote sensing and molecular epidemiology tools. A platform for reporting and alerting illnesses, specifically zoonotic diseases, implementing vaccination programs for vulnerable populations and animals, and establishing response teams. Cooperation at regional, national, subnational, and international levels. An all-encompassing health approach involving veterinarians, medical doctors, environmental experts, and other professionals. Adequate financial backing and advertising of zoonotic diseases through public outreach efforts. It is crucial to incorporate a Health strategy that promotes cooperation between the human, animal, and environmental health fields for prompt identification, evaluation, and control of zoonotic outbreaks. Analyzing disease patterns, identifying potential risks, and observing wildlife are essential steps, as well as maintaining food safety standards and secure laboratory protocols to prevent zoonotic diseases and bioterrorism. This summary emphasizes the necessity of a united global approach with the involvement of veterinarians, medical professionals, wildlife experts, and decision-makers to lessen the effects of zoonotic diseases and protect public health.

Keywords: *Zoonotic diseases, One Health, disease prevention, surveillance, public health, zoonoses control, vaccination, risk assessment, global health*

AFTEFS/SKUAST-K/MED/2024/20

Evaluation of various techniques for monitoring the enrichment of *Pseudomonas aeruginosa* specific aptamers through SELEX process

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Aptamers are short, single-stranded oligonucleotides that exhibit remarkable affinity and specificity in binding to a diverse array of targets, including tiny compounds, proteins, and entire bacterial cells. These chemically synthesized biomolecules can be utilized as detecting probes, antibacterial agents, or drug delivery vehicles, rendering them viable instruments for addressing the rising prevalence of multidrug-resistant (MDR) microorganisms. Aptamers are often

selected in vitro by the Systematic Evolution of Ligands by Exponential Enrichment (SELEX) technique. Throughout this process, the diversity of the oligonucleotide pool diminishes until, presumably, only sequences exhibiting the highest binding affinities for selected targets persist. Despite being well-founded in principles, the SELEX approach is susceptible to noise, resulting in the amplification of non-specific binding sequences; thus, it necessitates robust monitoring tools to assess the enrichment of aptamer pools and assure sensitivity. This work assesses different approaches for overseeing the selection process of aptamers derived from an N40 random DNA library targeting *Pseudomonas aeruginosa*, emphasizing their precision and appropriateness for various phases of SELEX. Methods including colorimetric assays, quantitative PCR, melting curve analysis, and fluorescence-based assays are evaluated for their efficacy in identifying and quantifying aptamer enrichment over repeated rounds. The results highlight the advantages and drawbacks of each approach in enhancing the selection process and promoting aptamer development for targeting different bacterial strains. This assessment offers a model for adapting suitable techniques, optimizing the efficacy of aptamer selection, and strengthening efforts against bacterial pathogens affecting environment and human health.

AFTEFS/SKUAST-K/MED/2024/21

Comparative Efficiency of DNA Tetrahedron and Exosomes in Drug Delivery of Epirubicin for Breast Cancer Treatment

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Epirubicin, a chemotherapeutic agent, is used in treatment of metastatic breast cancer treatment. However, poor intracellular delivery and systemic toxicity are its major limitations. Our study evaluates the use of DNA tetrahedron (TD) structures and exosomes for targeted delivery of epirubicin to enhance its therapeutic efficacy. Increased intracellular concentration of epirubicin was observed in Flow cytometer when delivered via the TD: Epi system compared to free epirubicin. Cell viability assays using Annexin V-FITC and propidium iodide staining revealed higher apoptosis rates in the TD: Epi system. Exosomes, primarily 100 ± 20 nm in size (99% of particles), exhibit a -28.5 mV

zeta potential, ensuring colloidal stability. SEM and TEM confirm their spherical shape, uniform size, and double membrane structure. The TD: Epi system showed the highest efficacy in RT-qPCR analysis, followed by Epirubicin + Exosomes systems and epirubicin only, further corroborated with western blot results. While exosomes also provided improved delivery and therapeutic outcomes compared to free epirubicin, they were less effective than the TD: Epi system. These results suggest that the TD carrier significantly enhances the delivery and apoptotic efficacy of epirubicin when compared to exosome-based delivery or epirubicin alone offering a promising strategy for improving treatment outcomes.

Keywords: *DNA tetrahedron, drug delivery, exosomes, breast cancer, epirubicin, metastasis*

AFTEFS/SKUAST-K/MED/2024/22

A Comparative Study on Level of Gender Equality in Rural and Urban Areas of MathuraDistrict

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Despite a high growth rate and various government measures to encourage gender equality, the gender gap still exists in India. Lack of gender equality not only limits women's access to resources and opportunities but also harms the life prospects of the future generation. Gender equality is achieved when women and men enjoy the same rights and opportunities across all sectors of society, including economic participation and decision-making, and when the different behaviors, aspirations, and needs of women and men are equally valued and favored. So, the main aim of thepresent study is to assess the gender equality level in rural and urban areas of the Mathura Districtof Uttar Pradesh state. The total size of the sample was 120 respondents from which 60 rural and 60 urban respondents were selected. Multistage stratified random sampling technique was used for the selection of samples. The standardized tool, developed by Asian Development Bank in 2013 on gender equality level was used. In rural and urban areas, women below 30 years of age found higher gender equality level as compared to women above 30 years of age(t=4.71 & t= 2.82 respectively) which was significant at <0.01 level. Those women

educated above intermediate in both areas found higher gender equality level as compared to those women educated below intermediate (t=7.16 & t=3.22) and it was significant at <0.01 level. Similarly, the women who have above Rs 16000 monthly family income found more gender equality level as compared to the women of below Rs 16000 monthly family income (t=4.21 & t=2.57) and it was significant at <0.01 level. In urban areas, the women of nuclear families found a higher gender equality level (64.63) than the women of joint families (54.18) which was evident by the obtained t value 3.08. The women who live in rural areas found a higher gender equality level (57.99) than the women who live in urban areas (41.65), which was obtained by t value 2.12 and it was significant at <0.05level. The results indicated the importance of awareness in improving the condition of gender equality in our society.

Keywords*: Gender Equality; Women; Rural Area; Urban Area; Mathura District*

AFTEFS/SKUAST-K/MED/2024/23

"PD-L1 (PROGRAMMED DEATH LIGAND-1) gene copy number variation (CNV)and expression analysis in skin cancer patients"

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Cancer Immunotherapy has been showing promising outcomes against cancer. The focus hasshifted to the use of immunotherapy to treat non-melanoma skin cancers (NMSCs), such as basal cell carcinoma (BCC), and cutaneous squamous cell carcinoma (cSCC). Checkpoint inhibitors are the antibodies that block proteins that regulate the immune system and mainly target the surface protein CTLA-4 (cytotoxic T-lymphocyte-associated antigen 4) and the PD-1/PD-L1 (programmed cell death protein 1/PD-ligand 1) axis. Programmed death-ligand1 (PD-L1) gene is a critical immune checkpoint protein that plays a

significant role in regulating the immune system's response to cancer cells. Studying PD-L1 in skin cancer willeventually help us in identifying the patients that can be put on Immunotherapy.

In this study, we investigated PD-L1 gene expression and copy number variation (CNV) in skin cancer patients and controls by Real-time quantitative PCR. A total number of 40 sampleswere analyzed, fold change was calculated by $2^{-\Delta\Delta CT}$

Based on fold change in different samples, the cases were divided into strong (fold change>6),moderate (>3≤6), weak positive (>1.5≤3) and negative.

Out of total 40 patients analyzed 32.4% of patients showed positive PDL1 expression in cases with 16.2% strong positive, 5.4% moderate, 10.8% weak and 67.5% negative. Also, out of the 42 samples analyzed, CNV was detected in 16 of the samples. The results suggest that increased PD-L1 gene expression may be present in a subset of skin cancer patients and could be used as a potential biomarker for skin cancer prognosis. The detection of PD-L1 gene CNV in skin cancer patients may have significant clinical implications. These findings have important implications for patient prognosis and treatment selection and may guide future research into the role of PD-L1 in skin cancer progression and immune evasion. However further research is needed to validate the observed associations and better understand the relationship betweenPD-L1 gene CNVs, expression, and treatment response in skin cancer.

Key words: *PDL1, CNV, Skin cancer, Targeted therapy*

AFTEFS/SKUAST-K/MED/2024/24

Glowing Carbon Based Quantum Dots: Syntheses, Properties andApplications

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Carbon based quantum dots generally classified as graphene quantum dots (GQDs)and carbon quantum dots (CQDs) have gained tremendous attention for their enormous potentials applications. Last few years' fluorescence protein and dye have predominantly changed the scenery of biomedical research, but

complicated arise for long-term imaging due to poor photostability of organic fluorophores. Metal quantum quantum (MQDs) have been considered as the promising alternative because of their high luminescent and excellent photo-stability. But problems rise due to MQDs are toxic and poorly soluble in water. In addition, MQDs have large crystal size than a biomolecule which might be create negative effect on cell dynamics for target molecules and easily form imitation cluster into bio-molecular studies. These weaknesses of the existing fluorophores, examining better fluorophores for stable bio- medical application. Synthesis of GQDs and CQDs are another powerful and attractive tool for generating the photoluminescence properties in the carbon based material. Both quantum dots possess more distinct edge effect and powerful quantum confinement effect than bulk carbon based materials. The GQDs and CQDs have several attractive merits, such as small size, high solubility, low cytotoxicity, large surface area, ease to be functionalized with biomolecules, tunable band gap, excellent photostability, highly tunable photoluminescence (PL) property, exceptional multi-photon excitation (up-conversion) property, electrochemiluminescence. These glowing carbon nanocrystals provide unprecedented opportunities for bioimaging and optical sensing, they may also serve as effective carriers for drug delivery. And also QDs can be used as opto electronic devices, catalysis etc.

AFTEFS/SKUAST-K/MED/2024/25

"Discovering the Untapped Potential of Fungal-Based Pancreatic Lipase Inhibitors for Obesity Management"

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Lipase inhibitors are compounds that locally block pancreatic and gastric lipases in the stomach and small intestine, preventing the hydrolysis of triglycerides (TGs) from food into absorbable monoglycerides and free fatty acids. Pancreatic lipase (PL) is considered as one of the safest target for diet induced anti induced, anti-obesity drug development. Search for pancreatic lipase (PL) inhibitors is essential for obesity and associated chronic disease therapy. PL inhibitors significantly reduce enzyme activity and prevent the

absorption and hydrolysis of triglycerides into free fatty acids. This review outlines a comprehensive approach to discover and characterize pancreatic lipase inhibitors derived from endophytic fungi, aiming to develop novel therapeutic agents for obesity and metabolic disorders. The methodology includes the isolation of fungal strains, screening for lipase inhibitory activity through agar plate and spectrophotometric assays, and extraction of active compounds via fermentation. Further analysis involves in vitro enzyme assays, characterization using mass spectrometry and NMR, molecular identification through DNA sequencing.

Keywords: *Endophytic Fungi, Pancreatic Lipase, Triglyceride Hydrolysis, Enzyme Assays*

AFTEFS/SKUAST-K/MED/2024/26

Minimally Invasive Biomarkers for Lung Cancer: A Studyon the Diagnostic potential of BCL-2 and RBP-4

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Introduction and Aim: Lung cancer is the second most common type of cancer with an incidence rate of 11.4%. It is a major health problem and the second most common cancer in the Kashmiri population. It is often diagnosed at an advanced stage, leading to poor clinical outcomes. This study was conducted to ascertain the significance of circulating B-cell lymphoma-2 protein (BCL-2) and Retinol Binding Protein-4 (RBP-4) in Lung Cancer patients. ***Methodology:*** Using the study design, 75 confirmed cases of lung cancer, 75 confirmed cases of non-cancerous patients, and 75 healthy volunteers were enrolled. Serum samples were obtained prior any treatment for the disease. The estimated levels of BCL-2 and RBP-4 were calculated using the quantitative Sandwich Enzyme Immunoassay technique (ELISA). The Mann-Whitney test was used to compare the levels of protein markers between the groups. This test also calculated the p-value for the differences in protein marker levels between the groups. ***Results:*** The Serum levels of BCL-2 = 6.339467±7.538994 (p-value: 0.8373) and RBP-4 = 20.63287±27.05966 (p-value: 0.0153) were increased in Lung Cancer patients compared to the Non-Cancerous patients

[BCL-2 = 5.469±1.170494 and RBP-4 = 13.1704±4.9263396] and Healthy Controls [BCL-2 = 5.978133±4.096552 and RBP-4 = 17.29393±9.604728].

Conclusion: Our data suggests that the serum protein markers BCL-2 and RBP-4 have a diagnostic utility for Lung Cancer. It also suggest that the decreased apoptosis; a hallmark of Cancer might be the effect of elevated Serum BCL-2 levels in Lung Cancer. Further, it may be possible to suppress the development of metastasis by using antiangiogenic and/or apoptosis- inducing therapy if the biological role of circulating angiogenic and/or anti-apoptotic factors like BCL-2 in cancer patients is understood. Also, the elevated levels of RBP-4 may promote the tumor progression, angiogenesis, epithelial-to-mesenchymal transition (EMT).

Keywords: *B-cell lymphoma-2 protein, Retinol Binding Protein-4, Lung Cancer, Minimallyinvasive.*

AFTEFS/SKUAST-K/MED/2024/27

Anti-cancer Effect of Naringenin On Human Triple Negative Breast Adenocarcinoma Cell Line

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Triple-negative breast cancer (TNBC) is the most aggressive subtype of breast cancer, with poor survival and high recurrence rates, as it lacks estrogen, progesterone, and HER2 receptors, making conventional therapies ineffective. The aim of the present study was to investigate the inhibitory effect of Naringenin on TNBC cells. MTT assay was used to investigate the inhibitory effect of naringenin on MDA-MB-231 cells. Naringenin reduced the viability of MDA-MB-231 cells by inducing apoptosis and autophagy. This study elucidates the molecular mechanisms underlying naringenin's efficacy, taken together, the results of the present study suggested that Naringenin upregulated the p65 expression which is of particular interest due to its association with the NF-κB pathway, a key regulator of inflammation and cellular growth. Naringenin's selective targeting of p65, without compromising p50-mediated physiological functions, highlights its potential as a precision therapy. The study speculates heightened expression of p65 may contribute to the anti-cancer properties of

naringenin by initiating genes associated with apoptosis and autophagy. These mechanisms could potentially underlie naringenin's ability to induce cell death in cancer cells and impede tumor growth.

Keywords: TNBC, Naringenin, NF-κB pathway, Apoptosis.

AFTEFS/SKUAST-K/MED/2024/28

Elucidating the role of Microalbuminuria as a Marker in Pre-Diabetic and Pre- Hypertensive Patients having risk of cardiovascular disease

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Background: Microalbuminuria, an early indicator of renal damage, is increasingly recognized as a marker for cardiovascular risk.

Aim and Objective: This study aims to evaluate the association between microalbuminuria and cardiovascular risk factors in pre-diabetic and prehypertensive patients.

Methods: A case-control study was conducted with 150 pre-diabetic and 150 pre-hypertensive patients, compared to age- and sex-matched controls. Participants underwent comprehensive assessments including anthropometric measurements, blood pressure monitoring, fasting blood glucose, serum lipid profiles, and urine albumin-to-creatinine ratio (ACR). Statistical analyses included ANOVA, post-hoc Tukey's tests, multiple linear regression, and logistic regression.

Results: The prevalence of microalbuminuria was significantly higher in prediabetic (45%) and pre-hypertensive patients (48%) compared to controls (15%). ANOVA revealed significant differences in mean ACR across quartiles of systolic blood pressure, BMI, and fasting blood glucose, with higher levels associated with increased ACR. Logistic regression showed that pre-diabetes and pre-hypertension were significant independent predictors of

microalbuminuria, with odds ratios of 2.73 and 3.24, respectively. The combined presence of both conditions increased the odds to 4.86.

Conclusion: Microalbuminuria is prevalent among pre-diabetic and pre-hypertensive individuals and is strongly associated with increased cardiovascular risk factors. Early screening for microalbuminuria and management of cardiovascular risk factors are crucial for preventing progression to more severe cardiovascular and renal diseases. These findings underscore the importance of routine monitoring and intervention in at-risk populations. Future research should explore additional biomarkers and confirm these associations in diverse populations.

Keywords: *Microalbuminuria, Cardiovascular, pre-diabetic, pre-hypertensive, renal.*

AFTEFS/SKUAST-K/MED/2024/29

To Study the prognostic and diagnostic role of Microalbuminuria and GFR in Diabetic and Hypertensive Individuals

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Background: Diabetes mellitus (DM) and hypertension (HTN) are major risk factors for chronic kidney disease (CKD). Early detection of kidney dysfunction in these patients is crucial for timely intervention. Microalbuminuria and glomerular filtration rate (GFR) are established biomarkers for assessing renal impairment, but their comparative effectiveness in early detection among patients with DM and HTN needs further evaluation.

Aim: This study aims to assess the utility of microalbuminuria and GFR for detecting early kidney function changes in individuals with DM and HTN compared to healthy controls.

Methods: A cross-sectional study included 160 patients with DM and HTN (cases) and 160 healthy individuals (controls). Microalbuminuria was measured using the urinary albumin-to-creatinine ratio (UACR), and GFR was

estimated using the Cockcroft-Gault formula. Statistical analyses, including t-tests and chi-square tests, were used to compare biomarker levels between groups. Post hoc analyses examined subgroup differences.

Results: Patients with DM and HTN showed significantly higher levels of microalbuminuria (175.3 ± 82.4 mg/g) compared to controls (18.2 ± 9.1 mg/g, $p<0.001$) and significantly lower GFR (68.4 ± 12.6 mL/min/1.73m^2) compared to controls (95.2 ± 15.3 mL/min/1.73m^2, $p<0.001$). A moderate positive correlation was found between HbA1c levels and microalbuminuria ($r = 0.62$, $p<0.001$), and a moderate negative correlation between HbA1c and GFR ($r = -0.57$, $p<0.001$). Longer diabetes duration and higher blood pressure levels were associated with greater microalbuminuria and lower GFR.

Conclusion: Microalbuminuria and GFR are effective markers for early detection of kidney dysfunction in patients with DM and HTN. Regular monitoring of these biomarkers is essential for early diagnosis and management. Rigorous control of glycemic and blood pressure levels is crucial to prevent kidney damage.

***Keywords**: Diabetes Mellitus, Hypertension, Microalbuminuria, Glomerular Filtration Rate, Kidney Function, Early Detection*

AFTEFS/SKUAST-K/MED/2024/30

Exploring the Potential of Naringenin: A Network Pharmacology Approach to Induce Apoptosis and Autophagy in Breast Cancer Cells

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Background

Recent years have seen a significant increase in the incidences of breast cancer globally. The insufficiency in current treatment regimens continues to prompt the researchers to discover novel means to inhibit the growth of breast cancer. Naringenin, a naturally occurring flavonoid present in citrus fruits is known to possess antimicrobial, anti-atherogenic, hepatoprotective, anti-inflammatory, anticancer and anti-mutagenic activities. In this study, we assessed the potential of naringenin as a potent inhibitory molecule in breast cancer (BC).

Methodology

A comprehensive strategy including network pharmacology, molecular modelling, and molecular biology verification was utilized to determine the mechanism by which naringenin inhibits BC. Initially potential naringenin targets for breast cancer were predicted and subsequently screened for overlapping, followed by analysis of their interrelationships. Molecular docking was subsequently utilized to verify the binding effect of the central target. Following this, Proliferating MCF-7 cells in culture were used as a model system to monitor the anti-proliferation potential of naringenin in breast cancer. Cellular proliferation was assessed by MTT, Colony formation, and wound healing assays. The cell cycle progression was assessed by flow

cytometry, apoptosis by western blotting and flow cytometry and autophagy by western blotting, and confocal microscopy.

Results

The potential targets of Naringenin were selected from the multi-source databases, and 62 target genes overlapping gene symbols related to naringenin and BC were obtained for generating a protein-protein interaction (PPI) network. Molecular docking and molecular dynamics (MD) simulation revealed high affinities between key targets and naringenin. Gene ontology (GO) analysis and Kyoto encyclopaedia of genes and genomes (KEGG) pathway enrichment analysis revealed that the PI3K-Akt signalling and MAPK signalling may be the key and main pathways of naringenin in treating BC. In addition, naringenin inhibited cellular proliferation in a dose-dependent manner by arresting the cells in the S-phase of the cell cycle. The cellular migration was compromised with naringenin treatment and there was a significant increase in early and late apoptotic cells. Naringenin induced autophagy indicated by the higher expression of autophagy readout marker, LC3-II ($p< 0.0001$), degradation of p62 and LC3-II-LAMP1 co-localization. Further, the expression of C-PARP ($p< 0.0001$) reduced when the cells were treated with naringenin along with an autophagy inhibitor, 3-methyladenine (3-MA).

Conclusion

Network pharmacology-based analysis in integration with molecular docking predicted that SRC, PIK3CA, and BCL2 may be potential molecular targets of naringenin for the treatment of breast. Our study also demonstrates the potential anti-migratory and anti- proliferative activity of naringenin and its potential to initiate pro-apoptotic autophagy in human breast cancer.

Keywords: *Naringenin; Network Pharmacology; Molecular Modelling; Apoptosis; Cell cycle; Autophagy.*

AFTEFS/SKUAST-K/MED/2024/31

Approach to identify and isolate *C. dubliniensis* in laboratory and comparison of various methods for same

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C. dubliniensis, a newly recognized fungal pathogen, is clinically significant as it develops a stable fluconazole-resistant phenotype on exposure to this antifungal in vitro. *C. dubliniensis* is overlooked and misidentified as it share many phenotypic traits with *C. albicans*. Molecular methods developed to distinguish the two species are not readily applicable. So an easy-to-perform and accurate phenotypic test would be a valuable tool. This study first of its kind from Kashmir Valley (conducted in SKIMS-1200 bedded tertiary care hospital) evaluated seven phenotypic tests with PCR-RFLP as a gold standard. Best methodology for routine identification of this emerging pathogen was developed.

AFTEFS/SKUAST-K/MED/2024/32

Biotechnology and Genetic Engineering: Genetic Modification and Gene Editing

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Biotechnology and genetic engineering are at the forefront of scientific innovation, offering transformative solutions across various fields, including agriculture, medicine, and environmental management. Biotechnology encompasses a broad range of techniques that utilize biological systems, organisms, or derivatives to develop or create products and processes for specific use. Genetic engineering, a subset of biotechnology, involves the direct manipulation of an organism's DNA to alter its characteristics in a precise and controlled manner.

Genetic modification and gene editing are revolutionary technologies in the field of biotechnology, offering precise and efficient methods to alter the genetic makeup of organisms. Genetic modification involves the introduction of foreign genes into an organism's genome to confer desired traits such as pest resistance, herbicide tolerance, and enhanced nutritional value. This technology has been instrumental in developing genetically modified organisms (GMOs) that contribute to increased agricultural productivity and sustainability. Gene editing, particularly through CRISPR-Cas9 technology, allows for targeted modifications within an organism's genome without introducing foreign DNA. This method enables precise alterations to enhance traits such as disease resistance, drought tolerance, and improved yield. Unlike traditional genetic modification, gene editing offers a higher degree of control over genetic outcomes, making it a powerful tool for both agricultural and medical applications.

In agriculture, genetic engineering has led to the development of genetically modified organisms (GMOs) that exhibit enhanced traits such as pest resistance, herbicide tolerance, and improved nutritional content. These advancements contribute to increased crop yields, reduced reliance on chemical inputs, and enhanced food security. In medicine, genetic engineering has revolutionized the production of pharmaceuticals, including insulin, growth hormones, and monoclonal antibodies, and has paved the way for gene therapy, which holds promise for treating genetic disorders.

In conclusion, biotechnology and genetic engineering are powerful tools that have the potential to address some of the most pressing challenges facing humanity today.

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Prediction, Cloning and Characterization of *narG* promoter of *Salmonella* Typhimurium

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Salmonella Typhimurium (STM) is a zoonotic bacterium and is a member of *Enterobacteriaceae*. *Salmonella* Typhimurium pathogenicity and virulence depends on binding of global regulatory proteins like Fnr and NarL to the certain promoters in order to up/down regulate them. Example *NarX/L* operon regulates the expression of *narGHJI* (nitrate-reductase A) and the downstream operons- *narGHI* and *napABC*. Therefore, for *Salmonella* to establish its colonization in the gut, *NarGHI* reductase is crucial. It is reported that Fnr and NarL binds to -35 and -200 bases upstream of the *narGHI*'s 5'-initiation site, respectively in case of *Escherichia coli*. However, not much study was conducted with respect to these promoters in case of *Salmonella* Typhimurium.This study we tried predicting, cloning and characterizing the *narG* promoter of *Salmonella* Typhimurium. The *narG* promoter region was identified using two different promoter prediction bioinformatic servers. One was "BDGP" and another was "BPROM" web servers. Around 387bp upstream to *narG* coding sequence was selected for predicting the promoter presence. The BDGP server predicted 4 promoter regions with scores 0.94, 0.98, 0.99 and 0.92, respectively. The BPROM server predicted one promoter at 219bp site. Finally, we designed the primers for cloning around 303bp predicted promoter sequence from *Salmonella* Typhimurium into the *lac* promoter region into pUC19 vector replacing its *lac* promoter. The cloning of predicted *narG* promoter was confirmed by colony PCR and insert release method. The functionality of the cloned promoter was confirmed by its ability to express beta-galactosidase in presence of 1mM IPTG and 40µg/ml X-gal substrate in the LB agar plate. The colonies gave blue colonies but were less intense compared to *lac* promoter bearing colonies.

Keywords*: promoter, narG, X-Gal, BPROM, Salmonella*

AFTEFS/SKUAST-K/MED/2024/34

Targeting Breast Cancer: Chemoprofiling and Cytotoxicity of *Ziziphus nummularia* Leaves

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Ziziphus nummularia (ZN), commonly known as Wild Jujube, is a thorny shrub from the Rhamnaceae family, traditionally used in the medicinal systems of the Indo-Pak subcontinent. Tribes like the Gujjar and Bakkerwal of Jammu and Kashmir have utilized ZN for treating various ailments, including colds, bronchitis, diarrhea, indigestion, and inflammation. This study aims to evaluate the phytochemical composition, antioxidant capacity, and anticancer potential of ZN against human breast cancer cells. Phytochemical screening was conducted using Gas Chromatography-Mass Spectrometry (GC-MS), while the antioxidant activity was assessed via the DPPH assay. The antiproliferative effects of the ethanolic leaf extract on breast cancer cells were validated using the Sulforhodamine B (SRB) assay. Additionally, molecular docking of key phytochemicals with the epidermal growth factor receptor (EGFR) was performed to further explore the anticancer potential.

Our findings indicate that ZN possesses potent anticancer and antioxidant properties, likely due to its diverse phytochemical constituents. Ongoing studies aim to elucidate the precise mechanism of action of ZN against breast cancer. This research contributes valuable insights toward the development of non-toxic, cost-effective therapies for breast cancer treatment.

Key words*: Phytotherapy, Breast Cancer, Antioxidant, GC-MS, Ziziphus nummularia, Molecular Docking.*

AFTEFS/SKUAST-K/MED/2024/35

Exploring the Hepatic Impact of Bisphenol A and Its Toxicological Mechanisms

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Bisphenol A (BPA), an industrial chemical widely used in the production of plastics and epoxy resins, has become a significant public health concern due to its pervasive environmental presence and ability to leach into food and water sources. BPA is recognized as an endocrine-disrupting chemical, affecting various organs, with the liver being one of the primary targets.Bisphenol A (BPA), binds to estrogen receptors and exhibits estrogenic, antiandrogenic, inflammatory, and oxidative properties. Its widespread presence in the environment and leaching into food products pose significant health risks, with prolonged low-dose exposure linked to adverse effects. The liver plays a key role in detoxifying harmful substances, metabolizing nutrients, and synthesizing different proteins.BPA has been found to induce hepatotoxicity, causing oxidative stress, inflammation, and liver enzyme disruption, leading to liver damage and contributing to the rising incidence of liver diseases.

Thecurrent study summarizes key research on BPA-induced liver toxicity, highlighting the mechanisms involved in BPA-mediated liver injury. Understanding these pathways is essential for addressing the broader health impacts of BPA exposure and mitigating its toxic effects on liver function.

Keywords: *Bisphenol A, Hepatotoxicity, Xenobiotics, Toxicant, Liver function*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/36

Reproductive toxicity of Bisphenol A (BPA): Unraveling Mechanism

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Bisphenol A (BPA), a widely used industrial chemical, has raised significant concern due to its endocrine-disrupting properties and potential adverse effects on human health. BPA is known to mimic estrogen, interfering with hormone regulation and leading to reproductive dysfunction in both males and females Emerging research highlights the detrimental effects of BPA on reproductive health in both males and females. Exposure to BPA has been associated with decreased fertility, altered sperm quality, disrupted ovarian function, and developmental abnormalities in offspring. The mechanisms underlying BPA-induced reproductive toxicity involve complex pathways such as oxidative stress, which damages reproductive cells, induction of apoptosis (programmed cell death), and epigenetic changes that can alter gene expression without changing the DNA sequence. Some studies have suggested a possible link between BPA exposure and the occurrence of polycystic ovary syndrome (PCOS). Furthermore, BPA has harmful effect on mammalian follicular granulosa cells, affecting steroidogenesis. The current study on BPA's impact on reproductive systems provides mechanistic insights into its role in hormone disruption, oxidative stress, and epigenetic modulation. The findings underscore the need for further investigation into safer alternatives and stricter regulations to mitigate the risks posed by BPA exposure to reproductive health.

Keywords: *Bisphenol A, reproductive toxicity, oxidative stress, PCOS.*

AFTEFS/SKUAST-K/MED/2024/37

Prevalence of β-Lactam Resistance in Hospital Effluents: A Study on Antimicrobial Resistance in Healthcare Settings

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Among antibacterial drugs, β-lactam antibiotics are the preferred treatment for infectious diseases. However, the rise of resistance, particularly due to β-lactamase-producing bacteria, poses a major global health threat. While β-lactam antibiotics combined with inhibitors like Clavulanic Acid, Sulbactam, and Tazobactam have been effective against Serine β-Lactamase (SBL) producing bacteria, the emergence of Metallo-β-Lactamases in hospital settings has rendered these inhibitors ineffective. Metallo-β-Lactamases hydrolyze nearly all β-lactam antibiotics, except monobactams, through a zinc-mediated mechanism, and there are currently no clinically available inhibitors for these enzymes. Hospitals, especially Intensive Care Units (ICUs), are prime environments for the spread of antimicrobial resistance (AMR), exacerbated by poor sanitation, inadequate effluent treatment, and improper disposal of medical waste. This study focused on reviewing the resistance profile of samples from hospital effluents against β-lactam antibiotics. Results showed a high level of resistance in these effluents, particularly in ICU samples, compared to general ward effluents. This suggests that healthcare facilities serve as hotspots for AMR spread and act as reservoirs of resistance genes, which can be transferred to other bacterial strains via Horizontal Gene Transfer (HGT). The study concludes that the lack of proper sewage treatment and disposal of hospital effluents poses a significant threat to public health, promoting the spread of antimicrobial resistance into community settings.

***Keywords**: Antimicrobial Resistance, β-lactam antibiotics, Hospital effluents, Horizontal Gene Transfer, Public Health*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/MED/2024/38

Eco-Friendly Antibacterial Textiles: Harnessing Medicinal Plants for Sustainable Health Solutions in Community Medicine

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The use of biomordants pretreatment is gaining attention in sustainable practices within community health and environmental research. This study explores the potential of medicinal plants in developing functional textiles that promote public health. Specifically, *Lawsonia inermis (heena)* serves as a biomordant, and *Acacia nilotica (babool* bark) provides a natural dye for cotton fabrics, creating an antibacterial finish. Cotton, valued for its comfort and breathability, often lacks antimicrobial properties, making it susceptible to bacterial contamination, which possess health risks and accelerates fabric deterioration. *Lawsonia inermis*, known for its medicinal properties, enhances dye uptake and functional properties of cotton, while *Acacia nilotica* imparts colour and natural antimicrobial effects, preventing microbial growth that causes odours and fabric degradation. This eco-friendly approach offers significant benefits for public health by reducing bacterial exposure and extending the lifespan of textiles. It holds important implications for community medicine, particularly in infection control, textile hygiene, and environmental health. By integrating sustainable materials and functional benefits, this study highlights the potential for natural dyes and biomordants to enhance eco-friendly, health-conscious textiles for use in clinical and public health settings. It provides an innovative solution for both the textile industry and environmental sustainability.

Keywords*: Acacia nilotica, Lawsonia inermis, antibacterial, environmentant and community.*

AFTEFS/SKUAST-K/MED/2024/39

Screening of natural AMPK protein Kinase Activators for managing Metabolic memory and associated complications

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Glycemic memory, a phenomenon where past episodes of hyperglycemia continue to influence cellular behavior even after blood glucose levels have normalized, plays a critical role in the progression of diabetes-related complications. AMP-activated protein kinase (AMPK), a key regulator of cellular energy homeostasis, has emerged as a promising target for mitigating the effects of glycemic memory. Natural phytochemicals found in plants have been traditionally used as medicines for the prevention of chronic diseases including diabetes. Many of these phytochemicals have been characterized as having few side effects, and scientific research into the mechanisms of action responsible has accumulated mounting evidence for their efficacy. These compounds, which may help to prevent metabolic syndrome disorders including diabetes, act through relevant intracellular signaling pathways. In this study we aim to examine the natural AMPK activators, particularly plant-based compounds, for their potential to manage glycemic memory and its associated complications, such as cardiovascular disease, nephropathy, and wound healing In type 2 diabetes the anti-diabetic efficacy of several compounds and extracts derived from medicinal plants, with a focus on AMP-activated protein kinase (AMPK) activity. By exploring both direct AMPK activators and natural plant-derived compounds, the study aims to identify therapeutic that can possibly, enhance glucose uptake, and reduce oxidative stress.

Keywords: *Direct AMPK activators, metabolic memory, plant-based AMPK activators, type 2 diabetes,*

SECTION-C

AFTEFS/SKUAST-K/VET & FIS/2024/01

Comparative study of two Himalayan Snow Trout, *Schizothorax niger* and *Schizothorax curvifrons* from meristics and karyotyping technique

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Schizothorax are indigenous fish species of Kashmir having significant ecological and evolutionary importance, with distinct morphological and biological traits that facilitate their adaptation to diverse habitats. In this study, we focused on two congeneric species, *Schizothorax niger* and *Schizothorax curvifrons*, employing meristic and karyological analyses to differentiate them. The objective of our work was to establish a clear differentiation between these two closely related species using meristic traits and karyological analysis, focusing on chromosome number. Meristic traits, such as fin rays, scales, and gill rakers, were meticulously recorded from 180 specimens, revealing distinct differences between the species. Principal Component Analysis (PCA) showed that the first three components accounted for 60.51% of the total variance, with a slight overlap in meristic characters but clear distinctions in dorsal fin rays, ventral fin rays, lateral line scale count, and gill raker count between *S. niger* and *S. curvifrons*. Karyological analysis revealed that *S. niger* has a diploid chromosome number of 2n = 98, while *S. curvifrons* has 2n = 94, with additional variations in chromosomal types and fundamental numbers highlighting genetic divergence. To optimize chromosome preparation, we tested four colchicine concentrations (0.025%, 0.05%, 0.075%, and 0.1%) and two hypotonic treatment timings (25 minutes and 45 minutes) using gill tissue. The optimal conditions were found to be 0.05% colchicine concentration with

45 minutes of hypotonic treatment, significantly influencing the number of metaphase chromosome spreads ($p<0.01$). Our findings underscore these species' adaptive significance and evolutionary separation, driven by ecological variances in their habitats. This study contributes to understanding the evolutionary biology, taxonomy, and conservation needs of *Schizothorax* species in the Kashmir region. Further molecular investigations are recommended to elucidate phylogenetic relationships and adaptive mechanisms.

Keywords*: Schizothorax niger, S. curvifrons, Snow trout, Kashmir, Meristics, Chromosomes, Colchicine, Gills*

AFTEFS/SKUAST-K/VET & FIS/2024/02

Gene Editing in Fish Cell Line and its Applications

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Gene editing in fish cell lines is a powerful tool used in biological research including aquaculture, and biotechnology. It involves modifying the genetic material of fish cells to study gene function, to acquire disease-resistant strains, or enhance desirable traits in aquaculture species. Various genome-editing technologies are being used, such as Zinc Finger Nucleases (ZFNs), Transcription Activator-Like Effector Nucleases (TALENs), and CRISPR/Cas9. CRISPR/Cas9 is one of the most popular and precise gene-editing tool. It uses a guide RNA to direct the Cas9 protein to a specific location in the genome, where it introduces a double-strand break and creates *Indels*. These techniques are used to edit genes in cell lines like fish cell lines. For example, researchers can edit the myostatin gene to study cell growth by knocking out this gene. *In-vitro* gene editing in cell lines enables the optimization of methods prior to in-vivo testing, which can save time and reduce costs while minimizing the number of fish required for experiments. Conducting gene editing in cell lines is crucial to assess whether a knockout might be lethal or cause undesired effects, which could impact fish welfare before proceeding to *in-vivo* trials. Furthermore, fish cell lines are used to study the role of specific genes in fish development and physiology. By knocking out or modifying genes, researchers

can investigate their functions and interactions, using fish cell lines as *in-vitro* models. Overall, gene editing in fish cell lines holds significant potential for advancing scientific research and aquaculture but must be approached with careful consideration of ethical, technical, and regulatory guidelines.

Keywords: *Genome Editing, CRISPR/Cas9, Fish Cell line, Aquaculture*

AFTEFS/SKUAST-K/VET & FIS/2024/03

Effect of water hyacinth (*Eichhornia crassipes*) leaf meal supplementation on meat composition of pangasius catfish (*Pangasianodon hypophthalmus*) juvenile

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The present study was aimed to analyze the effect of water hyacinth (Eichhornia crassipes) leaf meal supplementation on meat composition of pangasius catfish (Pangasianodon hypophthalmus). A total number of 120 juvenile pangasius catfish were stocked into 12 tanks, each tank having ten (10) pangasius juvenile with three replicates. Four iso-nitrogenous diet having water hyacinth leaf meal replacing fish meal with different concentrations were divided into four groups viz. control group (0%), T1 (10%), T2 (20%), and T3 (30%), respectively. Protein estimation of fish flesh meat of Pangasius catfish flesh protein was done by Kjeldahl's method. Protein estimation of different groups was performed and results revealed that the group T3 with 30 % of WHLM showed the maximum mean protein percentage (16.24 ± 0.76) followed by T2 (14.17 ± 0.60) and T1 (13.0 ± 0.83) group. The control group showed lowest percentage of protein (12.24 ± 0.19). The study revealed significant variations ($P<0.05$) in the crude protein (CP) of fish flesh. Group T3 fed with 30% water hyacinth leaf meal diet exhibited the highest crude protein levels in pangasius fish flesh (16.20 ± 0.26) among other groups. The study revealed that a better flesh crude protein in catfish was found with inclusion of 30% water hyacinth diet.

Keyword: *Water hyacinth leaf meal (WHLM), Pangasianodon hypophthalmus*

Innovations in Nutraceuticals and Functional Foods: Advancing Nutritional Wellness of aquatic organisms

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Nutraceuticals are often regarded as bioceuticals products that potentially exert immense benefits on both nutrition and pharmaceutical substances that foster living organisms physiological states. The nutraceuticals contain bioactive molecules that offer one or more health advantages. Functional foods are derived from natural sources (marine micro-algae and micro-organisms) available in the form of tablets, powders, or capsules. They have specific therapeutic values and are also fortified with essential nutrients including proteins, peptides, lipids, carotenoids, omega-3 and omega-6 fatty acids, polysaccharides, immunostimulants (chitin, chitosan), enzymes, methyl donors, nucleotides, levans, anabolic growth promoters, and organic acids. Nutraceuticals in the aquafeed industry are known to enhance feed intake, feed utilization, better water quality, immune-boosting, stress tolerance, stunning flesh quality, anti-microbial effects, and reproductive and productive performance of fish and shellfish. The novel method for delivery of these bioceuticals products involves oral administration, dietary supplementation, and parenteral route. The nanodelivery system has now gained major attention in aquaculture, like nano zinc supplementation studies that improve the growth and immunity of fishes through its enormous advantages, including preventing the loss of micronutrients and low cost. To prevent the deleterious effect on disease outbreaks like Early Mortality Syndrome and White Spot Syndrome virus in shrimp farming by knowing the synergistic effects of one or two bioactive compounds, the mechanism of their action, and the species-specific dose, revolutionize the aquaculture industry using nutraceuticals.

AFTEFS/SKUAST-K/VET & FIS/2024/05

Whiteleg shrimp production, challenges and market dynamics: A global perspective

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The whiteleg shrimp (*Litopenaeus vannamei*) also known as Pacific white shrimp, is one of the most economically significant species in global aquaculture. This research poster aims to investigate the current state of whiteleg shrimp production market dynamics and identify key challenges and opportunities in whiteleg shrimp production by analysing data from different sources and case studies from leading shrimp-producing countries such as China, India, Ecuador and Thailand. The proposed strategies for sustainable and profitable aquaculture consider environmental concerns and disease management and the advancements in aquaculture practices, including selective breeding, disease management, and habitat optimization, have significantly increased production efficiency and shrimp quality. Innovations such as recirculating aquaculture systems (RAS) and biofloc technology are highlighted for their roles in reducing environmental impact and enhancing yield. Additionally, the poster discusses the impact of global trade policies, consumer preferences, and market trends on shrimp production. This study insights into the current challenges and opportunities The Global production of farmed shrimp is 5.6 million metric tons (MMT) in 2023 and it is expected to reach about 5.88 MMT in 2024.

Keywords: *Whiteleg shrimp, Global demand, Challenges, Biofloc, Market dynamics*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/06

Development of protein enriched papad using muscles of Pacific white shrimp (*Litopenaeus vannamei*) and storage study

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The rapid growth in global population has resulted in significant concern about food security in modern times. Consequently, there is a strong requirement for highly nutritious food. In this regard, edible crustaceans play a vital role as a primary supplier of nutritionally valuable food. Among them, shrimps form a major group in the global seafood sector. Shrimp is a type of seafood that contains low fat, is rich in protein, and is an excellent source of essential minerals. Shrimp muscle was used in the preparation of papad to enhance its protein content, which was prepared at Chaudhary Charan Singh Haryana Agricultural University, Hisar. The physicochemical, biochemical, and organoleptic characteristics of papad were evaluated after 150 days of storage at ambient temperature. The mineral constituents and Fourier Transform Infrared Spectroscopy (FT-IR) analysis of shrimp muscle and papad were evaluated, including elements such as Phosphorus (P), Potassium (K), Sodium (Na), Iron (Fe), Copper (Cu), Zinc (Zn), Magnesium (Mg), and Manganese (Mn), which exhibited overall elevated concentrations of essential minerals. The results indicated that notable alterations occurred in the physicochemical and biochemical composition, in addition to changes in the organoleptic characteristics of the papad over the passage of time. In any case, the items were determined to be secure and relatively nutritious at the end of the storage duration. Furthermore, the organoleptic evaluations were also found to be within acceptable limits, permitting their usage for up to five months of the storage period. In this way, the present study might be of value to both shrimp producers and industrial partners in the efficient utilization of shrimp muscle for the development of value-added products such as papad. The nutritional benefits offered by the value-added product could help in its successful commercialization.

Keywords: *Protein-enriched papad, Shrimp muscle, physicochemical composition, FT-IR*

AFTEFS/SKUAST-K/VET & FIS/2024/07

Image Processing Technology for Fish Disease Diagnosis

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Fishermen contend that diseases affecting fish represent the foremost cause of productivity declines and economic challenges. The task of identifying fish diseases and monitoring their health through a manual method reliant on human observation proves to be quite challenging. Therefore, every method which is quicker, more reliable and with extensive automation, is of much greater interest regarding this problem. For this reason, in view of the advancement linked with the digital revolution, the treatment of images finds an increasing use in disease analysis. Employment of image treatment allows the possibility to increase the accuracy-obtaining capabilities of the standard procedures. Besides, different methods are used in image processing, such as feature extraction, object recognition, segmentation, pre-processing, acquisition, and classification. The adoption of image processing technology for diagnosing fish diseases is one of the new promising frontiers within aqua-production practice. In that respect, fish health management can be enhanced by using automated technologies to reduce production losses with proper diagnosis of diseases quickly. This is an innovative way to make aquaculture more sustainable and economically viable because it simplifies the process of diagnostics that can facilitate timely interventions and real-time surveillance.

Keywords: *Image processing, Fish, Disease diagnosis, Automated system, Real-time monitoring*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/08

Efficacy of *Salvia rosmarinus* on *Cyprinus carpio* against *Aeromonas hydrophila*

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Aquaculture, particularly the farming of *Cyprinus carpio* (common carp), plays a significant role in global food production. However, bacterial infections such as those caused by *Aeromonas hydrophila* pose a critical threat to the health and productivity of aquaculture species. The present study investigates the efficacy of *Salvia rosmarinus* (rosemary) extract as a potential therapeutic agent for *Cyprinus carpio* infected with *Aeromonas hydrophila*, a pathogenic bacterium responsible for significant losses in aquaculture. *Aeromonas hydrophila* is known to cause hemorrhagic septicemia, skin ulcerations and fin rot in fish, leading to high mortality rates. In this experiment, fish were exposed to varying concentrations of *Salvia rosmarinus* extract and its antimicrobial, anti-inflammatory and immunostimulatory effects were assessed. The experiment involved treating *C. carpio* with a diet supplemented with *S. rosmarinus* extracts before and after deliberate exposure to *A. hydrophila*. Several parameters were assessed, including survival rate, growth performance, hematological indices, immune responses in infected fish. The results demonstrated that *Salvia rosmarinus* extract effectively reduced the bacterial burden and enhanced the immune response of *C. carpio*, as evidenced by improved survival rates, enhanced white blood cell counts, red blood cells counts and reduced tissue damage. The study also explores the antioxidant properties of rosemary, which may contribute to its protective role against oxidative stress caused by bacterial infection. In conclusion, *Salvia rosmarinus* shows promise as an alternative natural remedy to combat *Aeromonas hydrophila* infections in aquaculture. This research provides a basis for further investigation into the use of herbal extracts for sustainable fish health management, reducing the reliance on synthetic antibiotics, and promoting eco-friendly aquaculture practices.

Keywords: *Carp, bacterial infection, rosemary, antimicrobial, immunostimulatory, antioxidant property*

AFTEFS/SKUAST-K/VET & FIS/2024/09

Smoking of Fish

Dr. Priti Mishra, Mr. Anil Kewat & Dr. Madhuri Sharma
Assistant Professor, Teaching Associates, Associate Professor

Smoking of fish is very popular in India especially in North-East India, where smoked fish and meat are relished as a delicacy. Smoked fish are fish that has been cured by smoking. Smoking is one of the oldest preservation methods, combines the effects of salting, drying, heating and smoking. The process of smoking occurs through the use of fire. Fish is one of the protein foods that need careful handling. However, due to poor handling, about 30- 50% of fish harvested are wasted. In order to obtain a product with good quality characteristics, it is essential to understand the mechanisms involved during the smoking process, so that the impact of the smoke inti the fish can be maximized. In addition, it is important to draw the attention of people on the need to assess the health risks associated with the consumption of smoked fish products and consequences. And the necessary measures and steps to reduce suchrisks in order to have a safer food for the consumers are highly advisable.

Key words: *Smoking, Fish, Preservation, Drying*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/10

Effect of water hyacinth (*Eichhornia crassipes*) leaf meal supplementation on meat composition of pangasius catfish (*Pangasianodon hypophthalmus*) juvenile

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The present study was aimed to analyze the effect of water hyacinth (*Eichhornia crassipes*) leaf meal supplementation on meat composition of pangasius catfish (*Pangasianodon hypophthalmus*). A total number of 120 juvenile pangasius catfish were stocked into 12 tanks, each tank having ten (10) pangasius juvenile with three replicates. Four iso-nitrogenous diet having water hyacinth leaf meal replacing fish meal with different concentrations were divided into four groups viz. control group (0%), T1 (10%), T2 (20%), and T3 (30%), respectively. Protein estimation of fish flesh meat of Pangasius catfish flesh protein was done by Kjeldahl's method. Protein estimation of different groups was performed and results revealed that the group T3 with 30 % of WHLM showed the maximum mean protein percentage (16.24 ± 0.76) followed by T2 (14.17 ± 0.60) and T1 (13.0 ± 0.83) group. The control group showed lowest percentage of protein (12.24 ± 0.19). The study revealed significant variations ($P<0.05$) in the crude protein (CP) of fish flesh. Group T3 fed with 30% water hyacinth leaf meal diet exhibited the highest crude protein levels in pangasius fish flesh (16.24 ± 0.76) among other groups. The study revealed that a better flesh crude protein in catfish was found with inclusion of 30% water hyacinth diet.

***Keyword**: Water hyacinth leaf meal (WHLM), Pangasianodon hypophthalmus*

AFTEFS/SKUAST-K/VET & FIS/2024/11

Single nucleotide polymorphisms of Mannose binding lectin 2 (MBL2) gene & its association clinical mastitis in Murrah buffaloes

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Single nucleotide polymorphisms of MBL2 gene in 200 Murrah buffaloes were investigated using polymerase chain reaction Direct sequence (PCR-direct - sequence) technique, in this study, four new SNPs at 1262G>A, 3382A>T, 4387C>T and 4511C>T loci of Mannose binding lectin 2 (MBL2) gene were found in Murrah buffaloes. Pair linkage disequilibrium analysis and haplotype construction of MBL2 gene were performed using SHEsis software. Two non synonymous type of changes were observed at 1262G>A (Gly40Asp) and 4387C>T (Thr166Met) of MBL2 protein. These amino acid changes were however predicted not be affecting the protein function in any manner. An odds ratio analysis showed that A allele of 1262G>A, A allele of 3382A>T, C allele of 4387C>T and C allele of 4511C>T had 3.7, 5.19, 7.82 and 3.7 fold increase risk for developing of clinical mastitis in Murrah buffaloes respectively, identifying that these alleles are “at-risk” alleles and showed significant association with increased risk for clinical mastitis in Murrah buffaloes (P< 0.01). Genotypic association analysis revealed that Murrah buffaloes with AG, AT, CT and TT genotypes at 1262G>A, 3382A>T, 4387C>T and 4511C>T loci of MBL2 gene respectively were found significantly least susceptible to clinical mastitis compared to other genotypes. A total of 7 haplotypes were constructed from four SNPs of MBL2 gene. Haplotypes association analysis showed that animals with allelic combination of i.e. haplotype Hap6 (GTCT) and Hap7 (GTTT) were significantly least susceptible to clinical mastitis compared to other haplotypes in Murrah buffaloes (P< 0.01).

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/12

Evaluation of performances in different breeds of rabbit

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The present study was planned with the aim of evaluating performance of different breeds of rabbit in the temperate climatic conditions of Kashmir Valley. The results revealed that body weight was highest in Black Brown breed of rabbit at birth as well as at 7th week. The breeds Californian White, New Zealand White and Black Brown showed highest mortality in 1st week but Grey Giant in 2nd week and Soviet Chinchilla in 4th week. Overall, the kindling rate and kit index was highest in Californian White rabbits. During winter, spring and summer, Grey Giant, Californian White and Black Brown respectively showed the highest kindling rate and kit index. Soviet Chinchilla kits were the fastest to open their eyes after birth and fur appeared fastest in Californian White after birth. Highest percentage of Californian White and New Zealand White does as well as kits were docile in behavior whereas bucks of all breeds were either active or very active. It is concluded that best performance was shown by Californian White in terms of kit index and docility.

Key words: *Rabbits, performance, breeds, weight*

AFTEFS/SKUAST-K/VET & FIS/2024/13

Histomorphological Study of Infundibulum in Laying Kadaknath and White Leghorn

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The present study was aimed to explore the histomorphological and histochemical characteristics of infundibulum in laying Kadaknath and White Leghorn fowl (WLH). A total number of 48 birds were taken for the study and categorized into four age groups- Group I (24 weeks), Group II (32 weeks), Group III (40 weeks) and Group IV (48 weeks) with six birds per group. The findings showed that the colour of the infundibulum was grayish in all the groups of Kadaknath, however in group IV the colour intensity was reduced. In WLH, it was white in colour in all the groups. The mean length of the infundibulum was maximum in group IV of Kadaknath. However, in WLH it was maximum in group I. At 24 weeks, Kadaknath birds had less developed mural folds, which became well-developed by 32 weeks, likely because they had not yet started laying at 24 weeks. The epithelium was pseudostratified comprised of single layer of ciliated columnarepithelium with goblet cells which was more in height and darkly stained in Kadaknath incomparison to WLH. The wall thickness of the infundibulum is thinner in all groups of WLH and Kadaknath compared to other parts of the oviduct. Glands appeared in the propria submucosa in group II of Kadaknath however, in WLH these were well developed in group I. All the three types of fibers were observed, with collagen fibers being short, located in the propria submucosa and extending into the core of mucosal folds.

***Keyword**: Kadaknath, White Leghorn, Infundibulum.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group

AFTEFS/SKUAST-K/VET & FIS/2024/14

Association of HSP90AA1 gene Genotypes with thermotolerance traits in Deoni breed of Indian Dairy cattle

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A group of proteins known as Heat Shock Proteins (HSPs) are synthesized during heat stress. HSP genes have been reported to be associated with heat tolerance and production performance in cattle. PCR-SSCP technique and direct sequencing was used to identify novel SNPs within the HSP90AA1 gene in Deoni breed of dairy cattle. The average rectal temperature (ART) and average respiration rates (ARR) were recorded during peak summer stress and heat tolerance coefficient (HTC) was calculated. Heat tolerance coefficient (HTC) for individual cows was calculated using Iberia heat tolerance test formula (Rhoad 1944), HTC = 100 – 10 (ART – 38.3), where HTC is the heat-tolerance coefficient, ART is the average rectal temperature, 38.3 is the physiological bovine body temperature, 10 is a correction factor to convert deviations in body temperature to a unit basis and 100 is the perfect efficiency in maintaining temperature at 38.3°C. The index of HTC was calculated for each cow to assess its heat adaptability. In Exon 8, three unique SSCP patterns corresponding to TT, GG and TG genotype with frequencies of 0.250, 0.639 and 0.111, respectively were observed. The sequence analysis of Exon 8 revealed T $\rightarrow$ G transversion at position 3650 (SNP g. 3650 T>G) of HSPAA1 gene (GenBank accession number NC-007319 as reference sequence). The observed polymorphism (T $\rightarrow$ G) at position 3650 (SNP g. 3650 T>G) results in substitution of an amino acid from Phenylalanine to Leucine. The identified genotypes were associated with relative thermotolerance in terms of physiological parameters and milk production traits. The results of the experiments revealed that the genotype frequency TT, GG and TG genotype with frequencies of 0.250, 0.639 and 0.111, respectively were observed. The association studies indicated that TG genotypes had significantly (P < 0.01)

higher HTC and lower ARR values than GG and TT genotype cows. TG genotype animals also had higher Lactation Milk Yield (1020.354 ± 87.432 kg) *(P* < 0.01) as compared to both the homozygotic (TT and GG) cows The genetic polymorphisms observed in HSP90AA1 exon 8 and their genetic association with heat tolerance and production performance traits reveals the importance of heterozygotic genotype had higher Lactation Milk Yield, higher, HTC and lower ARR can be useful for genetic improvement of Deoni cattle for Climate smart breeding. So, pattern -III TG genotype can act as potential genetic marker for thermotolerance and milk production traits and can be used in marker assisted selection.

AFTEFS/SKUAST-K/VET & FIS/2024/15

Complement Component 4A gene Association with Clinical Mastitis in Murrah Buffaloes

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Mastitis is a devastating disease of dairy industry, it is multi etiological and multi-factorial disease which is closely related with the innate immune response, including the complement system of the dairy animal. Complement component 4A gene is a membrane bound pattern recognition receptor (PRRs) that plays an integral role in the regulation of the immune system. The association analysis of C4A gene polymorphism with Mastitis susceptibility was investigated in 200 Murrah buffalo maintained at LRC NDRI, Karnal. In brief, DNA was extracted from 100 Murrah Buffalo blood samples with Clinical Mastitis and 100 healthy controls without a history of Clinical Mastitis up to 5th lactation. Genotyping of the identified five novel SNPs at position g.3692G>A, g.3898C>T, g.4370C>G, g.4371T>C and g.4377G>C of the C4A gene was performed using a polymerase chain reaction and direct sequencing method. Risk association, linkage disequilibrium (LD), genotypes and haplotypes analyses of these SNPs were assessed by using SHEsis software programme. An odds ratio analysis showed that A-allele of 3692G>A, C allele of 3898C>T, C-allele of 4370C>G, C allele of 4371T>C, and C allele of 4377G >C had 8.7, 6.2, 7.82, 7.7, 8.8 and 5.4-fold increased risk for developing the clinical mastitis

respectively, identifying that these alleles are "at-risk" alleles and showed significant association with increased risk for clinical mastitis in Murrah buffaloes (P< 0.01).This study found that Murrah buffaloes with GG (g. 3692G>A), CT (g. 3898 C>T), GG (g. 4370 C>G), TT (g. 4371 T>C) and GG (g. 4377 G >C) genotypes and the haplotype (GTGTG)Hap10 were found significantly least susceptible to clinical mastitis(P<0.01) thus may be used as molecular markers for breeding and selection of Murrah buffaloes with lower risk of clinical mastitis.

AFTEFS/SKUAST-K/VET & FIS/2024/16

Constraints perceived by the small-scale dairy farmers in the Baramulla district of Kashmir

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Dairy farming is a main or supplementary source of income to the farmers especially to small scale and poor farmers. However, there are certainly many constraints that come in way of dairy farming. Keeping this in view, the study is proposed with the aim of identifying constraints that are faced by small scale dairy farmers in district Baramulla. The results revealed that 37.5% perceived no constraints while 62.5% faced some constraints which were related to feed, fodder, labour issues, health, hygiene, milk price, marketing, housing and management, and winter stress. Feed cost & availability followed by labour input were the major constraints faced by the small-scale dairy farmers.

Key words: *Dairy, constraints, small scale farmers, feed*

AFTEFS/SKUAST-K/VET & FIS/2024/17

Optimization of a cost-effective protocol for isolation of Seminal Extracellular Vesicles from ram semen using polyethylene glycol precipitation

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Seminal extracellular vesicles (SEVs) are lipid bilayer nanovesicles and have potential to be used as fertility biomarkers. Isolation and characterization of SEVs is the primary requirement to explore their potential. Commercial kits for isolation are expensive and traditional methods like ultracentrifugation can be very laborious and time consuming. The aim of the study was to investigate whether PEG method (polyethylene glycol) is efficient in isolation of SEVs compared to the gold standard ultracentrifugation method. We used PEG at 10%, 20%, 30% and 40% concentration to optimise PEG based SEV isolation in sheep. Characterization of isolated SEVs was done by scanning electron microscopy (SEM), dynamic light scattering (DLS) and nanodrop spectrophotometer protein quantification. SEM confirmed the isolation of spherical shaped vesicles of expected size range of 40-300 nm in both methods. Average particle size measured by DLS was 115.03 nm, 134.03 nm, 144.70 nm, 154.87 nm and 125.32 nm in ultracentrifugation, 40%, 30%, 20% and 10 % PEG isolation methods. Zeta potential was lower negative for ultracentrifugation (-5.8 mV) than PEG isolated vesicles (-9.7mV). Average protein concentration measured was 19.605 mg/ml and 19.268 mg/ml in ultracentrifugation and PEG precipitation respectively. Higher PEG concentrations can isolate smaller size vesicles. More negative zeta potential in PEG method suggests better SEVs integrity than UC method. Further, SEVs yield was similar in PEG and UC method. Hence, it can be concluded that Hence, it can be concluded that PEG based precipitation is reliable, fast and affordable method and can be adopted for SEVs isolation.

Keywords*: polyethylene glycol precipitation, ultracentrifugation, seminal extracellular vesicles, scanning electron microscopy*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/18

Exploring Constraints in the Adoption of Dairy Management Practices by Dairy Farmers: a study in Uttarakhand

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Dairy farming stands as a cornerstone of India's agricultural landscape, contributing significantly to the nation's economy and providing livelihoods to millions of rural households. However, despite its pivotal role, the adoption of modern dairy management practices remains a challenge for many Indian dairy farmers. In this context, understanding the constraints impeding the uptake of efficient dairy management practices is crucial for enhancing productivity, production efficiency and sustainability within dairy farming sector. This study was carried in purposively selected two districts of Kumaon Division of Uttarakhand state. Further, two blocks from each district were chosen purposively, and two villages were selected from each block. Thirty (30) dairy farmers were selected from each selected village through purposive sampling. The descriptive research design was followed for the study. The study found that major constraints faced by dairy farmers were: non-availability of vaccines (89.58 per cent) under infrastructure constraints, low price of milk offered (79.17 per cent) under financial constraints, lack of training facilities in dairy sector (100%) under technical constraints and inadequate information about government schemes related to dairy enterprise (88.33) under miscellaneous constraints. These findings will illuminate the blind spots in understanding the major factors affecting adoption of advanced dairy farming practices; and will be helpful to the dairy professionals, dairy cooperative societies and extension workers and policy advocates in formulating appropriate strategies for promotion of dairy farming.

Key words: *Constraints, dairy farming, dairy management practices, Kumaon division, Dairy Cooperative Societies.*

AFTEFS/SKUAST-K/VET & FIS/2024/19

Canine Hip Dysplasia: Diagnostic Imaging and Surgical Treatment by Simultaneous Femur Head and Neck Ostectomy (FHO)

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In present case study 14 dogs of different breed (Labrador-9, German shepherd- 4 and Golden retriever-1), age, and body weight were reported with the history of hind limb lameness diagnosed as bilateral hip dysplasia clinically along with radiographic and computed tomographic examination. Clinical examination was conducted to evaluate difficulty during up and down stairs, thigh muscle atrophy, protrusion of the greater trochanter dorsally and laterally, over grown nails, inverted pear shape hind quarter, compensatory hypertrophy of shoulder muscle, crepitation on palpation, reduced range of motion of hip joint, positive ortolani sign, gait abnormality (swinging, bunny hopping, stiff gait, wide stance and recumbency). Irregular wear and misshapen femoral head appearance, subchondral sclerosis at the acetabular margin, flattened or shallow acetabulum, new bone formation on the acetabulum and femoral head, presence of Morgan line (caudal curvilinear osteophyte) and incongruity of hip joint, hip joint laxity, capsular enthesophyte formation (lipping) cranial to the acetabulum and coverage of the femoral head were evaluated using diagnostic imaging (radiography and CT Scan). In all

cases simultaneous bilateral femoral head and neck ostectomy was done. Duration of surgery, and postoperative time of limb usage with or without sling support, recuperation time of pain free gait and play full behaviour were recorded. Highly satisfied results of surgery and returned of pet's normal physical activity level were found in all cases. It was concluded that hip dysplasia can be confirmed by diagnostic imaging and simultaneous bilateral femoral head and neck resection can avoid multiple time surgeries and their postoperative care, promote symmetrical hind limb recovery with improvement in quality of life.

Key words- *Hip dysplasia, simultaneous femur head and neck ostectomy, radiograph, CT scan*

AFTEFS/SKUAST-K/VET & FIS/2024/20

Genetic Polymorphism of MBL1 gene in Murrah buffaloes

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Mannose-binding lectins (MBL1) gene has been understood to be a most important constituent of immune response system of an organism, the primary role of this gene in the classical and lectin-activation pathways is to provide protection against various dieses or bacterial pathogens. In this study, eight novel SNPs identified in the promoter region of MBL1 gene were 154C>T, 235G>A, 252A>T, 265C>A, 268T>C, 282G>A, 431G>A and 551C>G, when compared to reference sequence of *Bubalus bubalis* (NCBI accession number KC415281). Genomic DNA isolated from 200 lactating Murrah buffaloes was amplified for the targeted sequence of MBL1. PCR products were custom sequenced, edited and used for further analysis. Association between eight SNPs of MBL1 gene in Murrah buffalo has been analyzed and relative risks of the alleles for clinical mastitis were estimated with an odds ratio. Allelic association analysis showed that T allele of 154C>T, A allele of 235G>A, A allele of 252A>T, A allele of 265C>A , T allele of 268T>C, A allele of 282G>A , A

allele of 431G>A and G allele of 551C>G had significant association with increased risk of clinical mastitis (P< 0.01). Haplotype analysis showed that Hap15 (CAAATAAG) and Hap16 (TAAATAAG) i.e., the haplotypes containing all 8 "at-risk" alleles, were significantly associated with clinical mastitis (P< 0.01). Hap6 (CGAATAAC) and Hap8 (CGTCCGGC) were significantly associated with a lower risk of clinical mastitis in Murrah buffaloes (P< 0.01).On the other hand, the Hap6 (CGAATAAC) and Hap8 (CGTCCGGC) which are unrepresented in affected group and without "at-risk" alleles were significantly associated with a lower risk for clinical mastitis (P<0.01).These findings indicated a MBL1 gene polymorphism could be used as genetic marker for mastitis resistance in Murrah buffaloes.

AFTEFS/SKUAST-K/VET & FIS/2024/21

Direct Fed Microbials (DFM) and Solid State Fermented (SSF) Biomass: Their effect on the Digestion of Nutrients and Rumen Fermentation in Surti Buffaloes

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Present study was carried out to evaluate the effect of supplementing Direct Fed Microbials (DFM) and Solid State Fermented (SSF) biomass for 70 days on body weight, nutrient intake, digestibility and rumen fermentation in adult Surti buffaloes (n=15). Three groups of five animals each were randomly assigned to the animals. The animals in the control group (T1) were fed TMR (Roughage to concentrate ratio of 65:35) without supplement, while the animals in group T2 and T3 were fed TMR with 3% DFM and 3% SSF biomass on DM basis, respectively. The average initial and final body weight (kg) of animals in T1 (411.8 and 428.8), T2 (412.2 and 433.1), and T3 groups (415.8 and 438.7, respectively) were more or less similar. None of the probiotics had significant effect on average DMI and CPI. The average daily DCPI was however significantly (p<0.05) higher in T3 and T2 than T1. Average bi-weekly total digestible nutrient intake was significantly (p<0.05) higher in T3 followed by T2 and T1 group. Digestibility of all nutrients was improved numerically by supplementation of DFM and SSF biomass in the diet of buffaloes, and was

within the normal range. There was significantly ($p<0.05$) higher concentration of NH_3-N and TCA precipitable-N in SRL of treatment groups of animals, while the values of SRL pH, TVFA, total-N, soluble-N and NPN were statistically similar between groups. The overall results suggested that supplementation of SSF biomass or DFM @ 3% in the ration of buffalo has no adverse effect on feed intake, digestibility and rumen fermentation. Further research is needed to explore their utilization in livestock ration.

Keywords: *Buffalo, Direct fed microbials (DFM), Nutrients digestibility, Rumen fermentation, Solid state fermented (SSF) biomass.*

AFTEFS/SKUAST-K/VET & FIS/2024/22

In silico identification and characterization of HSP90AA1 Protein Structure in Dairy Cows

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Dairy cows play a significant role in the animal production system and are major contributors to the Indian economy. However, heat tolerance has been a significant challenge in their production and management. Heat stress stands as a significant issue in the global dairy industry, causing considerable losses in production. To mitigate these impacts, livestock producers may need to adopt climate-resilient practices, including improved animal management, breeding for resilience, and better disease control measures. The integration of these practices will be crucial in sustaining livestock production in the face of ongoing climate challenge emergence of less effective interventions. In this context, The HSP90AA1 gene (Heat Shock Protein 90 Alpha Family Class A Member 1) plays a crucial role in livestock adaptation to environmental stress, making it a valuable target for climate-smart livestock breeding. This gene encodes a molecular chaperone, HSP90, that helps in protein folding, stabilization, and degradation, especially under stress conditions such as heat.HSP90AA1 serves as a crucial element in the immune response system, playing a vital role in cellular stress response and acting as a primary defense

molecule of host cells to offer protection against a spectrum of stressors, suggesting its potential as a biomarker for heat tolerance and a candidate marker for marker-assisted selection, particularly in identifying heat tolerance in dairy cows. Until now, there has been limited reporting on studies concerning Indian dairy cow breeds. Therefore, HSP90 plays a critical role in livestock adaptation to heat stress, making it a valuable target for breeding programs aimed at developing climate-resilient animals. Through genetic selection, marker-assisted breeding, and modern biotechnological approaches, the incorporation of HSP90 into breeding strategies can enhance livestock productivity and welfare in the face of climate change.

Key Words: *Heat stress, HSP90AA1 Protein Structure, molecular chaperone, climate change*

AFTEFS/SKUAST-K/VET & FIS/2024/23

Knocking-out of FecX gene in granulosa cells of goat using CRISPR/Cas Technology

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High fecundity is an important economic trait for domestic small ruminants. The FecX gene is one of the most important fecundity genes identified in sheep. Site specific mutations in FecX gene results in altered ovulation rate and thus litter size in sheep. Similar mutation is not reported in goats which if introduced may cause increase in ovulation in goat also. In an attempt to introduce mutation (knock out) in FecX gene in goat granulosa cells, CRISPR-Cas9 technology was utilized. For this ovaries were collected from an abattoir and granulosa cells were cultured in vitro. Guide sequence was designed in-silico using available software. In vitro transcription was performed to generate SgRNA followed by its purification. sgRNA and Cas9 in the ribonucleoprotein format was electroporated in the cultured granulosa cells for knocking out of the FecX gene. The confirmation of FecX gene knock out was done by T7Endonuclease test.

Development and Characterization of Novel Gut Cell Line from *Clarius Magur* and Its Applications in Biotechnology

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Cell culture is the process in which the cells are grown under controlled environment, generally outside their natural environment by providing essential nutrients for their optimum growth and survival. *Clarias magur* is one among the catfish species, which is native to Southeast Asia. In this work, we developed the gut cell line using gut tissues from *Clarias magur* named as CMG *(Clarias magur* Gut) cell line. Explant method was used for the development of the cell culture system. Initially, 20% FBS was added to the L-15 medium used to maintain the primary culture of gut cell line. Initially the CMG cells were cultured in Leibovitz's 15 media (L-15) supplemented with 20% foetal bovine serum (FBS) at a temperature of 28°C. Gut cells were then optimized for growth in culture media by reducing the FBS concentration to 15% FBS and 5% FBS. The transfection efficiency of the CMG cells was 10% using the pMaxGFP vector. To authenticate the species of origin of the developed CMG cell line, the COI gene was used. Analysis of the COI gene sequence from CMG cells revealed a 99.69% similarity with *Clarius magur* sequences archived in NCBI. The CMG cell line was cryopreserved in liquid nitrogen (-196°C). The efficiency of cryopreservation was determined to be 75% and 65% at the 6th and 15th passages, respectively. The CMG cells will serve as a valuable tool for gene expression studies. This is the first report of gut cells derived from a fresh water fish species *Clarias magur*.

Keywords: *Biotechnology, CMG, Gut cell line, Clarius magur, FBS,*

AFTEFS/SKUAST-K/VET & FIS/2024/25

Assessment of Multidrug-Resistant Pseudomonas auruginosa from Poultry

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Antibiotic resistance in bacteria is a major worldwide health challenge. The study investigated multidrug-resistant Pseudomonas aeruginosa in clinical samples from poultry shops in Vallabhnagar, Udaipur. Out of 100 chicken meat swabs collected, 45 isolates was confirmed using routine selective media and PCR-based oprL gene amplification. These P. aeruginosa were tested for antibiotic susceptibility. The Disc Diffusion Assay revealed high resistance to Penicillin, Tetracycline, Trimethoprim-sulfamethoxazole and amoxicillin-clavulanic acid. Notably, 62 % of the isolates were multidrug-resistant, with resistance to 2 (42%) or 3 (09%) antibiotics. These findings underscore the need for cautious antimicrobial use in poultry to combat the rise of resistant bacterial strains.

Keywords: *Multidrug resistant (MDR), Pseudomonas aeruginosa, Poultry*

AFTEFS/SKUAST-K/VET & FIS/2024/26

Characterization of major bacterial pathogens of *Litopenaeus vanname* shrimp

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India is cashing on demand by increasing the area under shrimp aquaculture. Shrimp culture economics has a significant impact on farmers' socioeconomic status. White legged shrimp (*Litopenaeus vannamei*) farming in India has

helped to alleviate the problems connected with overfishing in marine habitats but *L. vannamei* related microbial diseases and fatalities have been a major source of shrimp farming setbacks. Characterization of major bacterial pathogens of *Litopenaeus vannamei* in Punjab and Rajasthan, India was done and thirty two bacterial isolates were isolated from diseased shrimps having symptoms like white gut, transparent or pale body, red telson with lesions. These were identified based upon morphological, biochemical and molecular tests. The isolates were found to be from *Vibrio*, *Shewanella*, *Staphylococcus*, *Pasturella*, *Escherichia* and *Klebsiella* genus. *Vibrio* spp were found pathogenic to shrimp at 10^4, 10^5, 10^6 CFU/ml leading to mortalities and decrease in growth parameters of *Litopenaeus vannamei*.

Key words: *Shrimp; diseases; bacteria; pathogenic; characterization*

AFTEFS/SKUAST-K/VET & FIS/2024/27

Antimicrobial Resistance Patterns of Staphylococcus aureus inBovine Mastitis Implications for Treatment Strategies

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Staphylococcus aureus is one of the most prominent nosocomial, community and farm acquired bacterial infections among animals and human population. The aim of our study was to identify and characterize antimicrobial resistance (AMR) among *Staphylococcus aureus* (*S. aureus*) isolated from bovine mastitis and to further identify the antimicrobial associated genes. Out of sixty (60) mastitis milk samples collected, Staphylococcus was isolated in pure culture from 50 samples on mannitol salt agar. Antimicrobial susceptibility testing for 11 antimicrobials was performed andconventional PCR was used to detect the presence of the *nuc* gene, mecA (encoding methicillin resistance), aacA-aphD (aminoglycoside resistance), tetk, tetM (tetracycline resistance), erm(A), erm(C) (macrolide-lincosamide-streptogramin B resistance) genes. Of the 50 isolates obtained

in pure culture on Mannitol Salt Agar, 32 (53.33%) were confirmed to be *S. aureus* via PCR of the *nuc* gene. Among *S. aureus*, the majority of the isolates harboured the tetracycline (tet) resistant gene (63.33%), followed by mecA responsible for methicillin resistance, which was detected in 36.66% of *S. aureus* isolates. Amino glycoside resistance (aacA-aphD) was detected at a comparatively lower rate (6.66%) and none of the *S. aureus* strain was found positive for macrolide-lincosamide- streptogramin B resistance (ermC) erm(A). Additionally, antimicrobial susceptibility study of S. aureus against 11 antimicrobial discs showed maximum resistance to oxytetracycline, penicillin, and fluoroquinolone groups. The high occurrence rate of *S. aureus* harbouring genes for virulence factors and antimicrobial resistance needs appropriate strategies to control mastitis in bovines and the pathogen spread to the human population.

Key Words: *Staphylococcus aureus, bovine mastitis, Antimicrobial Resistance*

AFTEFS/SKUAST-K/VET & FIS/2024/28

Prediction of Genetic Merit in Sheep Using Artificial Intelligence

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As the amount of data on farms grows, it is important to evaluate the potential of artificial intelligence for making farming predictions. Considering all this, this study was undertaken to evaluate various machine learning (ML) algorithms using 52-year data for sheep. Data preparation was done before analysis. Breeding values were estimated using Best Linear Unbiased Prediction. 12 ML algorithms were evaluated for their ability to predict the breeding values. The variance inflation factor for all features selected through principal component analysis (PCA) was 1. The correlation coefficients between true and predicted values for artificial neural networks, Bayesian ridge regression, classification and regression trees, gradient boosting algorithm, K nearest neighbors, multivariate adaptive regression splines (MARS) algorithm, polynomial regression, principal component regression (PCR), random forests, support vector machines, XGBoost algorithm were 0.852, 0.742, 0.869, 0.915, 0.781, 0.746, 0.742, 0.746, 0.917, 0.777, 0.915 respectively for breeding value prediction. Random forests had the highest correlation coefficients. Among the prediction equations generated using OLS, the highest coefficient of determination was 0.569. A total of 12 machine

learning models were developed from the prediction of breeding values in sheep in the present study. Itmay be said that machine learning techniques can perform predictions with reasonable accuracies and can thus be viable alternatives to conventional strategies for breeding value prediction.

Keywords: *Breeding Value, Artificial Intelligence, Machine Learning, Artificial Neural Networks*

AFTEFS/SKUAST-K/VET & FIS/2024/29

Effects of Antibiotic, Synbiotic and Thyme Essential Oil on Serum Biochemical Parametersof Broiler Chickens

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A feeding trial was conducted to investigate the effects of amoxicillin, synbiotic and thyme essential oil as feed additives on serum biochemical parameters in broiler chickens. A total of 200 Cobb broiler chicks of one week of age were randomly distributed into 5 dietary treatment groups: T_0 (Basal diet only); T_1 (Basal diet + amoxicillin @200mg/kg); T_2 (Basal diet + synbiotic@100mg/kg), T_3 (Basal diet + thyme essential oil @2ml/kg); T_4 (Basal diet + synbiotic @50mg/kg + thyme essential oil @1ml/kg). Each group contained 4 replicates with 10 birds for 35 days period. The results revealed a significant decrease in the parameters like triglyceride, total cholesterol, SGPT, SGOT and ALP in T_4 treatment group as compared to control group (T_0)and significant increase in HDL (T_3), total protein, albumin, and globulin in T_4 treatment group than control group (T_0). In antibiotic (amoxicillin) supplemented group (T_1) there was drastic increase in LDL, ALP, SGPT, SGOT, total protein, albumin and decrease in globulin compared to control group (T_0). In conclusion, supplementation of synbiotic, thyme essential oil alone or in combination can be beneficial in broiler chickens.

Keywords*: Antibiotic, Biochemical, Broilers, Essential oil, Synbiotic.*

AFTEFS/SKUAST-K/VET & FIS/2024/30

EFFECT OF SUPPLEMENTATION OF SPIRULINA (*ARTHROSPIRA PLATENSIS*) POWDER AS FEED ADDITIVE ON THE PERFORMANCE OFBROILER CHICKS

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A study was conducted to investigate the use of Spirulina powder (*Arthrospira platensis*) in broiler ration as a feed additive on performance of broiler chicks. A feeding trial of six weeks was conducted, using 150, one day old broiler chicks (VenCobb), randomly distributed in completely randomized design. The broiler chicks were divided into five dietary treatments groups with 3 replicates of 10 chicks each to make sure uniformity in various treatment groups. The T_1 group was fed on basal diet without feed additive and kept as control. The T_2, T_3, T_4 and T_5 group were supplemented with Spirulina powder @ 0.50%, 0.75%, 1.0% and 1.25% in the basal broiler starter and finisher ration, respectively. Statistical analysis of data revealed non-significant effect of Spirulina powder on dressing weight percent, eviscerated weight percent and on per cent liver weight, heart weight, gizzard weight and giblet weight. Ultimately, from the perusal of the results, it was concluded that the supplementation of Spirulina powder had no beneficial effect on meat production in the present research.

Keywords: *Broiler, carcass characteristics, dressed yield, feed additive, Spirulina powder.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/2024/31

Contribution of Dairy Sector in Rural Communities and its Challenges

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Milk and dairy products are the integral component of daily diet of Indians and these provide the essential nutrients for growth and development. Dairy farms are increasing in the urban and rural areas to meet the increasing demand of milk and milk products. National Dairy Development Board (NDDB) has spearheaded the White Revolution in India and it has substantial contribution in GDP of India. India contributes more than 22 % in global milk production and its annual production is around 200 million metric tons. More than 80 million people in India are employed directly or indirectly in dairy sector and is dominated by the small and marginal farmers of rural areas. Rural women significantly contribute in dairy farming and it promotes the gender equality in rural communities. Dairy farming improves the socio-economic status of rural people by ensuring the regular cash flow in rural households. Traditional system of dairy sector is the backbone of milk production in rural areas of the country. Rural dairy farming is mainly family managed operation where milk production is done along with agricultural activities.

Dairy farming in India faces the challenges that effect quality and productivity of milk. Rural communities use the crop residue as fodder which does not provide optimal nutrition to the cattle required for maximum milk yield. Limited veterinary care and traditional breeding practices are also responsible for low milk production. Milk production generally reduces during summer season due to limited availability of fodder and water. Seasonal barrier impacts the milk supply chain and income of the farmers. There is great need to develop the organised dairy farming system on large scale to meet the enhanced demand of milk. Collaborative efforts of policy makers, researchers and farmers in integrated dairy farming system will open the new door for production of good quality milk. Dairy sector not only supports the economic growth but also contribute to ensure food security and providing good public health.

Keywords: *Dairy Sector, Traditional System, Milk Yield, Policy Makers, Economic Growth.*

AFTEFS/SKUAST-K/VET & FIS/2024/32

Optimising polyethylene glycol based exosome isolation from seminal plasma in sheep

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Seminal plasma exosomes (SPEs) are lipid bilayer nanovesicles of size 30-150 nm and are potential semen fertility and cryotolerance biomarkers. Supplementation of SPEs from high quality semen have potential to improve the low quality semen. Isolation and characterization is the primary requirement to explore their potential. Commercial kits for isolation are expensive and traditional methods like ultracentrifugation can be very laborious and time consuming. The aim of the study was to investigate whether PEG method (polyethylene glycol) is efficient in isolation of SPEs compared to the gold standard ultracentrifugation method. We used PEG 8000 at 10%, 20%, 30% and 40% concentration to optimise PEG based SPEs isolation in sheep. Characterization of isolated SPEs was done by scanning electron microscopy (SEM), dynamic light scattering (DLS) and nanodrop spectrophotometer protein quantification. SEM confirmed the isolation of spherical shaped vesicles of expected size range of 30-300 nm in both methods. Average particle size measured by DLS was 115.03 nm, 134.03 nm, 144.70 nm, 125.32 nm, and 154.87 nm in ultracentrifugation, 40%, 30%, 20% and 10 % PEG isolation methods respectively. Zeta potential was lower negative for ultracentrifugation (-5.8 mV) than PEG isolated exosomes (-9.7 mV). Average protein concentration measured was 19.605 mg/ml and 19.268 mg/ml in ultracentrifugation and PEG precipitation respectively. Higher PEG

concentrations can isolate smaller size vesicles. More negative zeta potential in PEG method suggests better SPEs integrity than UC method. Further, SPEs yield was similar in PEG and UC method. Hence, it can be concluded that PEG based precipitation is reliable, fast and affordable method and can be adopted for SPEs isolation. Further, results of the study suggests 20% PEG yielded SPEs of more proper size, integrity, and quantity among other PEG concentrations.

Keywords*: polyethylene glycol precipitation, ultracentrifugation, seminal exosomes, scanning electron microscopy*

AFTEFS/SKUAST-K/VET & FIS/2024/33

Production of high genetic merit cows by use of sexed semen at MLRI, Manasbal

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Livestock sector contributes 5.62% to the GDP of J&K and 31% to the GDP contribution of Agriculture and allied sectors including forestry. The major contribution of livestock sector is from dairy industry and around 25.94 Lakh MT milk is produced in J&K annually which amounts to a turnover of Rs. 9080 Cr. The annual milk production accounts for 1.23% of total milk produced in country. The average lactation yield per animal in J&K is 2380 Litres, which can be increased manifolds by introduction of high genetic merit Jersy and HF cows. MLRI Manasbal, A premier institute dealing with the research in dairy sector in Jammu & Kashmir has introduced the use of high genetic merit sexed and conventional semen with an aim to propagate the highly valuable germplasm at a fairly fast rate tilting the theoretical 50-50 male female ratio highly in female side. Results so far have revealed a highly commendable success in terms of conception rate of more than 50% which is slightly more than the conventional semen of same bulls, while female ratio is again more than 90%.

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Therapeutic efficacy of lugol's iodine in infectious repeat breeding

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The study was conducted to evaluate the therapeutic efficacy of Lugol's iodine at MLRI, Manasbal to develop an economical and efficient alternative therapeutic regimen to antibiotics for the treatment of infectious repeat breeding in dairy cattle. Eighteen Jersy cows in their 2nd and 3rd lactations were selected and divided in three groups of 6 cows each. Cows in group I didn't receive any treatment and were inseminated twice (12 hours apart) on done on the day of estrus. Group II and Group III cows were given 0.3% of lugols iodine @30 ml and Lenovo AP @ 60 ml IU for 3 days, respectively and inseminated by double AI(12 hours apart) on next heat. Pregnancy diagnosis was done 60 days after AI by PR examination. Results revealed that recovery rate was 16.66, 66.66 and 100 percent in groups I,II and III, respectively, while conception rate was 16.66, 33.33 and 66.66, percent in the three groups. It was concluded that lugol's iodine can safely be used as an adjutant to antibiotic therapy in infectious repeat breeding, while complete replacement of intrauterine antibiotics by lugol's iodine may not be possible because of low pregnancy rates.

AFTEFS/SKUAST-K/VET & FIS/2024/35

Optimization of procedures for in vitro embryo production in Jersey cattle

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Rapid propagation of elite dairy germplasm has reached to a critical level in Indian subcontinent, considering low per animal productivity that has been primarily ascribed to absence of intensive selection scenario and indiscriminate breeding and/or culling. The huge cattle population exerts

alarming completion with available natural resources for the ever increasing human population. This necessitated the development/refinement of assisted reproductive techniques like MOET-IVF, cloning, twinning, AI, etc. in dairy cattle so that the superior quality animals are multiplied rapidly for faster establishment of the dairy replacement stock. In this context, the present study was envisaged for optimization of procedures for in vitro production of Jersey cattle embryos. Further development of biotechnologies for producing transgenic offspring and gene editing adds oil to the flame. The current study was planned/designed for optimization of the protocols for in vitro embryo production in Jersey cattle, considering the fact that Jersey breed has proved most economical in terms of adaptation and economics in Kashmir valley, unlike in other parts of the country where the focus has been on buffalo and other dairy cattle breeds. For this purpose, oocytes were retrieved from the ovaries (PM samples) by flushing in the standard flushing medium. The retrieved oocytes were graded and good quality cumulus-oocyte complexes (COCs), grade A and B, were subjected to *in vitro* maturation (IVM), in optimized maturation media under optimum incubation conditions (5% CO_2 and 5%O_2 at 38.5C). This was followed by in vitro fertilization (IVF), after 22h of culture. IVF was performed by using cryopreserved HGM Jersey bull semen, obtained from Genus ABS, India. The presumed zygotes were subjected to in vitro culture in defined medium after 18h of IVF in 100µl culture drops under mineral oil layer. IVC was carried out in embryo incubator for another 4-5 days at 38.5C under 5% CO_2 and 5%O_2 and 90% N_2 gases. Preliminary data revealed 65-70% IVM percentage with subsequent presumed zygotes percentage of 35-40%, yielding blastocyts (d5-6) at 20% level. This is the first such study in the country to the best of our knowledge.

AFTEFS/SKUAST-K/VET & FIS/2024/36

Induction of embryonic stem cell differentiation to germ cells (sperm & oocytes) under BMP4 stimulation

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Bone Morphogenetic Proteins (BMP) have been postulated to exert their effect towards differentiation of the pluripotent/totipotent cells into germline as well as other somatic cells during early embryonic development. The present study

was envisaged, in this context, to investigate the effects of BMP4 stimulation on differentiation of buffalo embryonic stem (ES) cells into germ lineage cells. For this purpose, ES cells were subjected to *in vitro* differentiation in floating (3-dimensional) and adherent cultures, under graded/different BMP4 concentration and for different culture intervals, so as to elucidate the optimal conditions for germ cell differentiation. ES cells used for the study were from the bubaline ES cell lines (48+XX), developed specifically for the study. The progress towards directed differentiation was examined through quantification of the genes and proteins associated with germ cell lineage, but otherwise absent in ES cell state, as well as the specific expression states of the germ cells vis-à-vis, sperm and oocytes. qPCR analysis revealed that BMP4 induced expression of germ line specific genes like DAZL, VASA, PLZF (Primordial germ cell specific genes), SYCP3, MLH1, TNP1/2 and PRM3 (Meiotic-markers), BOULE, TEKT1 (Spermatocyte markers) and GDF9, ZP2 and ZP3 (oocyte markers). The maximum induction of the genes was observed at 50ng/ml concentration for a culture period of 14 days in both floating (3D) and adherent cultures. Immunocytochemical analysis of embryoid bodies (EBs) and monolayer adherent cultures revealed expression of PGC- (c-KIT, DAZL and VASA); Meiotic- (SYCP3, MLH1 and PROTAMINE1); Spermatocyte- (ACROSIN and HAPRIN); and Oocyte- markers (GDF9 and ZP4). The differentiation cultures showed embryonic development and progressed through 2-cell, 4-cell, 8-cell and blastocyst-like structures. Global DNA methylation analysis showed significantly ($p < 0.05$) decreased levels of 5-methyl-2- deoxycytidine in EBs obtained in optimum differentiation medium. The expression of meiotic markers coupled with expression of spermatocyte and oocyte markers is an indication of post-meiotic progression into spermatogenesis and oogenesis, respectively.

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Development of nanoparticle based on green synthesis for sustainable aquaculture

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Development that balances the requirements of the present with those of future generations is referred to as sustainable development. The physical, chemical, and biosynthetic pathways are the most often used synthetic routes

for producing nanoparticles. Chemical processes can be extremely expensive and use hazardous and harmful chemicals, which can lead to a variety of environmental issues. On the other hand, green synthesis is safe, biocompatible, and friendly to the environment. Algae, fungi, bacteria, and plants have all been used in the creation of green synthesis. On the other hand, the green synthesis of NPs using plants is attracting the attention of scientists worldwide these days. Plant-derived NPs are also less likely to have detrimental effects on human health than NPs produced chemically. Nanotechnology applications in the fish processing industry can also be utilized to detect fish bacteria in packaging, produce stronger flavors, colour quality, and safety by increasing the protection properties. The particle size of minerals as feed additives in nanoparticle form is claimed to be smaller than 100 nanometres, so they can pass through the stomach wall and into body cells more quickly than ordinary minerals with larger particle size.

Keywords: *Nanotechnology, Nanoparticles, Aquaculture, Green Synthesis*

AFTEFS/SKUAST-K/VET & FIS/ 2024/38

Programmed Cell Death pathways in Bovine Mammary Epithelial Cells reveals Defective Efferocytosis as a potential factor for the development of Mammary Gland Fibrosis

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Bovine mammary gland infections & fibrosis causes huge economic losses in dairy cattle leading to decrease in milk production. Recent studies have focused on imbalance in generation and degradation of myofibroblasts and fibroblasts in the extracellular matrix, however, role of epithelial cells in fibrosis is still in its infancy stage. Our aim was to explore the correlation between mammary gland infections and fibrosis. We will address the RNA-Seq transcriptomics from bMECs with *E. coli* and *in vivo* bovine fibrosis tissue to study the cell death mechanisms in bMECs and fibrosis development. *E. coli* triggers mammary cell apoptosis through an extrinsic mechanism involving caspase 3 and 8. Enhanced expression of apoptosis regulators, cell signalling and adhesion, actin cytoskeleton organization, extracellular matrix and tissue development, oxidative stress modulators, DNA damage response and steroid

hormone metabolism point to an active apoptotic process in infected cells. We found that targeted epithelial cell injury led to apoptosis, however, failure of apoptotic cell clearance (defective efferocytosis) and concomitant increase in the release of necrotic cell contents triggers a heightened inflammatory response. The infective nature of *E. coli*, coupled with downregulation of efferocytosis receptors (MERTK, CD36, CD14, IL-10) in response to apoptosis upon infection will ultimately lead to dangerous accumulation of dead cell debris laden with DAMPs and contribute to the development of mammary fibrosis in the long run. DEGs and pathways support the functions of ECM-receptor interaction, focal adhesion, estrogen signalling, IL-17 pathway & ribosome pathway during mammary fibrosis. We hypothesize for the first time a novel link between bacterial infection, impaired cellular clearance mechanisms, and fibrotic tissue remodeling. The fibrotic phenotype of mammary gland tissue in bovines was positively correlated with defective apoptotic body clearance suggesting that inhibiting apoptotic body accumulation may be a potential therapeutic approach to alleviate mammary fibrosis.

Keywords: *Bovine mammary epithelial cells; E. coli; RNA-seq; apoptosis; fibrosis; efferocytosis*

AFTEFS/SKUAST-K/VET & FIS/ 2024/39

An Unusual Case of Adrenal Tumour in a Female Gaddi Dog

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This case report describes a rare occurrence of an adrenal tumour in a 13 year old female Gaddi dog which was presented with a history of anorexia, intermittent vomition and lethargy. Blood examination revealed neutrophilic leukocytosis with a mild left shift (TLC-24200/uL, neutrophil count- 20812/ uL), thrombocytopenia (74000 x 10^3/uL). Renal function test parameters like blood urea nitrogen (BUN (148 mg/dL), creatinine (7.6 mg/dL), phosphorus (13.1 mg/dL) and Liver function test parameters like ALT (173 U/L), AST (431 U/L), ALKP (214 U/L), GGT (16 U/L) were increased. Microscopic urine examination revealed mild to moderate number of pus cells. Ultrasonography of abdomen revealed a large multi-septated area containing echogenic fluid at the cranio-dorsal portion of the neck of urinary bladder. Necropsy examination showed multifocal necrotic areas in the liver with cirrhosis, renal infarct in

both the kidneys, gastric congestion with linear ulcers, intestinal congestion, hemorrhagic cystitis, hemorrhagic pancreatitis, splenic congestion and a large 20 x 16 cm mass in the abdominal cavity attached with mesentry. Visceral surface of mass consisted of abundant pus and the wall lined by multifocal to coalescing proliferative polyp of 3-7 mm in size. Histopathological examination of this tissue mass revealed the features of the tumourof adrenal origin i.e., adrenal cortical carcinoma.

Key words: *Neutrophillic Leukocytosis, Adrenal carcinoma, Necropsy, Renal function test*

AFTEFS/SKUAST-K/VET & FIS/ 2024/40

Trace mineral profiles in crossbred cattle suffering from post-partum anestrous in Kashmir valley

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The study was undertaken to estimate trace mineral profiles in blood of cross bred cows in Kashmir valley, exhibiting postpartum anestrum. 36 crossbred dairy cows presented at referral veterinary hospital, Veterinary Clinical Complex, Faculty of Veterinary Sciences and Animal Husbandry, with the history of anestrum, were subjected to two reproductive ultrasonographic examinations, 10 days apart. Blood sampling was carried out on days 0 (the date of presentation of animal), 21 (one cycle length) and day 60 of oral mineral supplementation. Plasma samples stored at -20°C, were digested using triple distilled water, Nitric acid, Hypochloric acid and heating in digestion flasks on heat plate upto formation of fumes. Plasma copper (Cu), Zinc (Zn), Iron (Fe), Cobalt (Co) and Manganese (Mn) levels were estimated in all the animals. The plasma levels, in µg/ml, for these trace minerals, respectively, were 0.5±0.0.06, 2.2±0.14, 2.53±0.44, 0.30±0.06 and 0.22±0.01. 60 days supplementation of chelated mineral mixture raised plasma Zn and Fe levels significantly ($p<0.05$) while other three trace mineral levels were not affected.

It can be concluded that deficiencies in trace minerals might lead to postpartum anestrum in dairy crossbred cows and supplementation of trace minerals in the form of chelated mineral mixtures @50g/animals/day for at least 60 days brings cyclicity in about 50% of cows suffering from postpartum anestrus in our region.

Key words: *anestrum, cross bred cow, supplementation, trace minerals*

AFTEFS/SKUAST-K/VET & FIS/ 2024/41

Effect of Herbal Extract and Enzyme Blend Supplementation on Zootechnical Parameters in Broiler Chicken

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Present study was planned to assess the impact of alcoholic extract of an herbal mixture alone and/or in combination of exogenous enzymes as an alternative of antibiotic growth promoters (AGPs) on growth performance and carcass characteristics of broiler chickens production. A 42 days trial was conducted on 250 day-old broiler chicks, those were randomly divided into five dietary groups (NC, PC, HE, EE and HEEE) along with five replications. 05 dietary treatments i.e. Basal diet (NC), Basal diet + Antibiotic growth promoter (PC), Basal diet + Alcoholic extract of 1.5% Herbal mixture (HE), Basal diet + 0.03% Exogenous enzymes (EE) and Basal diet + Alcoholic extract of 1.5% Herbal mixture + 0.03% Exogenous enzymes (HEEE). After 42 days of trial, the mean body weight of NC, PC, HE, EE and HEEE group birds was 2225.00, 2942.20, 2601.40s, 2549.20 and 2697.80 g, respectively. The average body weight, average daily gain (ADG) and growth rate of HE, EE and HEEE group birds were significantly ($P<0.05$) higher than NC, however lower than PC group birds. Overall average feed consumption data revealed that HEEE group birds feed intake was similar to NC group, which was significantly ($P<0.05$) higher in

comparison to PC, HE and EE group birds feed intake. Gain:Feed ratio of antibiotic supplemented birds was higher than other groups and the ratio in EE groups was lower than HE and HEEE groups. Herbal extract and enzymes either alone or in combination had significantly ($P<0.05$) higher energy efficiency ratio (EER), protein efficiency ratio (PER) and performance index (PI) in comparison to NC and lower than PC groups. Finally concluded that combination of alcoholic extract of 1.5% herbal mixtures with 0.03% exogenous enzymes have potential to improve overall performance of broilers chickens.

Keywords: *Broiler, enzyme, herbal extract, zootechnical*

AFTEFS/SKUAST-K/VET & FIS/ 2024/42

Trace mineral profiles in crossbred cattle suffering from post-partum anestrous in Kashmir valley

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36 crossbred dairy cows presented at Veterinary Clinical Complex, with the history of anestrum, were subjected to two reproductive ultrasonographic examinations, 10 days apart. Blood sampling was carried out on days 0 (the date of presentation of animal), 21 (one cycle length) and day 60 of oral mineral supplementation. Plasma samples stored at -20°C, were digested using triple distilled water, Nitric acid, Hypochloric acid and heating in digestion flasks on heat plate upto formation of fumes. Plasma copper (Cu), Zinc (Zn), Iron (Fe), Cobalt (Co) and Manganese (Mn) levels were estimated in all the animals. The plasma levels, in µg/ml, for these trace minerals, respectively, were 0.5±0.0.06, 2.2±0.14, 2.53±0.44, 0.30±0.06 and 0.22±0.01. 60 days supplementation of chelated mineral mixture raised plasma Zn and Fe levels significantly ($p<0.05$) while other three trace mineral levels were not affected. It can be concluded that deficiencies in trace minerals might lead to postpartum anestrum in dairy crossbred cows and supplementation of trace minerals in the form of chelated mineral mixtures @50g/animals/day for at least 60 days brings cyclicity in about 50% of cows suffering from postpartum anestrus in our region.

Key words: *anestrum, cross bred cow, supplementation, trace minerals*

AFTEFS/SKUAST-K/VET & FIS/ 2024/43

Impact of seasons on anaerobic digestion of organic waste for biogas production

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Anaerobic digestion is an effective method for producing biogas from a variety of organic wastes, including cattle dung, rice straw, poultry waste, sewage sludge and leaf litter of neem. This system offers several distinct advantages, including optimizing community energy usage, enhancing the ecology of rural areas, improving health by reducing pathogens, and providing effective waste management. Although the composition of the biogas produced by anaerobic digestion comprises methane and carbon dioxide make up the majority of it, along with a small amount of trace gases. By using all these organic substrates in 5 different treatments, estimated organic carbon content, total volatile fatty acids, total solids and biogas production in both summer and winter seasons for ten weeks duration. The results indicated that organic carbon content was highest in the treatment using neem leaf litter in the influent during the winter season and in the effluent during the summer season. Total volatile fatty acids were observed to be highest in the treatment that combined all additives in both seasons. Total solids were highest in the treatment containing poultry waste across both seasons, while biogas production was highest in the treatment using sewage sludge in both the winter and summer seasons.

Keywords: *Anaerobic digestion, biogas production, organic waste, seasons, waste management.*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/ 2024/44

Effect of Dietary Incorporation of Rumen Protected Amino Acids on Milk Production and Serum Biochemical Parameters of Transition Murrah Buffaloes

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A study was conducted to discern the effect of dietary incorporation of rumen protected methionine (RPM), lysine (RPL) and choline (RPC) on milk production, somatic cell counts and serum biochemical parameters of transition Murrah buffaloes. Based on previous lactation milk yield and body weight, 20 buffaloes (2nd to 4th lactation) in their third trimester were divided into four groups and fed as follows, Group I (control): basal diet consisting of wheat straw *ad lib+* green fodder + concentrate mixture as per ICAR (2013) feeding standard; Group II: basal diet supplemented with 7g RPM + 15g RPL; Group III: basal diet supplemented with 50g RPC and Group IV: basal diet supplemented with 7g RPM + 15g RPL + 50g RPC. Blood samples were collected on -90, -45, 0, +45 and +90 days of parturition. The milk yield and milk composition was recorded at weekly intervals. The average milk yield (kg/day) for Group I, II, III and IV was 10.96 ±0.66, 11.25 ± 0.89, 12.34 ± 0.45 and 12.58 ±0.76, respectively. Although, there was 2.64, 12.59 and 14.78% increase in milk yield in Group II, III and IV, respectively as compared to control but the increased in milk yield was non-significant. However, the values of 6% FCM, SCM, ECM and milk energy were higher ($P<0.05$) in buffaloes of groups III and IV. The values (%) of protein, fat, lactose and total solids in the respective groups were 3.66, 6.86, 4.59, 15.84 (Group I); 3.78, 7.69, 4.67, 16.80 (Group II); 3.73, 7.08, 4.63, 16.11 (Group III) and 3.90, 7.85, 4.81, 17.12 (Group IV). Percentage of milk protein, fat, lactose and total solids was higher ($P<0.05$) in buffaloes of group IV in comparison to control group. The somatic cell count (10^3cells/ml) recorded were in normal range for all the buffaloes indicating no mastitis case during the feeding trial. Supplementation of RPM, RPL and RPC reduced levels of urea, cholesterol, triglycerides and VLDL but other haemato- biochemical parameters were not affected. It can be inferred from the study that supplementation of RPM, RPL and RPC in buffaloes could improve milk production and blood lipid profile.

Keywords: *Methionine, Lysine, Choline, Murrah buffaloes*

AFTEFS/SKUAST-K/VET & FIS/ 2024/45

Detection and Isolation of Bovine Coronavirus in Hisar (Haryana)

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Bovine Coronavirus (BoCoV) is a causative agent of enteric and respiratory disease in cattle. BoCoV is a single-stranded positive-sense RNA virus with a lipid envelope belonging to the order *Nidovirales*, family *Coronaviridae*, and genus *Betacoronavirus*. BoCoV is related with an economic burden in both developed and developing countries. We collected rectal/nasopharyngeal swabs from 262 cattle in and around Hisar (Haryana). The virus was identified by viral genome detection by quantitative real-time PCR (qRT-PCR). The prevalence of BoCoV was observed to be 3.5%. The samples positive for BoCoV with a cT value of <30 were also subjected to virus isolation in NLBK cells. The virus isolation was successful in 3 out of the 8 positive samples. This study provides primary insight on the prevalence of BoCoV in Hisar.

Keywords: *Isolation, PCR, enteric disease, respiratory disease, nasopharyngeal*

Study on Modulation of Toll Like Receptor-4 Mediated Inflammation in Bovine Mammary Epithelial Cells Using Artemesia absinthium and Curcuma longa

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Mastitis is the most prevalent disease of bovines imposing a great economic set back and a public health problem worldwide. Antibiotic resistance in both animals and humans as a result of large use of antibiotics is increasing at an alarming level. To combat this menace, scientists are researching for the development of plant based medicine which have more sidebenefits and less side-effects in comparison to the synthetic drugs. Ethnoveterinary medicine has been used to treat a number of ailments of animals including mastitis since eons. Artemesia absinthium and Curcuma longa are the two medicinal plant species which are known to possess significant anti-inflammatory, antibacterial, antiparsitic and antioxidative properties. In the current study, we evaluated hexanic and ethanolic extracts of two plants viz A. absinthium and C. longa for their antiinflammatory and antioxidative role in LPS induced inflammation in Buffalo Mammary Epithelial Cell (BuMECs). We found that pretreatment with the extracts of both the plants downregulated the expression of proinflammatory cytokine, TNFα via TLR4/NFκB mediated signaling pathway. However, IL-6 was downregulated in only hexanic C. longa pretreated group. Significant upregulation of NRF2 mRNA expression was seen in all treated groups except hexanic A. absinthium pretreated group. Phytochemical screening of the extracts showed the presence of terpenoids, phenols, tannins and flavonoids in the extracts which was further screened in GC-MS/MS or tandem MS analysis. GC-MS/MS study of the extracts revealed the presence of important sesqueterpenoids, phenolics and some quinoxaline as bioactive phytoconstituents in the extracts. Three sesqueterpenoids viz Bourbonene 2631, Eudalene and Capparatriene were found for the first time in A.absinthium. These results suggest that A. absinthium and C. longa protect BuMECs from LPS induced inflammation and oxidant insult which might be due to presence of bioactive compounds like terpenoids, phenolics and quinoxaline compounds.

Keywords:- Mastitis, BuMECs, ROS, TLR4, Inflammation, LPS, Oxidative stress, Artemesia absinthium, Curcuma longa, GC-MS/MS

AFTEFS/SKUAST-K/VET & FIS/ 2024/47

Differential Methylation of the Mitogenome with Selection for Improved Growth in Male Nile Tilapia (*Oreochromis niloticus*)

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Epigenetic modifications of mitochondrial DNA (mtDNA) are crucial for regulating mitochondrial function, and affect energy production, apoptosis, and metabolism. All these biological processes have a direct impact on somatic growth, which is a key trait in aquaculture. In the present study, we investigated the epigenetic modifications of the mitogenome in Nile tilapia (*Oreochromis niloticus*), which is one of the most important farmed fish species worldwide. Three key methylation marks were analysed: 4-methylcytosine (4mC), 5-methylcytosine (5mC) and 6-methyladenine (6mA). A selective breeding program for improved growth was conducted up to the F3 generation, with both control and selected lines established. Fast muscle was collected from F3 control and selected males, and total DNA was isolated. Using nanopore sequencing with adaptive sampling for mitochondrial DNA, the samples were sequenced and the pod5 files were basecalled with Dorado v0.8.0. The bam files were processed with modkit v0.4.0 to generate methylation bed files. The total number of methylated positions in the F3 control and selected groups was 83 and 88 for 4mC, 94 and 109 for 5mC, and 173 and 158 for 6mA, respectively. Differential methylation analysis between control and selected fish (n=6) revealed 16 positions that were significantly hypermethylated in the mitogenome of selected males in the 4mC context. Furthermore, both hypermethylated and hypomethylated positions were observed across the mitogenome in the 5mC and 6mA contexts. The study indicates that epigenetic modifications may regulate mitochondrial gene

expression, influencing energy metabolism and growth in selectively bred Nile tilapia, suggesting a role for mtDNA epigenetics in fish domestication and breeding.

Keywords: *Nile tilapia; mtDNA; N4-methylcytosine; 5-methylcytosine; N6-methyladenine; Selective breeding.*

AFTEFS/SKUAST-K/VET & FIS/ 2024/48

Key Solution of Organic Agriculture: Fish Based Fertilizer

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Fisheries industry produce a significant quantity of fish waste. 30-70% of the original fish is fish waste (FW), depending on the species and technique of processing. Fish emulsion, fish hydrolysate/fish silage, fish compost, and digestate from anaerobic digestion/co-digestion are among the techniques utilized in processing of fish waste. About 30 g of minerals are included in each kg of fresh plant material in crop plants. A substantial portion of this quantity is made up of the six macronutrients nitrogen (N), phosphorous (P), potassium (K), calcium (Ca), magnesium (Mg), and sulphur (S). Both conventional organic and inorganic fertilizers can be replaced by fish-based fertilizer, which is rich in proteins, organic carbon, flavonoids, magnesium, potassium, phosphate, and sulphate, and free of antibiotics and antibiotic resistance genes. 60–70% of fish bones are made up of minerals, primarily Ca and P in the form of hydroxyapatite (Ca10(PO4)6(OH)2). Fish scales are particularly rich in N and also have P and Ca. Tissues from a few species of pelagic fish revealed that except N, the most prevalent components were Ca, P, K, Mg, sodium (Na), silicon (Si), and aluminium (Al), depending on the organ. Inland fish with average N-P-K values of 120:11:13 and marine fish with average N-P-K values of 130:16:11 were captured. Numerous research conducted in several nations and on commercial and non-commercial fish/FW based fertilizers show that they have a good effect on plant growth.

Key words: *Fish Waste (FW), Fish emulsion, Fish hydrolysate, Fish silage, fish based fertilizer*

SKUAST-Kashmir, AFTEFS and VITAL BIOTECH Education Group
AFTEFS/SKUAST-K/VET & FIS/ 2024/49

Evaluation of the Quality of Ready to Eat Pangasius Fish Fillets Chunks (Pangasius Hypopthalmus) in Masala Using Thermal Processing Technology

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A well-known Maharashtrian South Konkan dish, Pangasius Fillets chunks in masala medium, is made using pangasius fish (*Pangasius hypopthalmus*) in masala medium. The goal of the current study was to use flexible retortable pouches to optimize various F0 values of pangasius fillet chunks in masala. Similar heating and cooling lag factors were shown by heat penetration properties, despite the product being thermally treated at different lethality. The product processed at F0 value 7.37 and 8.12 had an Fh value of 13 and 16.5 minutes, respectively. Lethality was 7.37 and 8.12 minutes, respectively, with a total procedure time of 26.94 and 31.37 minutes. At F0 7.37 and 8.12 minutes, the corresponding cook values were 64.70 and 65.87 minutes. When the commercial sterility of thermally processed Pangasius fish fillet chunks masala in retortable pouch was evaluated, it was found that the thioglycolate broth tubes incubated at 55°C for 5 days and 37°C for 15 days did not exhibit any turbidity. This demonstrated that every procedure given was adequate to sterilize the product. Between the two samples, there were significant differences ($P<0.005$) in all instrumental texture parameters. The biochemical parameters indicated the permissible limit as well. The product processed at F0 7.37 min. had a higher quality rating based on the assessment of sensory qualities.

Key words: *Pangasius fillets chunks, F_0 value, Fh, cook value, commercial sterility*

AFTEFS/SKUAST-K/VET & FIS/ 2024/50

Increasing survivability, disease resistance and nutrient utilization in fishes using locally available plant leaf extracts

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In aquaculture, the plant extracts and their active compounds have been evaluated for improving growth performance, disease resistance and the overall physiological status of fishes. As Jammu & Kashmir is blessed with different fresh and dry fruit crops and is rich in other plant diversity as well. Collectively, it all opens up a broad horizon of using their leaf extracts for the development of aquaculture which includes increasing survivability, disease resistance and nutrient utilization. The leaf extract from the fruit tree, Plum (*Prunus domestica*), apricot (*Prunus armeniaca*), Peach (*Prunus persica*) have different pharmacological values like antimicrobial, antioxidant and analgesic effects. The leaf extracts from apple (*Malus spp*) contain an antioxidant called quercetin which improves, strengthens and protects the immune system and thereby helps in increasing survivability and disease resistance in fishes. The active constituents in willow leaves (Salix spp.) include salicin which is sometimes called "vegetable asprin", salicortin & other salicylic derivatives. Salicin since ancient times, has been recognized for its potent analgesic and anti-inflammatory properties making it a valuable remedy for overcoming the challenges of different diseases. The willow leaves have many potential health benefits which include antibacterial, antioxidant, analgesic and anti-inflammatory properties. The prospective application of using locally available leaf extracts in aquaculture feed is to check the survivability, disease resistance and nutrient utilization in fishes. The effective introduction of leaf extracts will help in reducing the bacterial infections which usually cause heavy mortalities in aquaculture sector and will also effectively replace the synthetic inorganic medicine application which usually leaves the residual effect in fishes. The potential of locally available leaf extracts and effective utility of their bioactive compounds could decisively be used for the progress of aquaculture.

Keywords: *Leaf extract, Feed, Fish, Survivability, Disease resistance, Nutrition*

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AFTEFS/SKUAST-K/VET & FIS/ 2024/51

Constraints on the Application of Drugs in Aquaculture Practices

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Aquaculture is the fastest-growing food sector in the world, plays a crucial role in the nutritional security of the world, and acts as a cheap protein source for the economically laggard peoples. As of today, because of these reasons, the demand for the fish has been tremendously increased, which leads to a higher production per unit area, which creates an outbreak of disease and tremendous loss in aquaculture because the high stocking density tends to cause stress in the environment. In contrast to mammalian therapeutics, the use of pharmaceutical substances is rather limited in fish. Aquaculture antimicrobials have a relatively limited market in agriculture-allied sectors because their application is limited and the approval process can be costly. As fish live in aquatic media, the use of drugs is limited depending upon the stability of the drug, and treating fish with medicated feed isn't sure. Even though prolonged application of antibacterial substances forms resistance in aquaculture and the human body also. The most widely used antibacterial in the industry is oxytetracycline due to its inexpensive cost and wide spectrum of activity. Since fish's intestinal tract absorbs oxytetracycline very poorly, the antibiotic must be given to them at a high dosage rate of 100–150 mg per kg of fish per day for 10–15 days. This results in a slow excretion of large amounts of the antibiotic, increasing the selective pressure that might result to the selection of oxytetracycline-resistant bacteria in the gastrointestinal and intestinal tracts.

Keywords: *Therapeutics, Drugs, antibacterial resistance, Aquaculture*

AFTEFS/SKUAST-K/VET & FIS/ 2024/52

Use of prebiotics in aquaculture

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In large-scale aquaculture, stressful conditions can lead to diseases, resulting in significant mortalities and economic losses. To mitigate these issues, sustainable and eco-friendly strategies are gaining attention, particularly the use of prebiotics. Defined by the International Scientific Association for Probiotics and Prebiotics (ISAPP) as substrates selectively utilized by host microorganisms to confer health benefits, prebiotics play a crucial role in enhancing fish health. They stimulate the innate immune system directly through interactions with receptors on macrophages and promote the growth of beneficial microbiota, which produce short-chain fatty acids (SCFAs) that further improve host health. Benefits observed in fish include restricted pathogen entry, enhanced nutrient utilization, improved immune function, and increased disease resistance. Commonly used prebiotics in aquaculture include fructooligosaccharides (FOS), mannanoligosaccharides (MOS), and inulin, among others. Their incorporation into diets offers a natural approach without the need for stringent precautions, potentially facilitating regulatory approval as feed additives. Despite associated costs, the benefits of improved production efficiency and reduced disease incidence can outweigh these expenses. As the aquaculture industry seeks to achieve sustainable and profitable production without reliance on antibiotics, further research is essential to optimize the use of prebiotics and synbiotics on an industrial scale, particularly through a deeper understanding of the gastrointestinal microbiome of cultured species.

Keywords: *prebiotics, health, synbiotics*

Unravelling the Interplay Between Non-Structural Protein (NS4) Of Bluetongue Virusand Glyceraldehyde-3-phosphate dehydrogenase (GAPDH)

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Bluetongue is a non-contagious, viral disease of domestic and wild ruminants transmitted by Culicoides species. It poses considerable losses to livestock health and the agricultural economy both directly and indirectly. It is mainly an arthropod disease which makes its controldifficult. BTV induces multiple clinical manifestations from asymptomatic to fatal haemorrhagicfever in different hosts. In the present study, the role of BTV NS4 protein was taken into consideration in the virus-host interface and the readily available Y2H compatible cDNA library from the homologous host sheep lung was used for screening the host proteins interacting with the NS4 protein of BTV. A reliable mating with mating efficiency of 3.3% was observed between NS4 bait and sheep lung library. On preliminary screening, blue colonies grew on DDO/X/A plates and were reduced on higher stringent media QDO/X/A agar plates. All positive colonies were PCR amplified and sequenced to eliminate redundant clones. Eighteen interacting partners of BTVNS4 were identified and three interacting proteins were selected for further validation in which GAPDH interacting protein was confirmed as one of the interacting prey proteins of the BTV NS4 segment. GAPDH is known to bind to AU-rich regions of certain RNA species and either stabilize or destabilize the mRNA and/or the process of translation, besidesthis downregulation of the GAPDH affects aerobic glycolysis in activated immune cells both in myeloid and lymphoid cells which hinders the process of immune activation.

Keywords: *Bluetongue virus, Non-structural protein, GAPDH.*

AFTEFS/SKUAST-K/VET & FIS/ 2024/54

Evaluation of antioxidant activity in buffalo, cow and goat milk of two different seasons in Haryana, India

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Dairy milk and its derivatives are potential sources of antioxidants and contribute to properties that promote health. The objective of this study is to assess the changes in antioxidant activity in accordance with the season and farm locations in Haryana. The antioxidant potential of milk samples was evaluated through two different methods: the FRAP assay and DPPH free radical scavenging activity. The FRAP level was significantly higher during the summer season, except in the case of buffalo milk. The levels were recorded at 70.00±4.22, 60.86±5.29, and 73.69±7.87 in the summer season and 72.64±8.22, 60.42±1.32, and 57.45±1.21 in the winter season for buffalo, cow, and goat milk, respectively. On the other hand, DPPH scavenging activity showed a higher trend in the summer season, but not significantly. DPPH levels were recorded at 19.12±2.53, 16.55±1.04, and 20.73±1.51 in the summer season for buffalo, cow, and goat milk samples, respectively. The reason could be attributed to an increase in antioxidative activity as an adaptation to heat stress conditions and variations in seasonal feed. The productivity and quality of milk from dairy animals change according to climatic conditions. Notably, significant differences were observed among locations, which could be linked to differences in the feeding management of farms. Buffalo milk possessed the highest antioxidant activity, with a FRAP value of 118.78±4.47 from Hisar and a DPPH value of 32.22±1.04 from Rohtak. On the other hand, the lowest FRAP values were recorded at 62.67±3.10 in the cow milk of Gurugram and the lowest DPPH value at 6.27±0.34 in the goat milk of Hisar. So far, not much research has been conducted on this aspect in Haryana. Therefore, further investigations are required to evaluate the bioactivity and potential of diverse components found in dairy milk. This assessment will probably provide insight into the quality of milk and its effect on human consumers.

Keywords: *Antioxidant • Bioactivity • Dairy • DPPH • FRAP*

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AFTEFS/SKUAST-K/VET & FIS/ 2024/55

ETHNO-VETERINARY PRACTICES FOR CURING DIFFERENT AILMENTS OF LIVESTOCK BY LOCAL PEOPLE OF HAMIRPUR DISTRICT, HIMACHAL PRADESH

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Traditional medicines have been playing significant role in livestock health care management since long back to till date especially in remote area. A field survey was conducted to collect information for curing different ailments used by Gujjar, Sphered tribes and local people in Hamirpur district in Himachal Pradesh. During the survey 541 households were interviewed on the basis of pre-planned questionnaires designed.

A total 119 plant species belonging to 58 families have been documented to be common use for curing 68 different types of animal ailments by tribes and local people. The ailments are categorized into 15 illness categories based on the animal body system. The highest numbers of ethno-medicinal plants were recorded from Fabaceae followed by Asteraceae, Euphorbiaceae, Solanaceae, Acanthaceae, Moraceae and Poaceae. Leaf was the most commonly used part of the plant for the preparation of medicine followed by bark, whole plant, whole aerial part and seed/seed oil and fruit. *Achyranthes aspera*, *Cassia fistula*, *Pogostemon benghalensis* are the most important plant used to cure different ailment on the basis of use value index. As per value of Informant Consensus factor (FIC), diseases related to Digestive system, Reproductive system, Respiratory and Fever were the major ailments categories.

The study has identified new findings to cure different ailments of animal. Further, phytochemical and pharmacological investigation should be undertaken to assess the potential and effectiveness of the important plants on the basis of UV value. In the other hand, tribes and rural local people depends mainly on the natural remedies for their daily health care of their own as well as animals. So there is more need to work and document the traditional uses before they passes away from our society or community.

***Key words**: Ethno-veterinary, Livestock, Traditional, Household, Tribes and Community.*

AFTEFS/SKUAST-K/VET & FIS/ 2024/56

Socio-Economic Status of Scheduled Castes (SC) – A Case Study inAnta Block, Baran District, Rajasthan

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The current study is an attempt to probe into the socio-economic status of Scheduled Castes (SC) populations in Anta Block, Baran District, Rajasthan, keeping in view the identification of key obstacles to their socio-economic development. A structured questionnaire was prepared with data supplemented by secondary sources for 14 Gram Panchayats and 82 villages. Findings indicated that 21.2% of the local population identifies as SCs, with a gender distribution of 52.61% men and 47.38% women. The majority of the SC community is engaged in agriculture, where two-thirds are cultivators rather than agricultural laborers. The situation is dominated by small and marginal landholdings, with 60-65% of the households owning 2-5 bigha of land. More than 90 percent of SC beneficiaries own livestock, and average annual incomes range between Rs. 25,000 and Rs. 1,00,000. Bank deposits constitute a crucial source of financial provisions for a few SC households, though overall most SC households continue carrying enormous debts in agriculture. Education levels, particularly among women, are alarming, while unemployment shows high levels in this community. The major proportion of SC families resides in poor houses, mostly made of mud structure. The availability of higher education is very limited. This paper throws into relief the acute need for targeted government interventions to address the socio-economic challenges faced by the SC community and facilitate sustainable development initiatives.

Keywords: *Socio-Economic Status, Scheduled Castes, Anta Block, Agriculture, Sustainable Development*

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Nutraceuticals and functional foods

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Nutraceuticals and functional foods have increasingly been recognized to be important factors in health promotion and in the prevention of chronic diseases. Nutraceuticals are bioactive compounds from natural sources such as plants, animals, and microorganisms that provide human and health benefits to humans, besides their nutritional value. Functional foods are on the other hand enriched food products with specific ingredients to enhance their properties in health promotion. These foods provide necessary nutrients along with a health benefit towards the prevention of any disease conditions, including diseases of the cardiovascular system, diabetes mellitus, obesity, and neurodegenerative disorders. Some of the common nutraceuticals include vitamins, minerals, probiotics, antioxidants, and polyphenols, which mainly prevent oxidative stress and inflammation-both of them are associated with the development of chronic conditions. Increasing consumer demand for health-enhancing products has led to numerous research studies in identifying new nutraceuticals and functional foods to be developed. This area also speaks to the burgeoning arena of personalized nutrition, where the benefits of nutraceuticals will be tailored toward individual genetic makeup and lifestyle choices. There are promises of health benefits presented by nutraceuticals and functional foods; however, a number of issues such as regulatory approvals, standardization of bioactive compounds, and long-term clinical efficacy need to be overcome. Future development can further be tailored to scientifically validated health claims with the product type becoming part of mainstream diets and set forth to improve public health.

Keywords: *Nutraceuticals, functional foods, disease*

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Molecular Epidemiology of ESBL-Producing *Escherichia coli* in Poultry in Kashmir Himalayas, India

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The present study aimed to investigate the prevalence of extended-spectrum beta-lactamases (ESBL)-producing Escherichia coli in poultry across the Kashmir region, highlighting the challenge posed by ESBL in contributing to antibiotic resistance, which affects both animal and human health. By phenotypic and genotypic techniques, the study identified and characterized these isolates, particularly focusing on the blaTEM, blaCTX-M, and blaSHV genes. Given that poultry is a key reservoir for ESBL-producing bacteria, which are associated with challenging infections in humans, this study sought to ascertain the frequency of such bacteria in this region's poultry. The study was conducted from June to December 2023, wherein 100 fecal samples from poultry farms were collected and cultured on specialized ESBL screening agar, and the double disc synergy test was employed to confirm ESBL-producing E. coli presence. The findings indicated a 52% prevalence rate (52 out of 100 samples) of ESBL-producing E. coli. Further genetic analysis of these phenotypically confirmed ESBL producers revealed the presence of blaTEM in 27 (27%) isolates, blaCTX-M in 37 (37%) isolates, and blaSHV in 24 (24%) isolates. The CTX-M group-specific multiplex PCR assay identified 25 isolates belonging to the CTX-M-1 group and 14 to the CTX-M-2 group, while the CTX-M-9 group was absent in all isolates. Additionally, one blaTEM gene sample was cloned and sequenced, aligning with the known blaTEM-1 sequence in databases. This study underscores the critical need for stringent antibiotic control measures and enhanced hygiene and sanitation practices in animal husbandry to mitigate the risk posed by antibiotic-resistant pathogens.

Key Words: *E. coli, ESBL, Poultry, blaTEM, blaCTX-M, blaSHV, CTX-M*

Insect Venom and Toxinology: Understanding Mechanisms and Developing Therapeutics

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Insect venom, including bee and wasp venom, contains various toxins with significant therapeutic potential. Toxinology focuses on understanding the mechanisms of these toxins, such as bee venom, which comprises of components like melittin and phospholipase A2 (PLA2). Melittin disrupts cell membranes, activates secretory PLA2, and influences apoptosis through caspase-3 and Bcl-2 pathways. It also inhibits calmodulin, affecting cancer cell growth and interacting with p38 MAPK pathway and NF-kB, which modulates inflammation and tumour progression. Wasp venom, particularly mastoparan, destabilizes membranes and stimulates histamine release, impacting cancer cell viability and mitochondrial membranes. Additionally, various venoms, including those from fire ants and blister beetles, show anti-cancer, anti-inflammatory, and anti-viral properties. For instance, antibacterial and antifungal actions of melittin are attributed to membrane disruption and apoptosis activation. Venom components like solenopsin and cantharidin demonstrate anti-angiogenic and anti-proliferative effects, while hyaluronidase shows anti-cancer activity. These venoms also offer the potential for treating diabetes by stimulating insulin release. Furthermore, bee venom provides radioprotective benefits by neutralizing free radicals and protecting against chromosomal damage and radiation-induced inflammation. Overall, insect venoms demonstrate diverse biological activities that can be harnessed for developing novel therapeutics. Ongoing research continues to elucidate the antimicrobial activity of these toxins from various insect groups, supporting the development of therapeutic drugs that may play a pivotal role in fostering a sustainable, secure, and healthy future for humanity.

Keywords: *Melittin. Phospholipase A2 (PLA2). Apoptosis Pathways. Anti-Cancer Properties. Therapeutic Drug Development.*

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Preservation using laboratory waste thermocol (expanded polystyrene). An innovative approach

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Plastination is a technique to preserve bodies or body parts in biological science. Curable polymers used in plastination generally include silicone, epoxy resin and polyester-copolymer. In the present study, a 15 % solution made from thermocol (expanded polystyrene) was used as plastination material. Organs including human heart, liver, uterus and brain, gizzard, liver, lungs, and heart from different domestic animals were collected and plastinated by this technique. The average shrinkage percentage was higher in softer tissue (brain) than the other plastinated tissues (heart, gizzard etc.). The color of most of the plastinated specimens remained normal except for the liver which changed to a slightly lighter color. The consistency of all the organs was hard but there was no change in morphological details.

Key words*: plastination; thermocol; waste*

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Advances in Nanotechnology for Fish Nutrition

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Nanotechnology in Fishes: Applications, Benefits, and Environmental Implications

Nanotechnology has emerged as a transformative field within various scientific disciplines, significantly impacting aquatic biology and fisheries management. This innovative technology involves the application of engineered nanomaterials to enhance fish health, improve aquaculture practices, and

monitor environmental conditions. The utilization of nanoparticles facilitates targeted drug delivery, enabling the treatment of diseases at a cellular level, which can reduce mortality rates among fish populations. Additionally, nanosensors play a crucial role in real-time monitoring of water quality, allowing for early detection of pollutants and pathogens—vital for maintaining healthy aquatic ecosystems. Furthermore, the integration of nanotechnology into feed formulations enhances nutrient absorption and growth rates, leading to more sustainable fish farming practices. Despite the numerous benefits, the potential ecological impacts of nanomaterials on aquatic life and ecosystems necessitate careful evaluation and regulation. This paper highlights the multifaceted applications of nanotechnology in fish biology and aquaculture, emphasizing its role in fostering sustainable fisheries while ensuring environmental safety.

Keywords: Nanotechnology, fish health, aquaculture, nanoparticles, nanosensors, water quality, sustainable fisheries, environmental impact.

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ICHTHYOFAUNAL DIVERSITY OF BALASORE COAST AND ITS ADJACENT COASTAL AREAS

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Fishes exhibit remarkable diversity in terms of their biological characteristics and their preferred habitats. This study aimed to investigate the fish diversity in the vicinity of the Balasore coast and its adjacent coastal areas. Fish are a vital resource, not only for their significance as a food source but also for their economic importance. However, many fish caught by local fishermen, deemed

non-economically valuable, are often discarded as by-catches. These by-catches encompass not only various fish species but also a range of other aquatic organisms, including crabs, squilla, lobster, gastropods, bivalves, sea cucumbers, sea anemones, octopuses, squids, hermit crabs, and jellyfish. The study spanned from January 2022 to May 2024, totalling 851 days. Throughout this period, samples were collected periodically. The research findings reveal a staggering diversity of 256 fish species belonging to 111 genera, 59 families, and 36 orders. Notably, seven previously unrecorded fish species for the Odisha coast were documented within the study area. This investigation encompasses commercially valuable species and those with little to no economic importance, often overlooked for human consumption. Non-commercial fish species can be transformed into value-added products, opening up opportunities for marketing and participation in the live ornamental fish trade, thereby enhancing the livelihoods of local fishermen. The ongoing collection of data on fish diversity at the Balasore coast and its adjacent coastal areas contributes to our growing understanding of the region's aquatic biodiversity.

Key Words: *Ichthyofauna,* Fish diversity, Coastal biodiversity, By-catch management, Ornamental fish trade, Economic importance of fish

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Molecular and Histopathological Studies of Lumpy skin disease in Uttarakhand

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Lumpy skin disease (LSD) is an economically significant, emerging viral disease affecting cattle and buffaloes, characterised by the development of skin nodules. It is caused by the Lumpy skin disease virus (LSDV) that belongs to genus Capripoxvirus within the family Poxviridae. The present study was conducted to investigate the occurrence of Lumpy skin disease (LSD) in district Nainital and U.S. Nagar of Uttarakhand state. A total of 20 skin nodule samples collected from infected cattle in field outbreaks were subjected to Polymerase chain reaction for confirmation of disease and half of the nodules were subjected to histopathological examination. The most frequent clinical signs of LSD recorded were nodular skin lesions, limb edema, lymphadenopathy, nasal discharge, ocular discharge, fever and ulcerative lesions on limbs. The skin nodules were distributed over the entire body, or localized on head and neck, limbs, perineum and trunk. The PCR targeting Thymidine Kinase (TK) gene was able to detect LSDV genome in 100% of skin nodules (20/20) samples. The predominant histopathological findings in skin biopsy samples of affected cattle revealed acanthosis, multifocal rete ridge formation, vacuolar degeneration of keratinocytes, intracytoplasmic inclusion bodies in keratinocytes, hyperkeratinization and micro-vesicles in epidermis and diffuse to multi-focal mononuclear infiltration particularly around the arterioles in dermis, hyperplastic hair follicles, multi-focal necrosis and degenerated sebaceous gland cells.

***Keywords**: Lumpy skin disease, Skin nodules, PCR, Histopathology,*


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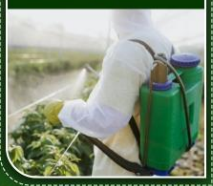

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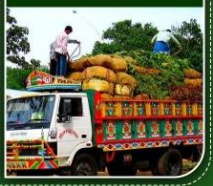

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