



*Technology for Humanity: Inclusive Innovation for Viksit Bharat*

# **Abstract Book**



100 YEARS  
**विकसित भारत**



**SCIENCE & TECHNOLOGY CONCLAVE**

**AND**

**INTERNATIONAL CONFERENCE ON INNOVATION & TECHNOLOGY FOR VIKSIT BHARAT  
(STC-ICIT 2026)**

*Organized By*

**VIGYAN BHARATI, HARYANA**

**AND**

**GURU JAMBHESHWAR UNIVERSITY OF SCIENCE AND TECHNOLOGY, HISAR**



*in association with*

**Chaudhary Charan Singh Haryana Agricultural University (CCS HAU), Hisar**

**Lala Lajpat Rai University of Veterinary & Animal Sciences (LUVAS), Hisar**

**ICAR-National Research Centre on Equines (ICAR-NRCE), Hisar**



*at*

***Guru Jambheshwar University of Science & Technology (GJUS&T), Hisar***

**(24-25 APRIL, 2026)**

**GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR**

**CITY GATE**





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# Theme A: Science & Technology

**Abstract No.: A-001**

**Registration No.: 1001**

**VALORISATION OF WATER HYACINTH TO ACTIVATED BIOCHAR FOR POTENTIAL REMOVAL OF EMERGING POLLUTANT BISPHENOL A (BPA) FROM WATER: RSM OPTIMISATION, MODELLING AND REUSABILITY**

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The occurrence of bisphenol A (BPA), an endocrine disrupting compound in water bodies has raised significant human health and environmental concerns. This necessitates the development of efficient and sustainable removal technologies. Valorization of plant-based waste material into adsorbents serves a dual solution to waste management and water treatment. This study investigates the application of low-cost KOH activated biochar for removal of BPA from water. The fabricated materials were characterized using different techniques *viz.* Fourier Transform Infrared Spectroscopy (FTIR), Energy-Dispersive X-ray Spectroscopy (EDAX), Scanning Electron Microscope (SEM), X-ray Diffraction (XRD). Batch mode experiments were performed to evaluate the effect of parameters (pH, adsorbent dose, BPA conc, contact time and temperature) on BPA removal. The equilibrium data was analyzed using adsorption isotherms such as Langmuir, Freundlich, and Temkin. The Langmuir model best fitted the data indicating monolayer adsorption and adsorption capacity of 295.34 mg/g. The kinetic study was done using pseudo-first order, pseudo-second order, and intra-particle diffusion models. Response Surface Methodology (RSM) based Central Composite Design (CCD) was employed to optimize the adsorption parameters. The developed quadratic model was found statistically significant with high predictive accuracy ( $R^2=0.93$ ). The regeneration and reuse efficiency of the material was studied upto 5 cycles with maximum BPA removal efficiency of 76% up to last cycle. These results suggested that the activated biochar is environmentally friendly and efficient adsorbent for BPA removal.

**Abstract No.: A-002**

**Registration No.: 1007**

**E-HR ADOPTION IN THE POST-COVID ERA: TRANSFORMING RECRUITMENT PRACTICES ACROSS PUBLIC AND PRIVATE SECTORS**

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The COVID-19 pandemic also hastened the digitalization of human resource management practices, especially for recruitment practices in public and private sector organizations. The research results showed a high level of adoption of electronic human resource (E-HR) systems by most of the organizations for recruitment practices. The pandemic resulted in most of the

organizations implementing electronic recruitment tools within the first three months of the pandemic outbreak. Although the public and private sectors showed a similar pattern of implementing electronic recruitment tools, private sector organizations showed a relatively high level of adoption of electronic recruitment tools advanced features such as artificial intelligence-based resume analysis tools and recruitment analytics tools. The chi-square test analysis for sector-wise data showed no significant difference in the adoption and use of electronic recruitment tools by public and private sector organizations. The results also showed a relatively high effectiveness of electronic recruitment tools for key dimensions such as time efficiency, tracking of candidates, communication capabilities, access to a wider pool of candidates, documentation requirements, data storage and retrieval capabilities in both sectors. Moreover, the research also revealed that the distinction in the perceived benefits of public and private sector organizations is not statistically significant. This indicates a similarity in the outcomes of digital recruitment in these sectors. The research provides empirical evidence for the integration of digital recruitment and is important for informing post-pandemic human resource strategies.

### **Keywords**

COVID-19 pandemic, digital recruitment, E-HR adoption, human resource management, public and private sector

**Abstract No.: A-003**

**Registration No.: 1012**

## **MODULATION OF MORINGA LEAF EXTRACT UNDER SALINITY STRESS ON PEARL MILLET**

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Salinity stress is a major abiotic constraint that adversely affects crop productivity by disturbing physiological and biochemical processes in plants, particularly in arid and semi-arid regions. Pearl millet, a climate-resilient cereal crop, is moderately tolerant to harsh environments; however, elevated salinity levels significantly impair its growth, photosynthesis, and yield. In recent years, the use of natural plant-based biostimulants has emerged as a sustainable strategy to mitigate salinity-induced damage. *Moringa oleifera* leaf extract is a rich source of antioxidants, essential nutrients, and plant growth regulators such as cytokinins (zeatin), which play a crucial role in enhancing plant stress tolerance. The application of moringa leaf extract under saline conditions has shown promising results in improving the physiological performance of pearl millet. Physiologically, moringa leaf extract enhances chlorophyll content and photosynthetic efficiency, leading to improved biomass accumulation. It promotes osmotic adjustment by increasing the accumulation of compatible solutes such as proline and soluble sugars, thereby maintaining cellular water balance. Additionally, it strengthens the antioxidant defense system by activating enzymes like superoxide dismutase, catalase, and peroxidase, which help in scavenging reactive oxygen species and reducing oxidative damage. The extract

also contributes to better ion homeostasis by decreasing sodium (Na<sup>+</sup>) toxicity and maintaining a favorable potassium to sodium (K<sup>+</sup>/Na<sup>+</sup>) ratio. Furthermore, it improves membrane stability and water use efficiency, ensuring better plant survival under stress conditions. In conclusion, the application of moringa leaf extract represents an eco-friendly, cost-effective, and sustainable approach to enhance salinity tolerance in pearl millet by regulating key physiological processes. This strategy holds significant potential for improving crop productivity in salt-affected soils and ensuring food security under changing climatic conditions.

**Key words:** Abiotic stress tolerance, antioxidant enzyme, bio stimulant, osmolyte accumulation, salinity stress

**Abstract No.: A-004**

**Registration No.: 1015**

## **IMPACT OF TECHNOLOGY-DRIVEN LIFESTYLE CHANGES ON FOOD CONSUMPTION PATTERNS IN RURAL AND URBAN AREAS**

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Rapid technological advancement and evolving lifestyles have significantly influenced food consumption patterns across rural and urban populations. The increasing penetration of smartphones, internet access and digital platforms has reshaped dietary habits, leading to a gradual shift from traditional homemade food toward fast and convenience foods. This study explores the impact of technology-driven lifestyle changes on food consumption behaviour with a comparative perspective on rural and urban settings. Evidence indicates that a substantial proportion of household food expenditure continues to be devoted to traditional items such as milk and milk products, accounting for approximately 41.7% in rural areas and 33.1% in urban areas in certain regions. However, rising income levels, urbanization and digital exposure have accelerated the demand for processed and ready-to-eat food. Nutritional patterns further reveal that average daily calorie intake is around 2440 kcal, while fat consumption ranges between 68–75 g per day, reflecting a shift toward energy-dense diets. The findings suggest that factors such as time constraints, changing work patterns and the growing influence of digital food environments are key drivers of this transformation. While convenience and accessibility have improved, these changes raise concerns regarding long-term health and sustainability, highlighting the need for awareness and balanced dietary choices.

**Keywords:** lifestyle changes, technology, consumption patterns

## **5 TATV BASED CHIP MANUFACTURING (TO IMPROVE FUNCTIONING OF 5 SENSE ORGANS)**

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In the current environment we are moving in a higher dimension of Applications in Space or in the deep sea, with the prime objective of helping devices build up in such a way that humans can lead life longer, healthy, prosperous, luxurious, filled with happiness and maximum comfort. My whole lifespan should be pain-free and none should cheat me. I don't cheat anyone. ऐश्वर्य निर्वाण, ऐश्वर्य युक्त जीवन is the objective and for this all intellectuals are working day and night. It all started with milli, micro and now new technology we are working on. There are 2 philosophies working for this, one western world which is dependent on rare earth materials and an empty amount of activities going on in this area. Another philosophy is mass production and logistics in moving transporting goods or Raw material etc. eastern philosophy is working in this direction. There is another 3rd philosophy of Southeast Asia, and they are trying to find the material which is available in abundance on all parts of the earth and they know that it will be in the range of Pico, Femto or much below.

Rare earth materials are very expensive not because of any heavenly reason, but availability is less in quantity and limited places on the planet. Transportation cost increments the value and the processing to remove impurities adds to the cost. Hence all try to maximize the profits or try to control things ensuring their people get max benefit. No one steals mainly the new technology material that we are talking about to manufacture chips and other components used in transportation carriers in deep sea or deep in space.

South asean society was working in different dimensions all together i.e. sub nano range where availability of the material should not be a problem across the globe. And in this many breakthroughs happened and new types of Chips and components came into existence viz. Vaayuchip, Agnichip, Akashchip and Raw material is available in abundance everywhere across the globe. The main game here was to develop methods which can produce these chips and make them usable for mankind. When too many depotes, discussion and lots of time spent by thousands of manhours with not really any useful results start bringing frustration in the community. An idea cropped in what is pranayam, how it works. And that conveyed the existence of the most complex machine being humans itself. Why not use them to manipulate the desired tatvchips. And started loading at various procedures to be adopted and way of delivering the manipulated chips than planting them to use etc.

So various technologies were developed like Shunxh Technology, UBM technology, UHB technology, tenmin technology etc. they were grouped and named Aeshoglobe system of technologies. And the best part is that each individual can manufacture these tatvchips inside themselves and recover from the problem he is facing.

Most important is that they work in a fisiovirtual space of individuals. We can build Shunkhs in various senses to filter out pollution, not allowing it to enter the body. Whatever waste is generated inside the body can be converted into energy usable for self.

The heavy waste is flushed out by heartbeat and you are energetic the whole day, able to take right meaningful decisions and can develop telepathy, air travel/walking etc as apply as per self desire.

These systems were found very useful for Female gender for their gyne healthcare, Attending calls of nature like menses cycle, menopause, pregnancy period, post pregnancy recovery etc. The life of a new-born can be well defined with respect to healthcare and career/profession, failure free and confusion free.

These were tested by many individuals setting all the benefits expected from the Aesho Globe System of technologies with no unknown side effects.

Now is the time that we at SETU institute Invite masses to use these Aesho Globe Systems & Technologies and start discussing more applications usable for the humans across globe enabling each to be prepared to fight, handle all kind of

Natural calamities as a team, as big as needed at that time to minimise the damages. These can also help assess the early warnings about the natural calamity going to happen soon. Because the sense organs of an individual may be sharpening to feel the changes taking place before the calamity arrives.

**Abstract No.: A-006**

**Registration No.: 1022**

## **DESIGN, SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL APPLICATIONS OF 3D TRANSITION METAL SCHIFF BASE COMPLEXES**

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A tridentate Schiff base ligand was synthesized by condensation of a suitable aldehyde with amine and used to prepare a series of transition metal complexes with Cu(II), Ni(II), Co(II), and Zn(II) ions. The ligand and its complexes were characterized by elemental analysis, molar conductance, FT-IR, UV–Visible, NMR, and magnetic susceptibility studies. Spectral data revealed coordination of the ligand through azomethine nitrogen and phenolic oxygen atoms, confirming a tridentate N,O,O donor mode and suggesting octahedral geometry around the metal ions. The metal complexes exhibited significantly enhanced biological activity compared to the free ligand, which is attributed to the chelation-induced escalated lipophilicity and improved cell membrane penetration. These findings indicate that tridentate Schiff base metal complexes are promising candidates for biological and pharmaceutical applications.

## PHYTOCHEMICAL PROFILING BASED ON FTIR ANALYSIS OF AQUEOUS AND ETHANOL EXTRACTS OF PADDY STRAW

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Paddy straw, often seen as agricultural waste is generated by harvesting of rice, which includes stems, leaves, and spikelets. Nearly half of the rice straw is burnt for cogeneration of heat and power with the subsequent environmental problems; but it is a potential source of biomolecules essentially constituted of cellulose (24.0%), hemicelluloses (27.8%), lignin (13.5%) and significant amounts of lipophilic compounds (3.4%) that can be used to obtain valuable phytochemicals. Plant lipophilic compounds comprise a wide range of chemical products (e.g., hydrocarbons, fatty acids, fatty alcohols, aldehydes, acylglycerols, terpenoids, and steroids) that present many applications in agricultural industry as biostimulants, biofertilizers and growth regulators. The present study aimed to comparatively evaluate the effect of solvent polarity on the extraction efficiency and phytochemical composition of paddy straw using soxhlet extraction. Fourier Transform Infrared (FTIR) spectroscopy was performed to characterize the functional groups present in aqueous and ethanol extracts of paddy straw. The aqueous and ethanol extracts of paddy straw exhibited a broad absorption band observed in the region of  $3316\text{cm}^{-1}$  corresponding to O-H stretching vibrations, indicating the presence of hydroxyl-rich compounds such as phenols and in the region of  $2974\text{cm}^{-1}$  aliphatic peaks shows C-H stretching representing the alkyl backbone of organic molecule.

The variation in intensity and sharpness of the O–H stretching band indicates variations in hydrogen bonding interactions and concentration of hydroxyl-rich compounds extracted by each solvent. The relatively stronger and more defined peak observed in the ethanolic extract indicates efficient extraction of bioactive constituents with moderate polarity. The results of the FTIR spectrum profile of paddy straw showed that ethanol proved to be more efficient solvent for extracting lignocellulosic and aliphatic bioactive compounds whereas aqueous extraction mainly solubilizes hydroxyl-rich compounds along with traces of inorganic minerals. The study highlights the influence of solvent polarity on phytochemical extraction efficiency and demonstrates the effectiveness of FTIR spectroscopy in differentiating solvent-dependent compositional variations in agricultural residues, thereby supporting sustainable biomass utilization approaches in agriculture.

**Keywords:** soxhlet, functional groups, bioactive, phytochemical, spectroscopy.

**Abstract No.: A-008**

**Registration No.: 1024**

**AN EVIDENCE-BASED INTEGRATION OF INDIAN KNOWLEDGE SYSTEMS WITH AI-DRIVEN MICRO-PERSONALIZED LEARNING FOR CONTEMPORARY CLASSROOMS**

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The rapid integration of artificial intelligence (AI) in education has significantly advanced personalized learning; however, existing systems often lack contextual adaptability and fail to address the diverse needs of real-world classrooms. In parallel, Indian Knowledge Systems (IKS), as recognized by the Ministry of Education, emphasize learner-centric, experiential, and context-based pedagogical practices, yet remain underutilized within contemporary digital learning frameworks. This study aims to bridge this gap by proposing an evidence-based integration of IKS principles with AI-driven micro-personalized learning.

The research introduces a hybrid framework that combines diagnostic assessment, adaptive content delivery, and continuous feedback mechanisms with core IKS elements such as individualized instruction, experiential engagement, and contextual relevance. Unlike conventional AI-based models, the proposed approach emphasizes both technological scalability and pedagogical depth, enabling effective implementation across diverse classroom environments, including those with limited digital infrastructure.

By aligning traditional educational insights with modern computational capabilities, the model offers a practical and inclusive solution to enhance learning outcomes and engagement. The study contributes to the evolving discourse on integrating indigenous knowledge with emerging technologies and highlights the potential of such frameworks in addressing contemporary educational challenges while supporting future-ready learning systems.

**Keywords:** Artificial Intelligence, Personalized Learning, Indian Knowledge Systems, Hybrid Model, Educational Innovation

**Abstract No.: A-009**

**Registration No.: 1037**

**ASSESSMENT OF HOUSEHOLD AWARENESS AND PRACTICES REGARDING E-WASTE MANAGEMENT IN RURAL AREA**

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The unprecedented growth in the consumption of electrical and electronic equipment has resulted in a parallel increase in electronic waste (e-waste), emerging as a critical

environmental and public health concern. At the household level, awareness and disposal practices significantly influence the effectiveness of e-waste management systems. The present study aims to assess household awareness and practices regarding e-waste management, with a focus on identifying existing knowledge gaps and behavioral patterns.

A cross-sectional descriptive research design was employed, and primary data were collected from 30 respondents residing in village Baddopatti, Hisar district, Haryana using a structured and pre-tested questionnaire. The study examined key dimensions including awareness of e-waste concepts, identification of e-waste items, understanding of associated environmental and health risks, and prevailing disposal practices such as reuse, storage, informal selling, and recycling. In addition, selected socio-economic variables like education, income and occupation were analyzed to determine their influence on awareness and practices.

The findings indicate that while a moderate level of awareness regarding e-waste exists among households, comprehensive knowledge about safe disposal methods and authorized recycling channels remains limited. A considerable proportion of respondents tend to store obsolete devices or dispose of them through informal means, reflecting a gap between awareness and practice. The study underscores the need for targeted awareness campaigns, improved collection and recycling infrastructure and effective policy interventions to promote responsible e-waste management at the grassroots level.

Keywords: E-waste, Household Awareness, Disposal Practices, Sustainability

**Abstract No.: A-010**

**Registration No.: 1038**

## **WASTE-TO- RESOURCE APPROACH: E-WASTE DERIVED CuO NANOPARTICLES FOR NICKEL REMEDIATION IN WASTEWATER**

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Polluted wastewater is a growing concern that endangers human health and disrupts ecosystems globally. Domestic sewage, agricultural runoff, and industrial effluents pollute water, which puts aquatic ecosystems at risk. As human activities continue to increase, large volumes of wastewater are generated, containing a wide range of pollutants, including heavy metals such as nickel (Ni). Heavy metals have a big effect on the environment since they are poisonous, non-biodegradable, and cancer-causing. The current study discusses the elimination of heavy metal ion, Ni (II), through adsorption onto Copper Oxide nanoparticles produced via an eco-friendly technique utilizing electronic waste. The green approach uses *Albizia lebbeck* leaves and is cheap, safe, and good for the environment. Copper oxide nanoparticles (CuO-NPs) have gathered significant attention as effective adsorbents due to their low cost, optimal surface area, abundance of active sites and high adsorption capabilities. Synthesized nanoparticles were characterized by using XRD, FT-IR, and SEM-EDX. The batch adsorption experiment reveals

that it is a good way to get Ni (II) ions out of water. Several factors were fine-tuned, including the concentration of dye (10-50 mg L<sup>-1</sup>), the load of nanoparticles (20 to 60 mg), the temperature, the pH (2-10), and the contact period (30 to 150 min). At 90 minutes, 40°C, pH 6, and 40 mg CuONPs for a 10-mgL<sup>-1</sup> concentration of Nickel (II), the heavy metal removal efficiency reaches its peak at 96.21%. It was easy to extract the adsorbent from the reaction mixture and utilize it again and again.

**Keywords:** Wastewater, Green Synthesis, Nanoparticles, Characterization, Adsorption

**Abstract No.: A-011**

**Registration No.: 1048**

## **“COMPREHENSIVE ANALYSIS OF TNF-ALPHA GENE POLYMORPHISM: A COMPUTATIONAL APPROACH”**

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**Background:** TNF-alpha, a potent cytokine produced by immune cells, regulates inflammation and immune responses. A number of studies demonstrate the connection between TNF-alpha and a variety of diseases. Understanding the genetic variations in TNF-alpha gene nsSNP and regulatory SNPs within the UTRs can help in elucidating the mechanisms of disease pathogenesis.

**Objective:** Present study involved a comprehensive analysis of the TNF-alpha gene to identify deleterious SNPs within UTR and coding region.

**Methods:** TNF alpha gene's SNPs data were retrieved from dbSNP and subsequently evaluated using *in-silico* tools to predict their pathogenic effects.

**Results:** A total of 2242 SNPs were retrieved, out of which 244 were nsSNPs, 459 were from 5'UTR and 429 were in 3'UTR. Among nsSNPs evaluated, three substitutions (I194N, R158W and K87T) were consistently predicted to be deleterious and were mapped to evolutionarily conserved residues with significant effects on protein structure. Analysis of UTR variants identified 13 pathogenic SNPs, which showed potential to disrupt transcription factor binding sites and protein binding sites, thereby exerting significant regulatory effects on TNF-alpha expression.

**Conclusion:** This study provides comprehensive computational evidence that both coding and regulatory SNPs of TNF-alpha gene may have significant functional implications, influencing protein structure and gene regulation. These findings contribute to our understanding of the genetic regulation of TNF-alpha and its role in disease development. Only a handful of SNPs have been explored extensively; however, others are completely neglected. Research focusing on other identified potentially pathogenic variants is required to comprehend the impact of TNF-alpha gene on various diseases.

**Keywords:** TNF-alpha, Inflammation, SNPs, Gene Regulation, Disease

## VERMICOMPOSTING OF EQUINE DUNG: A SUSTAINABLE SOLUTION FOR ORGANIC WASTE MANAGEMENT

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The rapid increase in organic waste due to industrialization, intensive agriculture, and livestock husbandry poses serious environmental and public health challenges. Improper disposal of equine dung (ED), underutilized animal bio-waste-leads to nutrient runoff, methane emissions, and land degradation. This study investigates vermicomposting as a sustainable, low-cost technology for managing equine dung using earthworms (*Eisenia foetida*).

The vermicomposting process was carried out under controlled conditions (humidity: 50–60%, temperature: 25–30°C). The resulting equine dung vermicompost (EDV) was analyzed for physicochemical and nutrient parameters. EDV exhibited a pH of 8.0 and electrical conductivity of 1.60 dS/cm. Nutrient analysis revealed high levels of organic carbon (19.70%), nitrogen (0.72%), phosphorus (0.61%), and potassium (1.07%), along with essential micronutrients: iron (992 ppm), zinc (675 ppm), manganese (258 ppm), and copper (235 ppm). The nutrient-rich EDV is suitable for agricultural, horticultural, and kitchen gardening applications. Beyond waste management, this eco-friendly technology enhances soil health, supports circular bio-economy principles, and offers income-generating opportunities for equine-owning families and rural women. This study provides a scientific framework for converting equine dung into a valuable resource, contributing to sustainable agriculture and environmental conservation.

**Keywords:** Vermicomposting, equine dung, *Eisenia foetida*, waste valorization, soil health, circular economy.

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## “ROLE OF AI IN ENHANCING SELF-REGULATED LEARNING AMONG UNIVERSITY STUDENTS”

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The rapid integration of Artificial Intelligence (AI) in higher education has transformed traditional learning environments, offering new opportunities to enhance self-regulated learning (SRL) among university students. This study examines the role of AI-driven tools—such as adaptive learning systems,

intelligent tutoring systems, and generative AI—in promoting key SRL processes including goal setting, self-monitoring, strategic planning, and self-reflection. Drawing on contemporary empirical studies and theoretical frameworks, the paper adopts a mixed-method/analytical approach to explore how AI facilitates personalized learning experiences and supports learner autonomy. Findings indicate that AI significantly enhances students' ability to regulate their own learning by providing real-time feedback, personalized recommendations, and interactive learning support. AI-based applications have been shown to improve metacognitive skills, motivation, and academic performance compared to traditional learning methods. Moreover, AI tools foster learner autonomy by strengthening self-efficacy, cognitive engagement, and reflective practices. Despite these advantages, challenges such as over-reliance on AI, ethical concerns, and the need for digital literacy remain critical considerations. The study concludes that while AI has substantial potential to enhance self-regulated learning, its effectiveness depends on pedagogically sound integration and responsible usage. The findings provide implications for educators and researchers to design AI-supported learning environments that promote independent, reflective, and lifelong learning among university students.

**Keywords:** Artificial Intelligence (AI), Higher Education, Personalized Learning, Self-Regulated Learning (SRL), University Students

**Abstract No.: A-014**

**Registration No.: 1059**

## **THE ROLE OF AI IN OCCULAR DISEASE DIAGNOSIS & TREATMENT**

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Artificial Intelligence (AI) is rapidly transforming the field of ophthalmology by enhancing the early detection, diagnosis, and management of ocular diseases. With the increasing global burden of vision impairment caused by conditions such as diabetic retinopathy, glaucoma, and age-related macular degeneration, AI-driven technologies offer promising solutions to improve clinical outcomes. Machine learning and deep learning algorithms, particularly convolutional neural networks, enable automated analysis of retinal images with high accuracy and efficiency, often comparable to expert ophthalmologists. These systems facilitate large-scale screening, especially in resource-limited settings, thereby reducing the risk of delayed diagnosis and preventable blindness. AI also supports personalized treatment planning by predicting disease progression and treatment response. Furthermore, integration with telemedicine platforms enhances accessibility to eye care services.

**“OCCUPATIONAL EXPOSURE AND ITS IMPACT ON GENETIC STABILITY AND INFLAMMATORY STATUS IN BRICK KILN WORKERS OF INDIA”**

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Brick kiln industries are widely prevalent across India and provide employment to a large workforce, often involving prolonged exposure to dust, smoke, and combustion-derived pollutants under unregulated conditions. Such occupational settings may have adverse effects on workers' health over time. The present study was designed to evaluate genotoxic damage, oxidative stress, and inflammatory status in brick kiln workers. A total of 40 subjects were included, comprising 20 brick kiln workers (exposed group) and 20 healthy controls. Genotoxic damage was assessed using the cytokinesis-block lymphocyte micronucleus (MN) assay in peripheral blood lymphocytes. Oxidative DNA damage was evaluated by measuring 8-hydroxy-2'-deoxyguanosine (8-OHdG) levels using ELISA with a Labrecon diagnostic kit. Inflammatory status was determined by estimating serum C-reactive protein (CRP) levels using an ERBA diagnostic kit on a semi-autoanalyzer. The findings showed an increased frequency of micronuclei in brick kiln workers ( $7.2 \pm 1.28$ ) compared to controls ( $3.65 \pm 0.74$ ), indicating chromosomal damage. Elevated CRP levels ( $1.80 \pm 1.34$ ) were observed in the exposed group as compared to controls ( $0.81 \pm 0.52$ ), suggesting a heightened inflammatory response. Increased levels of 8-OHdG further indicated oxidative DNA damage among workers. A positive association among genotoxicity, oxidative stress, and inflammation was observed, reflecting cumulative cellular damage due to occupational exposure. In conclusion, brick kiln workers are at increased risk of genetic damage, oxidative stress, and systemic inflammation due to prolonged exposure to environmental pollutants. The combined use of lymphocyte micronucleus assay, 8-OHdG, and CRP estimation provides a comprehensive biomonitoring approach for early detection of occupational health risks. These findings highlight the potential for long-term health complications, including respiratory disorders, cardiovascular diseases, and **chronic degenerative conditions associated with sustained cellular and molecular damage**. Therefore, implementation of preventive strategies such as the use of personal protective equipment, improvement in workplace conditions, regular medical screening, and awareness programs is essential to minimize exposure and safeguard worker's health.

**Abstract No.: A-016**

**Registration No.: 1067**

**SYNTHESIS AND BIOLOGICAL EVALUATION OF  
DIORGANOTIN(IV) COMPLEXES BASED ON A SCHIFF BASE  
LIGAND**

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Malaria is a serious disease caused by *Plasmodium* parasites, which are spread to humans through the bites of infected mosquitoes. Symptoms usually include high fever, vomiting, muscle pain and in severe cases coma or death (especially in *P. falciparum* malaria). The rising incidence of malaria poses a significant public health challenge, and microbial infections have frequently affected humans, and animals with disastrous results. Consequently, there is an urgent need for the development of effective antimalarial and antimicrobial therapeutics. According to recent research, Schiff base-organotin(IV) complexes have been identified as important pharmacological agents because of their strong antiparasitic, antibacterial, anticancer and antifungal properties. In this study, three diorganotin(IV) complexes were synthesized using a Schiff base ligand, which was obtained *via* the condensation of 4-ethoxybenzhydrazide with 4-(diethylamino)salicylaldehyde in a 1:1 molar ratio and the synthesized compounds were tested for their antiplasmodial and antimicrobial properties to ascertain their ability to control infectious diseases. According to the biological analysis, the diorganotin(IV) complexes displayed significantly enhanced biological activity compared to their parent Schiff base ligand, in agreement with the principles of Tweedy's chelation theory. Overall, the collective findings of these studies indicate that diorganotin(IV) complexes are promising candidates for future drug development.

**Keywords:** Organotin(IV) complexes, Schiff Base, Biological activity.

**Abstract No.: A-017**

**Registration No.: 1069**

**DESIGN, SYNTHESIS AND CHARACTERIZATION OF AZOLE BASED  
HYBRIDS**

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Nitrogen-containing heterocycles serve as essential structural frameworks in drug design, playing a key role in determining the biological activity and therapeutic effectiveness of many pharmaceutical compounds. Among them, azoles have received significant interest due to their wide range of biological properties, including antibacterial, antifungal, antioxidant, antitubercular, anticancer, anti-inflammatory, and antidiabetic activities. Several well-known

drugs such as Fluconazole, Itraconazole, Rufinamide, Metronidazole, Ibudilast, Alpelisib and Miconazole, possess azole rings in their structures. These drugs are widely used in clinical practice; therefore, considering their significant therapeutic importance, the present study focuses on the development of novel azole-based hybrid molecules to further enhance their efficacy and potential. In this context, the present study aims at the design and synthesis of novel azole-based hybrid compounds through suitable synthetic approaches, including condensation and cyclization methods. The synthesized compounds were characterized using standard analytical techniques such as Nuclear Magnetic Resonance (NMR), Fourier Transform Infrared Spectroscopy (FTIR), and High-Resolution Mass Spectrometry (HRMS), and the obtained spectral results confirmed the proposed structures of the synthesized hybrids. These hybrid compounds may serve as promising candidates for future biological evaluation.

**Abstract No.: A-018**

**Registration No.: 1072**

**“COORDINATION BEHAVIOUR AND ANTIMICROBIAL ACTIVITY  
OF TRANSITION METAL(II) COMPLEXES OF A  
SALICYLALDEHYDE-BASED HYDRAZONE LIGAND”**

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Four **Co(II)**, **Ni(II)**, **Cu(II)**, and **Zn(II)** complexes were synthesized utilizing salicylaldehyde derivatives and 4-aminobenzoic hydrazide. Schiff base ligands have emerged as an important class of compounds in medicinal and coordination chemistry due to their structural flexibility, straightforward synthesis, and diverse biological properties. Their general structural formula,  $R_1R_2C=NR_3$ , highlights the imine nitrogen atom as the primary donor site that governs both their coordination behavior and biological activity. In particular, N, O-donor Schiff base ligands form a prominent group of chelating agents because of their strong affinity toward metal ions, multiple coordination modes, and wide-ranging applications in biomimetic studies, catalysis, and pharmaceutical research. The ability of these ligands to form stable neutral complexes, combined with features such as tautomerism and tunable chemical reactivity, enhances their potential in drug design and development. Transition metal complexes derived from Schiff base ligands, especially those involving **Co(II)**, **Ni(II)**, **Cu(II)**, and **Zn(II)**, have been widely studied owing to their increased lipophilicity, structural variability, and improved biological efficacy. These complexes have demonstrated a broad spectrum of biological activities, including antioxidant, antimalarial, and antibacterial properties, highlighting their growing significance in biomedical and pharmaceutical applications. The synthesized compounds were characterized using a range of spectroscopic techniques, such as FT-IR,  $^1H$  NMR,  $^{13}C$  NMR, and mass spectrometry. The spectral data supported an octahedral coordination geometry around the transition metal ion, with the ligand acting in a bidentate manner through the enolic oxygen and imine nitrogen donor atoms.

**Keywords:** ligand; transition metal(II) complexes; IR, mass spectrometry, microbial

**Abstract No.: A-019**

**Registration No.: 1074**

**DESIGN, SYNTHESIS AND CORROSION INHIBITION STUDIES OF URETHANE-QUINOLINE HYBRID WITH A TRIAZOLE LINKER AGAINST MILD STEEL**

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Among various heterocyclic molecules, quinoline and 1,2,3-triazoles are effective and economical choices for the researchers as good corrosion inhibitors against mild steel. Therefore, in the urge to develop more effective corrosion inhibitors for mild steel in acidic media, we have synthesized a new urethane-quinoline hybrid with a triazole linker, in which urethane and 1,2,3-triazole moieties are united together through the molecular hybridization approach following click reaction. After successful characterization synthesized compound was evaluated for its anticorrosion potential against mild steel in 1M HCl solution using various electrochemical techniques which includes EIS, PDP, and weight loss measurements. Furthermore, to better understand the interaction between the mild steel specimen and corrosion inhibitors, SEM combined with EDX were also used to know the morphology and elemental composition, respectively. Results of the PDP study shows that the urethane-quinoline hybrid exhibited 98 % efficiency at a concentration 500 ppm. Additionally, weight loss study evaluated that maximum inhibition efficiency was observed 97.52 % at 500 ppm concentration of the corrosion inhibitor.

**Keywords:** *Quinoline, 1,2,3-Triazole; Urethane; Click reaction; Corrosion Inhibition*

**Abstract No.: A-020**

**Registration No.: 1076**

**SUSTAINABLE CARBON DOTS IN BIOMEDICINE: IMAGING, DRUG DELIVERY, AND THERAPEUTIC APPLICATIONS**

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**Abstract:** Nanomedicine has attracted a lot of interest in recent years due to the emergence of new materials for systems to deliver drugs. Carbon dots (CDs), a type of carbon-based nanomaterial, are promising candidates for drug delivery and therapy. Having a size range of less than 10nm, they are further categorized as graphene quantum dots (GQD), carbon quantum dots (CQD), carbon nanodots (CND), and carbonized polymer dots (CPD). Because of their distinct luminescent behavior and nanoscale size, CDs' biocompatibility may enable tailored therapeutic delivery and in-situ monitoring for real-time applications, making them exceptional

alternatives to conventional nanocarriers. Bottom-up and top-down synthesis methodologies are particularly important for CDs synthesis, since they dictate their physical characteristics and uses. Before using CDs in drug delivery applications, CDs were functionalized to provide exact biocompatibility and drug interaction. Furthermore, their applications in targeted cancer theranostics and gene delivery are discussed to demonstrate their permeability to biological barriers, which has the possibility for therapeutic delivery. As a result, we provide current advances and viewpoints on the use of CDs to identify prospects for future research, concentrating on CDs' therapeutic value in practice.

**Keywords:** Carbon dot, nanocarriers, drug delivery systems, Therapeutics, functionalization Techniques, controlled drug release

**Abstract No.: A-021**

**Registration No.1078**

## **SYNTHESIS, CHARACTERIZATION AND EVALUATION OF *IN VITRO* ANTIMICROBIAL POTENCY OF DIORGANOTIN(IV) COMPLEXES**

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In recent work, we have synthesized three diorganotin(IV) complexes from hydrazone ligand, which was obtained by condensation of 3,5-dibromosalicylaldehyde and 2-(cyclohexyloxy)acetohydrazide with general formula  $R_2SnL$  where, R = Me, Et, Bu groups and L is hydrazone ligand. Hydrazones are considered as privileged ligands due to their high stability, facile synthesis, good solubility, and availability of -NH-C=O group in the proximity of azomethine group making them great chelating ligands. The synthesized compounds were investigated by different spectral methods like FT-IR, ( $^1H$ ,  $^{13}C$ ,  $^{119}Sn$ ) NMR, mass spectrometry. The findings of spectral data showed that ligand is coordinated in tridentate manner to diorganotin(IV) salts through imine nitrogen, enolic and phenolic oxygen giving rise to penta-coordinated geometry around tin metal center. *In vitro* antimicrobial potency of the compounds was evaluated against different bacterial (*P. aeruginosa*, *B. subtilis*, *E. coli*, *B. cereus*) and fungal strains (*A. niger*, *C. albicans*), suggesting that complexes exhibited good activity compared to their ligand. The improved efficacy of diorganotin(IV) complexes may be explained on the basis of Tweedy chelation theory and Overtone's theory. Dibutyltin(IV) complex with MIC value ranging between 0.018738-0.009369  $\mu\text{mol}/\text{mL}$  showed superior potency against *E. coli* and *A. niger*, while diethyltin(IV) complex showed MIC value in between 0.020459-0.010229  $\mu\text{mol}/\text{mL}$  and dimethyltin(IV) complex displayed MIC value in range of 0.021444-0.010722  $\mu\text{mol}/\text{mL}$ .

**Abstract No.: A-022**

**Registration No. 1079**

## **ORGANOMETALLIC COORDINATION STUDIES: SYNTHESIS AND CHARACTERIZATION OF DIORGANOTIN(IV) COMPLEXES**

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Scientific literature reveals that organometallic compounds are gaining interest due to their wide-ranging applications in industrial and biological fields, largely attributed to their ability of showing diverse coordination sites. Among such ligands, hydrazone ligands are frequently chosen for complexation, due to their versatile physiochemical properties. Flavone act as a secondary metabolite in plant and in our current work, we synthesized and characterized diorganotin(IV) complexes bearing flavone derivative. This ligand shows high tendency for complexation due to high stability and high solubility. Characterization was done using various spectroscopic techniques like multinuclear NMR, Mass, *etc.* Data revealed that ligand coordinated to tin metal *via* ONO donor atoms forming a penta-coordinated geometry.

**Abstract No.: A-023**

**Registration No. 1083**

## **TRANSITION METAL COMPLEXES AS EMERGING ANTIBACTERIAL AGENTS**

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Transition metal complexes have gained considerable attention in modern medicinal chemistry due to their significant potential in the treatment and management of various diseases. Antimicrobial resistance is one of the global public health and development threats. According to Global Antimicrobial Resistance Surveillance Report 2025, bacterial infections are increasingly causing severe harm due to rising antimicrobial resistance, making common illnesses harder to treat. The primary cause of bacterial infections is the invasion and proliferation of pathogenic bacteria, facilitated by factors such as poor hygiene, contaminated food and water, and increased exposure to infectious environments. Weakened immune systems and disruption of the normal microbiota, often due to excessive antibiotic use, significantly increase the risk of infection. The escalating global challenge of antibiotic resistance has necessitated the development of innovative antimicrobial strategies, leading to significant advancements in the use of transition metal complexes. Transition metal complexes have emerged as promising candidates in this context due to their unique physicochemical properties. This review focuses on the antibacterial capabilities of different ligands and their Co(II), Ni(II), Cu(II), and Zn(II) complexes, demonstrating their potential as agents against bacterial infections. Significant global progress has been made in the development of transition

metal complex-based antibacterial drugs, though continued efforts are necessary to fully realize their clinical potential.

**Keywords:** Ligands; Transition metal complexes; Antibacterial activity

**Abstract No.: A-024**

**Registration No. 1084**

## **IMIDAZOLE-COUMARIN HYBRIDS: EMERGING PHARMACOLOGICAL POTENTIALS**

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Imidazole and Coumarin scaffolds are prominent in medicinal chemistry owing to their broad pharmacological profiles and structural adaptability. Their molecular hybridization has recently gained attention as an effective approach for developing compounds with enhanced therapeutic potential and improved biological performance. This review highlights recent progress in the synthesis and biological evaluation of imidazole-coumarin hybrids. Reported synthetic strategies, including conventional, green, and catalyst-assisted methods, are summarized with emphasis on reaction efficiency, yield, simplicity, and functional group tolerance. In addition, recent developments focusing on sustainable and eco-friendly synthetic approaches have also been considered. The influence of structural modifications within both scaffolds on biological activity is discussed in a general context. These hybrids exhibit a wide range of biological activities, notably antimicrobial (antibacterial and antifungal), anticancer, antioxidant, antiviral, and enzyme inhibitory effects, making them attractive candidates for therapeutic development. Furthermore, their versatility allows exploration across multiple disease targets. Collectively, the findings establish imidazole-coumarin hybrids as a promising class of bioactive molecules in modern drug discovery. This review also outlines existing challenges and future directions for the rational design and development of more effective, selective, and safer therapeutic agents.

**BIOLOGICAL ACTIVITIES OF SCHIFF BASE DERIVED  
ORGANOTIN(IV) COMPLEXES****Priyanka Yadav, Sonika Asija\***

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With the development of science and technology to improve the life standards, a lot of new fields have emerged to encounter the emerging and existing challenges to the humankind. Organotin(IV) compounds have proven to be extremely valuable in the treatment and management of various diseases. The considerable advances in the use of Schiff base derived organotin(IV) compounds as development of new drugs. It is reported that organotin(IV) compounds, having an organic moiety, show varying biological activities. Research in the 1980s and 1990s shifted toward understanding the structure–activity relationship governing their biological effects. The effectiveness of organotin(IV) complexes is significantly governed by their structure, lipophilicity, and coordination patterns. Entering the 21st century, the focus expanded toward designing organotin(IV) complexes with tailored biological properties using ligands such as Schiff bases. Several researchers have identified complexes that are effective as anti-inflammatory, anti-tuberculosis anti-microbial, antibacterial, antiviral, anti-proliferative and anti-cancer drugs in recent years, therefore their applications have gotten a lot of biological interest. Biological properties of the system are modified by changing the organic ligands in organotin(IV) complexes which stimulate the reactivity. This review focuses on the biological activities of various ligands and their organotin(IV) complexes, highlighting their potential for their progression into effective therapeutic agents.

Keywords: Schiff base; Organotin(IV) complexes; Biological activities

**Abstract No.: A-026**

**Registration No. 1086**

**SYNTHESIS, CHARACTERIZATION AND ANTIDIABETIC EVALUATION OF  
DHA-CHALCONE-TRIAZOLE TRIADS AS  $\alpha$ -GLUCOSIDASE INHIBITORS**  
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Diabetes mellitus (DM) is one of the major global health concerns of this century. Design and development of new preventive drugs for DM are currently needed. The literature reports revealed that a number of heterocyclic compounds including DHA, triazoles, pyrazoles, imidazoles, isatin, *etc.* exhibit  $\alpha$ -glucosidase inhibition. In view of the above-mentioned and in search of some new  $\alpha$ -glucosidase inhibitors, herein, we have designed and synthesized some DHA-chalcone-triazole triads starting from some basics scaffolds *i.e.* dehydroacetic acid (DHA), salicylaldehyde and 1,2,3-triazoles *via* molecular hybridization approach as well as 'Click' reaction. All the synthesized triazole hybrids were thoroughly characterized using spectral techniques FTIR, HRMS and NMR. Further, their  $\alpha$ -glucosidase inhibition potency was estimated in terms their IC<sub>50</sub> ( $\mu$ M) values taking acarbose as the reference drug. One of the molecule **4k** with fluorine substitution at *para* position was found to exhibit IC<sub>50</sub> value  $1.35 \pm 0.13 \mu\text{M}$  compared to acarbose (IC<sub>50</sub> =  $13.5 \pm 0.32 \mu\text{M}$ ). Moreover, to have an insight on the binding mechanism of these triads molecular docking studies were also performed computationally with  $\alpha$ -glucosidase protein. Details will be discussed during the conference.

**Keywords:** Dehydroacetic acid, salicylaldehyde, 1,2,3-triazoles,  $\alpha$ -glucosidase inhibition, molecular hybridization.

**Abstract No.: A-027**

**Registration No. 1087**

**DEVELOPMENT OF SCHIFF BASE METAL COMPLEXES AS  
EFFECTIVE INHIBITORS OF TUBERCULOSIS**

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Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a major global health burden now a days, with approximately 10.7 million new cases reported worldwide in recently. Despite being preventable and curable, TB continues to be one of the leading infectious diseases which causes mortality. A major concern is the rise of drug-resistant forms, particularly multidrug-resistant tuberculosis (MDR-TB). Globally, about 0.4 million cases of MDR/rifampicin-resistant TB are reported annually, and only around 40% of affected patients receive appropriate treatment, highlighting a serious therapeutic gap. Furthermore, nearly 3.2%

of new TB cases and up to 16% of previously treated cases exhibit drug resistance, emphasizing the urgent need for new anti-TB agents. In this context, Schiff base transition metal complexes have gained significant prominence candidates due to their enhanced biological activity and structural versatility. In the present study, Schiff base ligands were synthesized via condensation of suitable aldehydes and primary amines to form hydrazones, thiosemicarbazone followed by complexation with Ni(II), Cu(II), Zn(II), and Co(II) ions. The synthesized compounds were characterized using UV-Visible and FT-IR spectroscopy along with elemental analysis, confirming coordination through the azomethine (-C=N-) group. The results demonstrated that metal complexes exhibit significantly higher activity than free ligands. Notably, Cu(II) and Co(II) complexes demonstrated pronounced antitubercular efficacy, exhibiting significantly reduced MIC values, indicative of higher potency against *Mycobacterium tuberculosis*. These findings suggest that Schiff base metal complexes represent a promising strategy for developing novel anti-TB therapeutics, particularly against drug-resistant strains.

**Abstract No.: A-028**

**Registration No. 1090**

**DEVELOPMENT AND BIOACTIVITY PROFILING OF HYDRAZONE-BASED TRANSITION METAL COMPLEXES TARGETING ANTIMALARIAL ACTIVITY**

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Malaria, a major vector-borne disease caused by *Plasmodium* parasites, is transmitted to humans through the bites of infected mosquitoes and continues to pose a serious global health challenge. It is commonly associated with symptoms such as fever, vomiting, and myalgia, while severe infections, particularly those caused by *P. falciparum*, may lead to life-threatening complications including coma and death. In addition to malaria, the widespread prevalence of microbial infections affecting both humans and animals further exacerbates the global burden of infectious diseases, thereby emphasizing the urgent need for the development of effective antimalarial and antimicrobial drugs. Hydrazones constitute an important class of Schiff base ligands in coordination chemistry, known for their strong metal-chelating ability and significant biological potential. In recent decades, considerable attention has been directed toward transition metal complexes derived from hydrazone ligands owing to their diverse pharmacological activities, including antioxidant, anticancer, antimicrobial, antimalarial, and antidiabetic properties. In the present study, a hydrazone ligand was synthesized *via* the condensation reaction of ethyl carbazate with salicylaldehyde and subsequently employed for the preparation of its Co(II), Ni(II), Cu(II), and Zn(II) complexes, with the aim of exploring their potential biological activities. Furthermore, the ligand and its metal complexes were evaluated for antimalarial activity, with the metal complexes exhibiting enhanced biological efficacy compared to the free ligand. These findings underscore the potential of hydrazone-based transition metal complexes as promising scaffolds for the development of new antimalarial drugs.

**Keywords:** Hydrazone, Transition metal, Antimalarial activity,

**CONSUMER AWARENESS AND ACCEPTABILITY OF MILLETS AS FUNCTIONAL FOODS: INTEGRATING INDIAN KNOWLEDGE SYSTEMS WITH MODERN NUTRITION SCIENCE****Raveena Rani and Dr. Venu Sangwan**

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Milletts are increasingly recognized as functional foods; however, their integration into modern diets remains limited despite their strong foundation in traditional Indian food systems. The present study assessed consumer awareness, consumption patterns, perceived health benefits, and acceptability of millets, with a focus on integrating Indian Knowledge Systems (IKS) with modern nutrition science. A cross-sectional survey was conducted among 60 respondents (18–60 years) using a structured questionnaire to evaluate dietary habits, knowledge, and preferences related to millet consumption. The findings revealed that 70% of respondents were aware of the nutritional benefits of millets, yet only 35% consumed them regularly, indicating a clear gap between awareness and practice. About 62% associated millets with traditional diets, whereas only 27% recognized their role in managing lifestyle diseases such as diabetes and obesity. Major barriers included taste (55%), longer cooking time (43%), and limited availability of ready-to-eat products (40%). However, 78% of participants expressed willingness to incorporate millets into their diets if available in convenient, value-added forms. Furthermore, 67% of respondents believed that traditional processing methods such as soaking, fermentation, and germination enhance digestibility and nutritional quality. Sensory evaluation of millet-based products (n = 30) showed good acceptability, with mean scores above 7.5 on a 9-point hedonic scale. The study concludes that integrating indigenous knowledge with modern food innovations and improving product accessibility can significantly enhance millet consumption and support nutritional security.

**Keywords:** Millets, Functional Foods, Consumer Awareness, Nutritional Security, Value Addition and Traditional Diets.

**Abstract No.: A-030**

**Registration No. 1094**

**ARTIFICIAL INTELLIGENCE DRIVEN PROSTHETIC SYSTEMS: ENHANCING MOBILITY AND FUNCTIONAL INDEPENDENCE**

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Artificial Intelligence (AI) is rapidly evolving prosthetic technology from passive mechanical aids into intelligent, adaptive systems capable of closely mimicking natural human movement. This work highlights the role of AI-driven prosthetic systems in enhancing mobility, functionality, and user independence. By integrating machine learning and pattern recognition, modern prostheses can analyse electromyographic signals to accurately interpret user intent, enabling intuitive and precise control with reduced cognitive effort. In lower-limb prosthetics, AI facilitates real-time adaptation to dynamic environments, such as uneven terrain and varying walking speeds, thereby improving balance, gait stability, and energy efficiency. In upper-limb devices, AI enables multi-articulating robotic hands with diverse grip patterns, significantly enhancing dexterity and daily task performance. A major advancement lies in the incorporation of neural interfaces and brain-computer interfaces, allowing direct communication between the user's nervous system and the prosthetic device. This not only improves control but also addresses the long-standing limitation of sensory feedback by translating external stimuli into interpretable neural signals, restoring a sense of touch. Additionally, AI contributes to personalized prosthetic design through 3D scanning and modelling, optimized rehabilitation protocols, and predictive maintenance for long-term reliability. Overall, the convergence of AI, robotics, and neural engineering represents a paradigm shift in prosthetics, offering improved quality of life, greater autonomy, and enhanced functional outcomes for individuals with limb loss.

**Keywords:** Artificial Intelligence (AI), Prosthetics, Machine Learning, Electromyography (EMG), Neural Interfaces, Brain-Computer Interface (BCI), Smart Prosthetic Systems, Rehabilitation, Sensory Feedback, Biomechanics

**Abstract No.: A-031**

**Registration No.1095**

**FROM MOLECULAR LIGANDS TO ANTICANCER AGENTS: THE ROLE OF METALS IN ENHANCING ANTICANCER POTENTIAL OF SCHIFF BASE LIGANDS**

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**Abstract:** Metal-based drugs have gained significant attention as promising therapeutic agents, particularly in the development of bioactive compounds for cancer treatment-one of the most pressing global health challenges. Cancer involves the uncontrolled growth of abnormal cells that can spread throughout the body, making its treatment complex. Among organic compounds, Schiff bases form an important class, where the azomethine (-C=N-) group plays

a key role in their biological activity and pharmaceutical relevance. Various ligands, including Schiff bases, hydrazones, carbazones, thiosemicarbazones, and other heterocyclic compounds, have been extensively studied for their anticancer potential. Notably, their complexes with transition metal ions such as Co(II), Ni(II), Cu(II), Zn(II), Ru(II), and Pt(II) often exhibit enhanced cytotoxicity compared to the free ligands, making them more effective candidates for cancer therapy. In addition, a wide range of metal-based molecules have been shown to act through several diverse mechanisms for their anticancer activity, which includes DNA binding, generation of reactive oxygen species (ROS), disrupting the cell cycle, and thereby emphasized as potential lead compounds in antitumor drug design. Their promising biological applications, inspired me to explore these compounds in depth.

**Keywords:** Schiff bases; Transition metal ions; Anticancer activity; Cytotoxicity; DNA binding; Antitumor drug

**Abstract No.: A-032**

**Registration No.1096**

**SYNTHESIS, STRUCTURAL CHARACTERIZATION AND  
ANTIMALARIAL INVESTIGATION OF TRANSITION METAL  
COMPLEXES OF PYRAZOLE HYDRAZONES**

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**Abstract:** Hydrazone ligands, an important class of Schiff bases, are characterized by the presence of an azomethine ( $-\text{CH}=\text{N}-$ ) functional group and frequently contain additional donor atoms such as nitrogen and oxygen, which enable versatile coordination with metal ions. Due to these structural attributes, the rational design and synthesis of transition metal complexes derived from hydrazone ligands have gained considerable attention in medicinal inorganic chemistry, particularly because of their structural diversity and significant biological relevance. Their tunable electronic properties facilitate stronger interactions with biological macromolecules, thereby enhancing their pharmacological potential. Recent studies have emphasized the biological significance of hydrazone-based metal complexes as promising antimalarial agents, as they can interfere with essential parasitic metabolic pathways and redox homeostasis. The coordination of these ligands with transition metal ions further improves their biological performance by enhancing stability, lipophilicity, and cellular uptake, which ultimately increases their effectiveness against malarial parasites. In the present study, a series of Co(II), Ni(II), Cu(II), and Zn(II) complexes were synthesized using hydrazone ligands obtained through the condensation of a pyrazole derivative with hydrazide derivatives under methanolic reflux conditions for 5–6 hours. The synthesized ligand and its corresponding metal complexes were systematically characterized using various spectroscopic techniques. Furthermore, the synthesized compounds were evaluated for their *in vitro* antimalarial activity

against *Plasmodium falciparum* strains and exhibited promising inhibitory responses. These findings indicate that pyrazole-based hydrazone metal complexes serve as potential bioactive scaffolds for the development of novel antimalarial agents and provide a strong basis for future research in medicinal chemistry and drug discovery.

**Keywords:** Pyrazole, Hydrazone ligand, Transition metal, Antimalarial

**Abstract No.: A-033**

**Registration No.1097**

## **IMIDAZOLE–TRIAZOLE HYBRIDS: ANTIMICROBIAL EVALUATION AND MOLECULAR DOCKING INSIGHTS**

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**Abstract:** The rapid emergence of microbial resistance has become a major global health challenge, significantly reducing the effectiveness of existing antimicrobial therapies. Pathogens affecting humans and plants contribute to serious infections and major agricultural losses across the globe. These concerns highlight an urgent need for the development of new and effective antimicrobial agents with improved efficacy and mechanisms of action. In this context, the present study focuses on the design and synthesis of a series of imidazole-triazole hybrid molecules as promising antimicrobial scaffolds. The hybridization of two biologically active heterocyclic pharmacophores, imidazole and triazole, was expected to enhance biological activity through synergistic effects. The synthesized compounds were evaluated for their in vitro antimicrobial potential against selected fungal strains, including the mycopathogens *C. albicans* and *A. niger* and the phytopathogens *R. solani*, *F. oxysporum*, and *M. phaseolina*, as well as bacterial strains including *B. subtilis*, *S. aureus*, *E. coli*, and *P. aeruginosa*. Several compounds demonstrated appreciable inhibitory activity against the tested organisms, indicating the potential of this hybrid framework as a source of new antifungal agents. To further understand the possible mechanism of action, molecular docking studies were performed for the most active compounds with relevant target proteins. Molecular docking revealed favorable binding energies and crucial interactions at the active sites of sterol 14- $\alpha$ -demethylase and DNA gyrase, involving hydrophobic interactions,  $\pi$ - $\pi$  stacking, and halogen bonding, which support the antimicrobial potential of the compounds.

## DEVELOPMENT AND BIOACTIVITY PROFILING OF HYDRAZONE-BASED TRANSITION METAL COMPLEXES TARGETING ANTIMALARIAL ACTIVITY

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### Abstract

Malaria, a major vector-borne disease caused by *Plasmodium* parasites, is transmitted to humans through the bites of infected mosquitoes and continues to pose a serious global health challenge. It is commonly associated with symptoms such as fever, vomiting, and myalgia, while severe infections, particularly those caused by *P. falciparum*, may lead to life-threatening complications including coma and death. In addition to malaria, the widespread prevalence of microbial infections affecting both humans and animals further exacerbates the global burden of infectious diseases, thereby emphasizing the urgent need for the development of effective antimalarial and antimicrobial drugs. Hydrazones constitute an important class of Schiff base ligands in coordination chemistry, known for their strong metal-chelating ability and significant biological potential. In recent decades, considerable attention has been directed toward transition metal complexes derived from hydrazone ligands owing to their diverse pharmacological activities, including antioxidant, anticancer, antimicrobial, antimalarial, and antidiabetic properties. In the present study, a hydrazone ligand was synthesized *via* the condensation reaction of ethyl carbazate with salicylaldehyde and subsequently employed for the preparation of its Co(II), Ni(II), Cu(II), and Zn(II) complexes, with the aim of exploring their potential biological activities. Furthermore, the ligand and its metal complexes were evaluated for antimalarial activity, with the metal complexes exhibiting enhanced biological efficacy compared to the free ligand. These findings underscore the potential of hydrazone-based transition metal complexes as promising scaffolds for the development of new antimalarial drugs.

**Keywords:** Hydrazone, Transition metal, Antimalarial activity

**Abstract No.: A-035**

**Registration No.1099**

## **SCHIFF BASE METAL COMPLEXES AS EMERGING CANDIDATES FOR ANTIMALARIAL DRUG DEVELOPMENT**

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**Abstract:** Malaria remains one of the most devastating parasitic diseases worldwide, with *Plasmodium falciparum* demonstrating increasing resistance to frontline artemisinin-based combination therapies. The rapid emergence of drug-resistant strains of *Plasmodium* parasites has created an urgent need for new and more effective antimalarial agents. This pharmacological challenge has catalyzed research into bioinorganic chemistry, specifically the design of transition metal complexes derived from Schiff base ligands as alternative inhibitory agents. Schiff bases, characterized by the azomethine ( $>C=N-$ ) functional group, serve as exceptional chelating agents that stabilize various oxidation states of d-block metals such as Cu(II), Zn(II), Co(II), and Ni(II). This enhanced efficacy is attributed to increased lipophilicity upon chelation, which facilitates the penetration of the parasite's cell membrane. Mechanistically, these complexes interfere with the parasite's heme detoxification pathway, preventing the formation of hemozoin and leading to the accumulation of toxic free heme. Additionally, the redox-active nature of the metal centers promotes the intracellular generation of reactive oxygen species (ROS), inducing oxidative stress within the parasite. These findings suggest that transition metal Schiff base complexes represent a potent and versatile class of inhibitors. The results highlight the potential of Schiff base metal complexes as promising scaffolds for the development of new antimalarial drugs. This research contributes to the growing effort to discover innovative metal-based therapeutics that could help address the challenge of antimalarial drug resistance.

**Keywords:** Schiff base, Transition metals, *P. falciparum*, Antimalarial.

**Abstract No.: A-036**

**Registration No.1101**

## **CLOSED-FORM ANALYTICAL EXPRESSIONS FOR STATIC DEFORMATION DUE TO DIP-SLIP FAULT**

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**Abstract:** A dip-slip fault located in the elastic half-space has deformed a homogeneous, isotropic, elastic layer of uniform thickness lying over a homogeneous, isotropic, elastic half-space. By applying suitable boundary conditions at the free surface and interface, the integral expression for the horizontal

displacement has been produced using the Airy stress function approach. MATLAB software has been utilized for the graphical representation of the results. Research has been done on how Poisson's ratio and the ratio of rigidity affect horizontal displacement. It is observed that the displacement approaches zero for all rigidity ratios at larger distances from the fault. Dip-slip faults, a crucial feature of sedimentary basins, have a substantial impact on oil and gas development and production.

**Abstract No.: A-037**

**Registration No.1102**

## **PYRAZOLONES SCHIFF BASE DERIVED METAL COMPLEXES AS ANTIMICROBIAL AGENTS**

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**Abstract:** Now a day's rise of multidrug-resistant infections have intensified the search for better antimicrobial agents. According to the WHO Global Antimicrobial Resistance Surveillance Report 2025 on rising resistance in pathogens such as *E. coli* and *K. pneumoniae*, leading to treatment failures and underscoring the need for new antimicrobial drugs. Many of the nitrogen containing heterocyclic compounds have been reported as key motifs in medicinal and coordination chemistry. Among the broadly available organic ligands pyrazolones derivatives are known for their better chelating tendency and broad spectrum of biological activities such as antimicrobial, antimalarial and anticancer etc. Several studies have shown that coordination of pyrazolones functionality with metal ions, significantly enhance their therapeutic potential. It was intended to synthesize some pyrazolones derivatives and their cobalt(II), nickel(II), copper(II), and zinc(II) complexes in order to assess in-vitro antimicrobial activity against the following bacterial and fungal strains: *Escherichia coli* (MTCC 16521), *Pseudomonas aeruginosa* (MTCC 647), *Staphylococcus aureus* (MTCC 3160), *Bacillus subtilis* (MTCC 441), *Candida albicans* (MTCC 183), and *Rhizopus oryzae* (MTCC 262). Among the tested compounds, Zinc complexes showed the strongest antimicrobial potential. This suggests that these complexes could be excellent candidates for the development of future antimicrobial drugs.

**Keywords:** Pyrazolones, Transition metal complexes, Antimicrobial activity

**PYRAZOLYL IMINE-BASED COBALT, NICKEL AND COPPER  
COMPLEXES AS ANTIMICROBIAL AGENTS****Renu, Mahavir Parshad**

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**Abstract:** Chemistry of nitrogen heterocycles play pivotal role in coordination and medicinal chemistry. Among the broadly available heterocyclic nitrogen containing organic ligands, pyrazolyl based imine derivatives are gaining much importance due to ease of formation and better coordination with the metal ions. Complexes of such ligands with metal ions have emerged as important candidates in medicinal chemistry due to their diverse biological activities and adaptable coordination behavior. Numerous examples of pyrazolyl imine-based metal complexes have been reported with enhanced biological performance as compared to the free ligands. Pyrazolyl imine derivatives are particularly recognized for their broad-spectrum antimicrobial activity against various pathogenic microorganisms. This activity is largely attributed to the synergistic effect of the pyrazole ring and imine functionality, which facilitates interaction with microbial enzymes and cellular targets. Prompted by this, it was planned to synthesised some pyrazolyl imine-based ligands and their Cobalt(II), Nickel(II), and Copper(II) complexes, in order to study for their *in vitro* antimicrobial activity against selected microbial strains, including *Candida albicans* (MTCC 227), *Pseudomonas aeruginosa* (MTCC 424), *Rhizopus oryzae* (MTCC 262), *Escherichia coli* (MTCC 732), *Staphylococcus aureus* (MTCC 2901) and *Bacillus subtilis* (NCIM 2063). From the antimicrobial studies it was revealed that the metal complexes exhibited enhanced antimicrobial activity as compared to the free ligands. These findings highlight the significant role of metal coordination in improving the biological efficacy of pyrazole-based metal complexes in the search of effective antimicrobial agents.

**Keywords:** Pyrazolyl imine, transition metal, antimicrobial activity

**Abstract No.: A-039**

**Registration No.1121**

**SYNTHESIS AND CHARACTERIZATION OF TRIAZOLYL SCHIFF  
BASE DERIVED TRANSITION METAL COMPLEXES**

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**Abstract:** Transition metal complexes containing heterocyclic organic ligands featuring triazole ring have been widely acknowledged for their significant biological potential. Triazoles are known for their medicinal and synthetic applications. Combination of triazoles with azomethine group enhances molecular interactions with the biological targets, making them excellent chelating precursors for complexation. Formation of metal complexes with such types of ligands further improves their biological activity. This synergic bonding between triazole functionality and metal ions is responsible for their enhanced pharmacological performance. The lipophilicity of these complexes facilitates their diffusion across cell membranes, thereby increasing bioavailability. Triazolyl Schiff base derived complexes have been reported to exhibit strong antimicrobial activity against various bacterial and fungal species. They are also known to possess antioxidant and anticancer properties. Promoted by wide range of pharmaceutical and synthetic utility of triazolyl Schiff bases and their metal complexes, it is planned to carry out synthesis and characterization of some triazole Schiff base ligands and their Co(II), Ni(II), Cu(II), and Zn(II) complexes in different M:L molar ratios. The synthesized compounds were characterized using FT-IR, <sup>1</sup>H & <sup>13</sup>C NMR, HRMS, and SEM-EDAX techniques.

**Keywords:** Synthesis, Triazolyl Schiff base ligand, transition metal complexes, characterization

**Abstract No.: A-040**

**Registration No.1124**

**AN IMPERIAL STUDY OF SOLID INK DENSITY AND INK TRAPPING  
IN RECYCLED AND VIRGIN PAPER**

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**Abstract:** This research evaluates the influence of uncoated virgin and uncoated recycled paper in print quality by analysing SID (solid ink density) and ink trapping behaviour for CMYK (cyan, magenta, yellow, black) inks, printed using UV-inkjet printer, the solid ink density and ink trapping is measured using spectrophotometer in room temperature. The uncoated virgin

and recycled papers have same dimensions, same GSM (grammage per square meter) but different amount of filler content in them. The dimensions are measured using mm scale, GSM is measured using gsm tester and filler content is measured using ash tester. This research shows that by using fillers in paper improves print quality of recycled paper and it is possible to achieve print quality of virgin paper in recycled paper. The print quality depends on the balance between ink absorption and surface retention. Therefore, recycled paper and virgin paper both are suitable for general printing applications but for sustainability, recycled paper should be preferred.

**Keywords:** - Recycled paper, virgin paper, Sustainability, SID, Ink trapping, CMYK, Fillers, GSM.

**Abstract No.: A-041**

**Registration No.: 1125**

## **BIOLOGICAL STUDIES OF NOVEL DI-SUBSTITUTED IMIDAZOLE-ACETAMIDE HYBRIDS**

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Imidazole is a five-membered heterocyclic compound recognized for its crucial role in medicinal chemistry, drug discovery and biological activities. Due to its unique electronic properties and ability to participate in hydrogen bonding, imidazole and its derivatives exhibit a wide spectrum of biological activities, including antifungal, antibacterial, anticancer, anti-inflammatory, and enzyme-inhibitory effects. The acetamide moiety is known to enhance hydrogen-bonding interactions with biological targets, improving binding affinity and pharmacokinetic behaviour. On the basis of ongoing challenge to develop novel compounds with enhanced efficacy, we report the synthesis of molecular hybridized imidazole-acetamide compounds using p-toluenesulfonylmethyl isocyanide (TosMIC) as a key reactant. The structures of all novel synthesized compounds were confirmed by FT-IR, NMR, and HRMS techniques. The synthesized hybrids were then screened for their antibacterial, antifungal, and antioxidant activities against selected microbial strains and standard reference drugs. Several compounds exhibited significant biological activity, with some derivatives showing promising antimicrobial effects comparable to standard drugs.

**EXPLORING BIIMIDAZOLE-TRIAZOLE HYBRIDS:  
ANTIMICROBIAL ACTIVITY AND COMPUTATIONAL INSIGHTS****Sonia\* and Vikas Verma**

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According to World Health Organization (WHO), antimicrobial resistance represents a major global health threat, contributing to nearly five million deaths annually. The global rise of antimicrobial resistance highlights the urgency of developing innovative scaffolds with enhanced therapeutic effectiveness. Nitrogen-containing heterocycles represent one of the most important classes of compounds in medicinal chemistry due to their distinctive chemical features and broad biological relevance. Among them, biimidazole and triazole scaffolds are well-established pharmacophores in medicinal chemistry, each independently recognized for their diverse biological activities including antibacterial, antifungal, antioxidant, and anticancer etc. The hybridization of these two heterocyclic motifs offers a promising strategy for developing novel compounds with enhanced antimicrobial potential. In the present study, a small library of novel biimidazole-triazole hybrids was designed and synthesized using a hybrid pharmacophoric approach via click chemistry. The structures of all synthesized hybrids were confirmed using spectroscopic techniques. These hybrids were subsequently evaluated for their antimicrobial activities against two Gram (+) bacteria (i.e. *B. subtilis* MTCC 441 and *S. aureus* MTCC 3160), two Gram (-) bacteria (i.e. *E. coli* MTCC 16,521 and *P. aeruginosa* MTCC 647) and two fungal strains (i.e. *R. oryzae* MTCC 262 and *C. albicans* MTCC 183). Several hybrids demonstrated significant inhibitory effects, highlighting the synergistic contribution of both pharmacophores. To further elucidate their mechanism of action, molecular docking studies were performed, which revealed favorable interactions with relevant microbial targets and supporting the experimental observations. Collectively, these findings highlight the potential of biimidazole-triazole hybrids as emerging antimicrobial agents and provide valuable insights for their future development in drug discovery.

**Abstract No.: A-043**

**Registration No.: 1131**

## **SYNTHESIS OF ECO-FRIENDLY DEEP EUTECTIC SOLVENTS, CHARACTERISATION AND COMPUTATIONAL STUDIES**

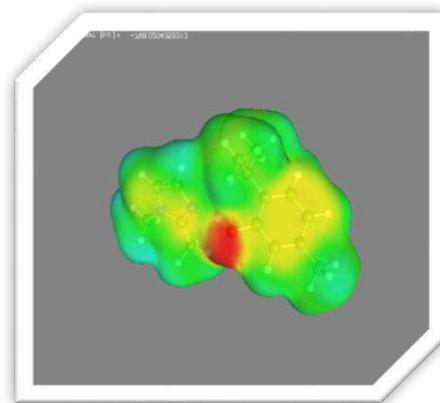
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Deep eutectic solvents (DESs) are sustainable and tunable fluids that can be customised by varying hydrogen bond donor (HBD) and hydrogen bond acceptors (HBA) components and have been recently emerged a new ionic liquids (ILs) analogue. The low vapor pressure, inflatability, biodegradability and positive effect on the environment make DESs more favourable as neoteric solvents. In this study, Thymol was selected as a hydrogen bond donor (HBD) and 1,2-Dimethylimidazole hydrogen bond acceptors (HBA) at various ratios (1:1,1:2 and 2:1) in the temperature range i.e. 298.15-353.15 K using the conventional method and explore the formation of DESs that was colourless liquid at room temperature and less viscous. Third component metal salt was added for the enhance the physical properties of synthesised DESs. That DESs were characterised using the fourier transform infrared spectroscopy (FT-IR) was employed to study the functional groups and nuclear magnetic resonance (NMR) spectroscopy studies for determine structure, purity and composition of the synthesised DESs. The physical properties were measured such as viscosity, density, refractive index, pH and electrical conductivity. Computational studies also performed to optimise the geometry, electronic energy and molecular interactions of the synthesised DESs. Also to identify, qualitatively molecular properties like polarity or HBD, HBA, sigma-profile, sigma-potential and compare the hydrogen bond interactions of the synthesised DESs.



**Abstract No.: A-044**

**Registration No.: 1132**

## **ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING AGRICULTURAL PRODUCTIVITY AND RESOURCE EFFICIENCY**

**Sunil Kumar**

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Artificial Intelligence (AI) is emerging as a transformative tool in agriculture, offering data-driven solutions to improve productivity while optimizing the use of limited resources. The present study investigates the role of AI-based technologies in enhancing agricultural productivity and resource efficiency among farmers. An original field-based study was conducted in selected rural areas of Hisar district, Haryana, with a sample of 60 respondents. Data were collected using a structured interview schedule focusing on awareness, adoption, and perceived effectiveness of AI tools such as mobile-based advisory services, crop monitoring applications, and automated irrigation systems.

The findings reveal that moderate awareness of AI technologies exists among farmers; however, actual adoption remains limited due to constraints such as lack of technical knowledge, high initial costs, and inadequate access to digital infrastructure. Farmers who adopted AI-based practices reported noticeable improvements in crop yield, efficient water usage, and reduced input costs through precise application of fertilizers and pesticides. AI-enabled decision support systems also contributed to better crop planning and risk management, particularly under changing climatic conditions.

The study highlights that AI has significant potential to enhance agricultural productivity while ensuring sustainable resource utilization. However, its widespread adoption requires targeted interventions, including capacity-building programs, affordable technological solutions, and strengthened rural digital infrastructure. The research emphasizes the need for policy support and extension services to bridge the gap between technological innovation and practical application at the grassroots level.

Keywords: artificial intelligence, agriculture, sustainable, technology

**Abstract No.: A-045**

**Registration No.: 1139**

**RECENT PROGRESS IN EXPLORING THE ANTIMALARIAL  
POTENTIAL OF TRANSITION METAL COMPLEXES**

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Malaria persists as a serious global health threat, especially in low-resource areas and wide population. Therefore, with the aim of discovering effective therapeutic agents against malaria and its associated dysfunctions, the present study focused on the synthesis of four novel transition metal complexes containing Cu(II), Zn(II), Co(II) and Ni(II) using metal chlorides and Schiff base ligand which were formed *via* condensation between 2-amino-4-methylbenzothiazole and salicylaldehyde derivative having 3-methoxy substituents. The derived compounds were analysed using several spectroscopic and physico-chemical techniques, including <sup>1</sup>H and <sup>13</sup>C NMR, UV-Visible, FT-IR, and ESI-mass spectrometry, elemental microanalysis, ESR, PXRD, SEM-EDAX, molar conductance, and thermogravimetric analyses to elucidate their structural features. *In vitro* evaluations were performed by using micro assay methods, to explore antimalarial potentials of synthesized compounds, assessing their effectiveness against malarial diseases. The potency of metal complexes against antimalarial deformities was higher than that of parent ligand due to chelation.

**Abstract No.: A-046**

**Registration No.: 1142**

**INFLUENCE OF FEEDSTOCK SELECTION ON PHYSICO-CHEMICAL  
PROPERTIES OF ACTIVATED CARBON**

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The choice of biomass feedstock significantly influences the physicochemical characteristics and efficacy of activated carbon. This study examines the effects of two commonly accessible agricultural residues (rice straw and corn cob) on the properties of activated carbon prepared under controlled conditions through chemical activation using phosphoric acid. In order to assess variations in pore structure, surface functionality, and structural ordering, the resultant materials were methodically evaluated using BET surface area analysis, Fourier Transform Infrared (FTIR) spectroscopy, Scanning Electron Microscopy (SEM), and X-ray Diffraction (XRD).

Distinct variations were observed between the two feedstocks. Rice straw-derived activated carbon had a higher ash and silica content, which hampered pore formation by generating partial pore blockage and reducing surface accessibility. Corn cob-derived activated carbon, on the other hand, had a better carbon composition with less ash content, resulting leading to higher pore formation, surface area, and structural integrity. Although their accessibility and efficacy differed depending on the type of feedstock, surface functional group analysis revealed the existence of oxygen-containing groups (–OH, –COOH) in both materials.

These differences significantly impact adsorption behavior, with corn cob-derived activated carbon showing superior performance due to its well-developed porous network and greater availability of active sites. The findings highlight that feedstock selection is not merely a preparatory choice but a critical design parameter that governs activation efficiency and adsorbent quality. This study provides valuable insights for optimizing biomass selection in the development of cost-effective and sustainable activated carbon materials for environmental remediation applications.

**Keywords:** Activated carbon, Corn cob, rice straw

**Abstract No.: A-047**

**Registration No.: 1144**

## **SYNTHETIC PROTOCOLS FOR IMIDAZOLES: A COMPREHENSIVE REVIEW**

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Imidazoles, a class of nitrogen-containing heterocycles, have long been recognized as privileged scaffolds in medicinal chemistry due to their broad spectrum of biological activities. Their derivatives are widely explored for antimicrobial, anticancer, antiviral, and anti-inflammatory applications, making the development of efficient synthetic strategies a critical area of research. This review discusses different methods used to synthesize imidazole derivatives, including cyclo-condensation, multicomponent reactions, and metal-catalyzed techniques, emphasizing their efficiency, selectivity, and environmental sustainability. It also highlights future directions in imidazole synthesis, such as the use of green chemistry, nanotechnology, and computational approaches to develop new compounds with improved effectiveness and lower toxicity.

**DESIGN AND DEVELOPMENT OF DEHYDROACETIC ACID-BASED HYDRAZONE CHEMOSENSOR FOR SELECTIVE DETECTION OF Hg<sup>2+</sup> ION****Sonia Balan<sup>1</sup>, Prof. Kashmiri Lal<sup>1</sup>**<sup>1</sup>Department of Chemistry, Guru Jambheshwar University of Science and Technology, Hisar – 125001, Haryana, India

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In the present study, a dehydroacetic acid (DHA)-based hydrazone derivative was designed, synthesized, and evaluated as efficient chemosensor for the selective detection of toxic metal ion, particularly Hg<sup>2+</sup>. The target compound was synthesized via a simple condensation reaction between DHA and suitable hydrazide precursors under reflux conditions in ethanol. Structural characterization was accomplished using FTIR, <sup>1</sup>H NMR, <sup>13</sup>C NMR, and HRMS techniques. The sensing performance of the synthesized probe was systematically investigated using UV–Vis absorption and fluorescence spectroscopy. The probe exhibited high selectivity and sensitivity toward Hg<sup>2+</sup> ions even in the presence of competing metal ions. Upon interaction with the target ions, significant spectral changes, including hypsochromic and hyperchromic shifts, were observed, indicating effective ligand–metal coordination. Binding stoichiometry was established through Job’s plot analysis, confirming a 1:1 interaction between the probe and metal ions. Furthermore, the Benesi–Hildebrand (B–H) plot was utilized to determine the binding constant ( $K_a$ ) for the association of probe with Hg(II) ions, which was found to be  $2.4 \times 10^5 \text{ M}^{-1}$ , indicating strong binding affinity. The limit of detection (LOD) and limit of quantification (LOQ) were calculated to be  $6.23 \times 10^{-8} \text{ M}$  and  $2.07 \times 10^{-7} \text{ M}$ , respectively, demonstrating the ability of the probe to detect Hg<sup>2+</sup> ions at very low concentrations. Additional studies, including interference analysis, pH-dependent behaviour, and reversibility tests using EDTA, demonstrated the selectivity, and recyclability of the sensing system. Fluorescence studies further supported the sensing mechanism, highlighting modulation in emission intensity governed by photoinduced electron transfer (PET) processes. Overall, the developed DHA-based hydrazone probes provide a simple, cost-effective, and reliable platform for the selective detection of Hg<sup>2+</sup> ions, with promising applications in environmental monitoring and biological systems.

**Keywords:** Dehydroacetic acid; Hydrazone derivatives; Chemosensor; Mercury detection; Chromium detection; UV–Vis spectroscopy; Fluorescence; PET mechanism; Metal ion sensing; Environmental monitoring

**Abstract No.: A-049**

**Registration No.: 1149**

**GREEN CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIA VIA *P. SURFINIA* FLOWERS EXTRACT: TOWARD SUSTAINABLE MATERIALS**

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Escalating environmental concerns associated with conventional toxic corrosion inhibitors have intensified interest in bio-derived, eco-benign alternatives. This work evaluates *P. surfinia* Flowers Extract as a green inhibitor for mild steel in 1.0 M HCl. Inhibition performance and interfacial behavior were assessed using weight-loss measurements, Contact angle, electrochemical impedance spectroscopy (EIS), and scanning electron microscopy (SEM). *P. surfinia* Flowers Extract delivers high protection, achieving 97% (weight-loss) and 95% (EIS) inhibition efficiencies at an optimal concentration of 2000 ppm. The  $\pi$ -electron systems and heteroatom-bearing polar functional groups within *P. surfinia* Flowers Extract constituents promote strong adsorption of inhibitor molecules onto the mild steel surface, effectively suppressing corrosion. Collectively, the results position *P. surfinia* Flowers Extract as a low-cost, renewable, and environmentally friendly inhibitor with promising potential for applications in acid media.

Keywords: - *P. surfinia* Flowers, Corrosion inhibitor, HCl, Mild steel, Contact angle

**Abstract No.: A-050**

**Registration No.: 1151**

**STRATEGIES FOR IMPLEMENTING THE NATIONAL EDUCATION POLICY 2020 FOR TRANSFORMATIVE EDUCATION**

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The National Education Policy 2020 (NEP 2020) marks a significant reform initiative aimed at restructuring India's education system to meet global standards while addressing local socio-economic needs. The policy emphasizes holistic, multidisciplinary and skill-oriented education, alongside a strong push toward digital transformation and inclusivity. Effective implementation of NEP 2020 requires a multi-layered strategy involving institutional restructuring, capacity building and technological integration. One of the key strategies involves the phased integration of vocational education and skill development across all levels of schooling and higher education. By aligning curricula with industry demands and embedding experiential learning, internships and entrepreneurship education, the policy aims to enhance employability and reduce the gap between education and the labor market. Digital

transformation is another cornerstone of NEP 2020 implementation. The policy promotes the use of digital platforms, online learning ecosystems and emerging technologies such as Artificial Intelligence and data analytics to improve access, quality and equity in education. Strengthening digital infrastructure, especially in rural and underserved areas and enhancing teachers' digital competencies through continuous professional development are critical components of this strategy. Furthermore, public-private partnerships and community engagement are encouraged to mobilize resources and ensure localized implementation. Despite its transformative vision, challenges such as regional disparities, financial constraints, resistance to change and the digital divide may hinder effective execution. Therefore, a robust monitoring and evaluation mechanism, coupled with stakeholder collaboration is essential to ensure the successful realization of NEP 2020 objectives. In conclusion, the strategic implementation of NEP 2020 has the potential to create an inclusive, flexible and future-ready education system that fosters innovation, skill development and national growth.

**Keywords:** NEP 2020, educational reform, implementation strategies, skill development and multidisciplinary education

**Abstract No.: A-051**

**Registration No.: 1152**

### **Self-Healing Conductive Fabrics For Durable Electronics**

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Self-healing conductive fabrics are an emerging class of smart textiles designed to improve the durability and lifespan of wearable electronics. These fabrics incorporate conductive materials such as graphene, carbon nanotubes, metallic nanowires and conductive polymers within textile structures capable of restoring functionality after damage. Self-healing is achieved through mechanisms such as reversible chemical bonding, microencapsulation and supramolecular interactions, thereby enabling the recovery of both electrical conductivity and mechanical strength. Various fabrication methods, including coating, electrospinning and embedding techniques, are used to develop uniform and flexible conductive networks. Advanced polymers with dynamic bonds enhance healing efficiency while maintaining comfort and flexibility. These materials are highly relevant for applications in healthcare monitoring, smart clothing, soft robotics and defense, where reliability under repeated stress is essential. Despite significant progress, challenges such as scalability, healing speed, environmental stability and cost remain barriers to large-scale adoption. Future developments focus on multifunctional fabrics that integrate sensing, energy storage and adaptive features. Self-healing conductive fabrics offer a promising pathway toward sustainable, resilient and next-generation wearable electronic systems.

**Keywords:** self-healing textiles, conductive fabrics, wearable electronics, smart textiles, nanomaterials and flexible electronics

## INNOVATIONS IN LIGHT-EMITTING TEXTILES FOR FASHION AND SAFETY

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Light-emitting textiles represent a significant advancement in the field of smart and functional fabrics by integrating illumination technology directly into textile structures. These innovative materials combine traditional fabric properties such as flexibility, softness and comfort with modern light-producing systems including light-emitting diodes, optical fibres, electroluminescent coatings and conductive yarns. As a result, textiles are no longer limited to passive use but are evolving into interactive and multifunctional materials with wide-ranging applications. In the fashion industry, light-emitting textiles are creating new possibilities for designers by enabling garments that can glow, change patterns, display colours and respond to movement or environmental conditions. These textiles are increasingly used in runway collections, stage costumes, luxury apparel, sportswear and wearable art, where visual impact and innovation are highly valued. Their ability to merge aesthetics with technology has opened a new era of creative expression in modern clothing design. Apart from fashion, light-emitting textiles have gained considerable importance in safety and protective applications. Enhanced visibility is essential in low-light and hazardous environments, making these textiles highly suitable for road workers, cyclists, emergency responders, military personnel, construction workers and children's apparel. Compared with conventional reflective materials, illuminated textiles provide active visibility, improved recognition, lightweight comfort and better wearer mobility. Recent technological developments in flexible electronics, rechargeable power systems, washable circuits, energy-efficient lighting components and sustainable textile materials have further increased the practicality and commercial potential of these fabrics. However, challenges such as durability, washability, cost, power supply integration and large-scale production still need to be addressed for broader adoption.

Keywords: Smart textiles, Light-emitting fabrics, Wearable technology, Fashion innovation, Safety clothing

**Abstract No.: A-053**

**Registration No.:1155**

**TAILORING THE OPTOELECTRONIC RESPONSE AND  
STRUCTURAL MORPHOLOGY OF ZNS NANOSTRUCTURES VIA  
MANGANESE ION INCORPORATION**

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Zinc Sulphide (ZnS) is a semiconductor receiving discernible attention as a nanomaterial scale because of excellent ion accessibility, charge storage ability, enhanced luminescent efficiency and lifetime shorting in comparison to that of bulk. However, doping of manganese (Mn) ion enhances its optoelectronic properties due to large exciton energy and wide bandgap at room temperature. In this study, pristine and Mn-doped Zinc Sulfide (ZnS) nanoparticles were successfully synthesized via a controlled hydrothermal route. The as-prepared samples underwent comprehensive characterization through X-ray diffraction (XRD), Field emission scanning electron microscopy (FE-SEM), Energy dispersive X-ray Spectroscopy(EDX), Fourier transform infrared spectroscopy (FTIR), UV-Vis and Photoluminescence (PL) spectroscopy. The XRD pattern confirmed the cubic sphalerite crystal structure of prepared nanoparticles (NPs) with crystallite size of 24.26, 31.9 and 32.6 nm whereas FE-SEM micrographs showed sphere-shaped NPs. Stretching mode of undoped ZnS was observed at  $636\text{ cm}^{-1}$  and the Zn-S-Zn network was perturbed by the presence of Mn. The bandgap of pristine Zinc Sulphide calculated from Tauc's plot is 3.68 eV, 3.5 eV for 5 % Doped ZnS and 3.45 eV for 10 % doped ZnS which shows Zinc Sulfide is only responsive to UV light absorption. PL spectra was recorded at excitation wavelength of 325 nm with additional peak was observed in doped samples.

Keywords: ZnS, Mn-doped, Hydrothermal, UV-spectroscopy, Photoluminescence

**Abstract No.: A-054**

**Registration No.:1157**

**LITERATURE AND TECHNOLOGY : AN INTERFACE WITH  
REFERENCE TO DONNA HARAWAY'S CYBORG**

**Priyanka**

This paper delves into the dynamic interplay between literature and technology, grounded in Donna Haraway's groundbreaking concept of the cyborg as presented in *A Cyborg Manifesto* (1985). Haraway's cyborg challenges conventional dichotomies—such as human/machine, nature/culture, and male/female—inviting a transformative examination of identity in our increasingly technological world. The study investigates how literature not only mirrors but also critiques this blended reality, engaging with themes of posthumanism, digital identities, and the influence of technology on human experience. By analyzing a selection of literary works alongside relevant theoretical frameworks, the paper posits that literature serves as an essential platform for creatively navigating the complex implications of technological advancements. Moreover, it contextualizes this exploration within the frameworks of

contemporary digital culture and artificial intelligence, illustrating how literary narratives continuously question the demarcations between humanity and technology. Ultimately, the paper contends that literature is not merely a reflection of technological change; it is a crucial force in shaping our ethical and philosophical perceptions of the posthuman landscape.

**Abstract No.: A-055**

**Registration No.:1158**

**OPTIMIZING THE SYSTEM EFFICIENCY BY USING THE RAM  
(RELIABILITY, AVAILABILITY, & MAINTAINABILITY) MODEL IN  
PRINTING AND PACKAGING DOMAINS**

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This Paper is all about the Printing and Packaging Industry. It depicts the possibility of introducing the RAM (Reliability, Availability, & Maintainability) Model in Printing and Packaging Industry. The RAM Model (Reliability, Availability and Maintainability Model) has a number of applications for countering different practical problems in our day-to-day Printing and Packaging modules. Printing is an Industry that is being overlapped by a number of domains. It has an association with Food industry also. The concept of 3-D Printing is extensively being used by Food industry. In 3-D Printing, the object is being created by the application of a moving head that moves in any direction under controlled mechanism. One end of the moving head is essentially connected with Ink supply or Food material supply. The second end of the moving head is an Ink-jet nozzle spray head. In broader sense, the working of a 3-D Printing machine starts with Ink or food material supply. The Ink or food material will be supplied to the moving head. Further the moving head will deposit layers of the Ink or food material in microns, with the help of an Ink-jet nozzle spray head. The pressures at the Ink-jet nozzle spray head, the thickness of the Ink or food material to be deposited, and the dimensions of the final object to be created will determine the time required to complete the task. The recent example of applications of 3-D Printing in Food Industry is National Aeronautics and Space Administration. Gone are the days when NASA used to provide food packets to the Astronauts. Now, with the help of a 3-D Printing machine, the Astronauts can prepare their food by themselves in space/Rocket vehicles. Printing is also making its way to the outer world regarding the protection of environment from harmful materials.

**Keywords :** Reliability Engineering, Three-dimensional Printing, Food Industry, Replica, Energy, Ink, Material.

**Abstract No.: A-056**

**Registration No.:1159**

**PRINTING : SERVING THE EVERY STRATA OF LIFE**

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Present era is meant for the 'Survival of the Fittest'. Printing is an art, craft, science, & technology of reproduction of 'n' number of replicas with the help of a suitable Printing Process on the desired substrate and surface. It has an impact on everyone's life. Printing is the second largest industry of India. We are basically providing services to the society; being overlapped by various branches of Education like Computers, Electronics, Manufacturing, Chemical, Electrical, Optical and, what not? It is impossible to imagine survival of human beings without Printing. Sir Johannes Gutenberg, Father of Printing, was declared as 'Man of Millennium' by Time magazine. And, Printing is declared as the 'Greatest Invention of Millennium' again, by Time magazine. And, this is where Printing has touched one and all. It is said that Printing had started with humanization. On a parallel track, it has an association with human lives till time. It's not a dictum that society is concerned about environmental damages. We try to aware our society about the practices with which we can protect our ecosystem. Printing is also making its way to the outer world regarding the protection of environment from harmful materials. Like any other strata of our society, Printing also own three factors for its optimization – Time, Money, & Energy. Work done within the given time limits is always appreciated; and, the efficient use of available energy resources will help in greener environment. The controlled emission of Volatile Organic Compounds (VOC's) in various Printing industries is what is required to save the environment from chemicals.

Keywords : Printing, Environment, Energy, Volatile Organic Compounds.

**Abstract No.: A-057**

**Registration No.:1160**

**TURN-OFF' FLUORESCENT PROBE BASED ON ANTHRAQUINONE  
GRAFTED WITH NANOCELLULOSE FOR THE SENSITIVE  
RECOGNITION OF MERCURY, BILIRUBIN AND FAST GREEN DYE  
IN AQUEOUS MEDIUM**

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A novel fluorescent probe, anthraquinone grafted nanocellulose (AGN), has been synthesized by grafting an anthraquinone derivative onto the selective recognition groups of nanocellulose. The AGN was characterized using FTIR, XPS, EDX, BET, TGA, SEM, TEM, XRD, fluorescence, and UV–Vis spectroscopic techniques and further evaluated its structural, morphological, thermal and sensing properties. The rich presence of free hydroxyl groups, along with nitrogen and oxygen functionalities in the composite, can effectively bind heavy metal ions such as Hg<sup>2+</sup>. The outcomes demonstrated that the 'turn-off' fluorescence strategy

employed by AGN offers a simple, rapid, and reliable method for the sensitive recognition of  $\text{Hg}^{2+}$ , bilirubin, and fast green dye, making it an effective tool for environmental and biomedical applications. The limit of detection (LOD) for  $\text{Hg}^{2+}$  in plant samples was found to be  $0.09 \mu\text{M}$  within a concentration range of  $0.10\text{--}60.00 \mu\text{M}$  ( $10.70 \mu\text{g/L}$ ), which is significantly lower than the permissible limit set by the World Health Organization (WHO).

**Abstract No.: A-058**

**Registration No.:1163**

**INCORPORATING POLYMER INTO THE SURFACE OF POLYETHERSULFONE (PES) MEMBRANE FOR THE EFFICIENT REMOVAL OF LEAD IONS ( $\text{Pb}^{2+}$ )**

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A significant environmental issue is the presence of toxic  $\text{Pb}^{2+}$  in water systems. In this study, a polyethersulfone-based nanoporous material was developed as an effective adsorbent for removing  $\text{Pb}^{2+}$  from water. The research involved synthesizing fluorescent polythioamide (P1) through a one-step Willgerodt–Kindler reaction using diamines, elemental sulfur, and dialdehyde, facilitated by a magnetically separable heterogeneous catalyst,  $\text{IL@Fe}_3\text{O}_4$ . The surface of the polyethersulfone (PES) membrane was enhanced with P1 using the drop-cast technique, significantly improving its  $\text{Pb}^{2+}$  extraction efficiency. Furthermore, a detailed investigation into the mechanism revealed that the adsorption process involves physisorption, follows pseudo-first-order kinetics, and takes place on a heterogeneous surface as supported by the strong fit to the Freundlich isotherm model ( $n > 1$ ). The sulfur groups in P1 provide the polymer with a soft acid character, enabling strong interactions with the hard base  $\text{Pb}^{2+}$ , thus facilitating effective removal from aqueous solutions. When applied to real water samples, the method provided its practical utility by achieved a 99.95 % retention rate, thereby demonstrating its potential for effective and reliable detection of this toxic metal over a wide concentration range from (0-1000 ppm).

**Abstract No.: A-059**

**Registration No.:1164**

**UNLOCKING SYNERGISTIC HER KINETICS IN ACIDIC MEDIA: CE-MOF AS A REDOX-ACTIVE PLATFORM FOR BOOSTING  $\text{MOS}_2$  CATALYSIS**

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Developing efficient, non-precious electrocatalysts for the hydrogen evolution reaction (HER) in acidic media remains a critical challenge. Here, we strategically engineer a series of cerium-

based metal–organic framework (Ce-MOF) and molybdenum disulfide (MoS<sub>2</sub>) composites at mass ratios of 1:1, 2:1 and 3:1. Among all tested compositions, the optimally balanced 2:1 composite (**MCM**) delivers superior catalytic activity, requiring an overpotential of only 192 mV to achieve a current density of 10 mA cm<sup>-2</sup>. This performance significantly outperforms the bare glassy carbon electrode, pristine Ce-MOF, pristine MoS<sub>2</sub>, and the off-ratio composites. The enhanced activity originates from strong synergistic interactions between the porous, redox-active Ce-MOF and catalytically active MoS<sub>2</sub>, which promote improved electron transfer, increased electrochemically active surface area, and accelerated proton adsorption. Kinetic analysis via Tafel measurements reveals the lowest slope of 45 mV dec<sup>-1</sup> for the optimal MCM composite, indicating favorable HER kinetics following the Volmer–Heyrovsky mechanism. Collectively, this rationally designed **MCM** composite establishes itself as a promising, durable, and structurally optimized HER electrocatalyst for acidic environments.

Keywords: Hydrogen evolution reaction (HER), Molybdenum disulfide, Metal-organic framework (MOF), Electrocatalysis, Acidic media.

**Abstract No.: A-060**

**Registration No.:1166**

## **SUSTAINABLE INKJET PRINTING: AN EMPIRICAL ASSESSMENT OF PRINT QUALITY AND COLOUR STABILITY ON ECO-FRIENDLY PLASTIC SUBSTRATES**

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The growing demand for sustainable printing solutions has accelerated research into environmentally responsible materials within the printing and packaging industry. This study presents an empirical investigation into the print quality characteristics and colour stability of eco-friendly plastic substrates printed using Greenguard (Gold) certified inks through a piezoelectric inkjet printing system. As environmental regulations tighten and consumer awareness rises, the industry faces the dual challenge of maintaining consistent output quality while transitioning away from conventional solvent-based, high volatile organic compound (VOC) inks. The research evaluates two plastic substrates recycled polyester (PET) and polyvinyl chloride (PVC) film assessing their compatibility with low-emission, UV-curable Greenguard (Gold) certified inks. Piezoelectric drop-on-demand (DOD) inkjet technology was selected for its precise droplet control, substrate versatility, and reduced ink wastage. Print samples were produced under standardised laboratory conditions, controlling variables including temperature, substrate surface tension, ink viscosity, print resolution, and environmental humidity. Print quality was evaluated using ISO-prescribed metrics encompassing Solid Ink Density (SID), colour difference ( $\Delta E$ ), and colour stability. Assessments were conducted through natural and accelerated weathering tests, with colorimetric data analysed against ISO 12647-2 and ISO 15311-2 standards. Greenguard (Gold) certified inks consistently demonstrated low VOC emissions without compromising chromatic performance, confirming suitability for outdoor signage and advertising applications. This study establishes baseline performance data for eco-friendly substrate and

certified ink combinations, offering actionable insights for print manufacturers and environmental compliance bodies supporting the industry's transition toward a circular economy model.

**Abstract No.: A-061**

**Registration No.: 1175**

**STUDY OF STRESS DISTRIBUTION OF A FINITE ELASTIC LAYER  
LYING OVER A ROUGH RIGID BASE**

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The solution for two-dimensional problem of coseismic deformation of a homogeneous, isotropic, elastic layer of uniform thickness over a rough rigid base caused by horizontal tensile fault has been examined analytically. With the help of Airy stress function approach and appropriate boundary conditions, the expressions for the stress distribution have been obtained. The variations of stress distribution have been analysed for continental crust model of the earth. Using MATLAB software, the results have been shown graphically. It is observed that the magnitude of all stress fields increases as Skempton's coefficient increases. Numerous disciplines, including engineering, environmental geology, geophysics, earthquake engineering, structural geology, geotechnical engineering, oil and gas exploration, seismologists, and civil engineering, could benefit from this work.

**Abstract No.: A-062**

**Registration No.: 1195**

**HIGHLY FLORESCENT HO, N CO-DOPED CARBON QUANTUM  
DOTS FOR SENSITIVE AND SELECTIVE CURCUMIN SENSING:  
MORPHOLOGY, MECHANISM, SMARTPHONE RGB AND BIOFLUID  
APPLICATIONS**

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In this study, a highly selective fluorescent probe was developed to detect curcumin, demonstrating high recovery percentages in real samples. Hydrothermal provides a straightforward and cost-effective method for synthesizing holmium and nitrogen co-doped carbon dots (Ho,N-CQDs). The Ho,N-CQDs have a maximum emission wavelength of 408 nm and an excitation wavelength of 330 nm. Multiple analytical techniques were used to characterize the as-prepared Ho,N-CQDs, including transmission electron microscopy, X-ray diffraction, scanning electron microscopy, infrared spectroscopy, X-ray photoelectron spectroscopy, UV-visible spectroscopy, and photoluminescence spectroscopy. The Ho,N-CQDs based fluorescence sensor successfully detects Curcumin in aqueous solution with a

linear range of  $0-62.4 \times 10^{-8}M$  and a detection limit of  $1.94 \times 10^{-8}M$  (19.4 nM). Specific amino acids, vitamins and other biochemical do not interfere with Curcumin (Cumn) detection, resulting in high selectivity. The Ho,N-CQDs fluorescence switch sensor showed outstanding accuracy and precision in urine and blood samples, with recoveries ranging from 97.07 % to 101.1 %.

Keywords: Nanomaterials, Curcumin, Rear Earth Metal, Real sample, Quenching.

**Abstract No.: A-063**

**Registration No.: 1198**

## **ENVIRONMENTAL JUSTICE AND GREEN TECHNOLOGY: A SOCIOLOGICAL ANALYSIS OF COMMUNITY RESILIENCE IN HARYANA**

**Komal**

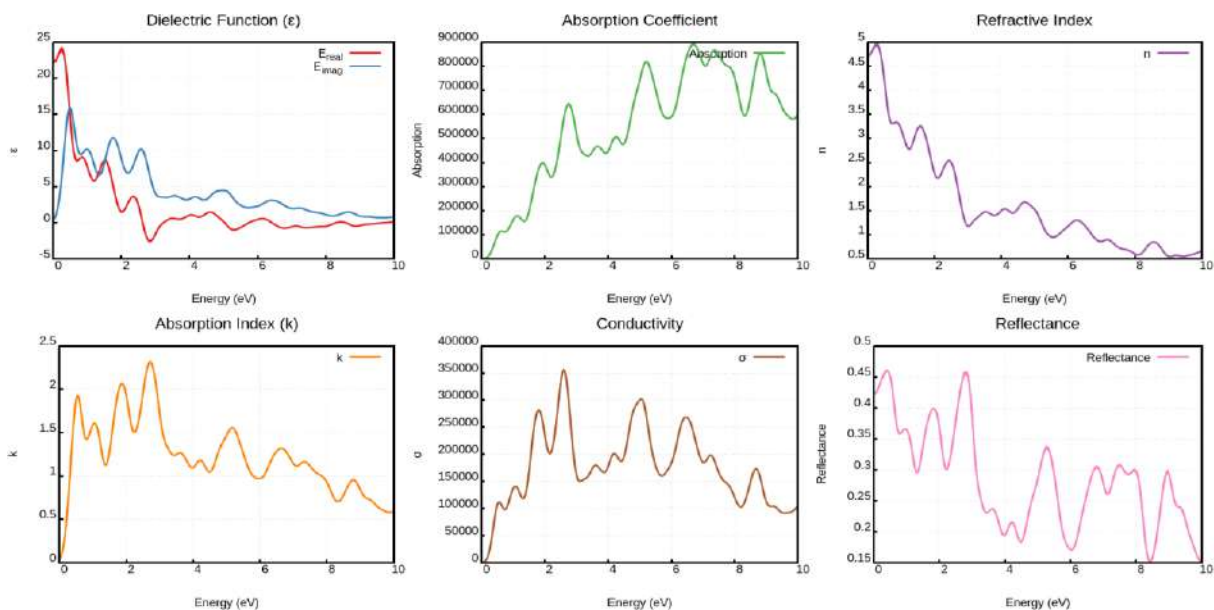
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India's green technology ambitions are growing rapidly, yet a critical question remains largely unaddressed: are these transitions reaching the communities that need them most? This paper explores that concern through the lens of Haryana, a state that sits at a sharp intersection of agricultural tradition, industrial growth, and deep social inequality. While Haryana has seen significant policy investment in renewable energy and sustainable agriculture, communities on the social margins—smallholder farmers, rural women, and lower-caste households—continue to face the sharpest environmental burdens: declining groundwater tables, health impacts from stubble burning, and exposure to industrial pollution. At the same time, these very communities have the least access to the green technologies being promoted as solutions. Drawing on secondary literature and policy analysis, this paper examines why this gap exists and what it means for inclusive development. It draws on Sumesh's (2023) call for a decolonial intersectional environmental justice framework in Indian policymaking, and engages with recent environmental sociology scholarship which argues that climate inequality cannot be resolved through technology alone—it demands structural change. The paper also highlights the overlooked role of Indian Knowledge Systems (IKS) and indigenous ecological practices as genuine assets in building community resilience. Ultimately, this paper argues that for Haryana's green transition and by extension, the Viksit Bharat @2047 vision to be truly meaningful, it must be built on justice, not just innovation.

Keywords: Environmental justice, green technology, community resilience, Haryana, Indian Knowledge Systems, social inequality.

**COMPUTATIONAL ANALYSIS OF V<sub>3</sub>C<sub>2</sub> MXENE FOR OPTOELECTRONIC APPLICATIONS****Manu Sharma<sup>1</sup> and Ramesh Kumar<sup>1</sup>**Department of Physics, Guru Jambheshwar University of Science & Technology, Hisar  
125001, Haryana, India\*Presented author e-mail: [manujoshi2110@gmail.com](mailto:manujoshi2110@gmail.com)

Density functional theory (DFT) calculations are performed for studying the structural, electronic and optical properties of V<sub>3</sub>C<sub>2</sub> MXene. The generalized gradient approximation (GGA) in the Perdew–Burke–Ernzerhof (PBE) form for exchange–correlation interactions are employed. A Mesh-cutoff energy of 400 eV was used to ensure convergence. The Brillouin zone was sampled using a Monkhorst–Pack k-point mesh of 20 × 20 × 1, appropriate for the 2D V<sub>3</sub>C<sub>2</sub> MXene supercell. A vacuum layer of ~15–20 Å was introduced along the z-direction to avoid interlayer interactions. Structural optimization was carried out until the energy and force converged to 10<sup>-5</sup> eV and 0.01 eV/Å, respectively. The optical properties such as dielectric function, absorption coefficient, refractive index, conductivity and reflectance are calculated and confirmed that studied MXenes are suitable for optoelectronic applications.



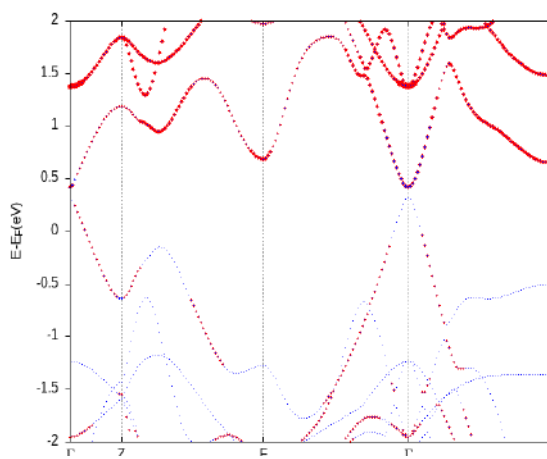
**IMPACT OF SOCIAL MEDIA PLATFORMS ON CONSUMER BUYING BEHAVIOUR****Preeti, Dr. Sunita Mehla, Dr. Subodh Agarwal****Chaudhary Charan Singh Haryana Agricultural University, Hisar****College of Agriculture****Department of Business Management**

In today's digital era, social media platforms have become an important part of people's daily lives and play a major role in influencing their buying decisions. This study explores how social media affects consumer buying behaviour in Haryana, while also highlighting its role in spreading digital awareness and shaping informed decision-making. The study is based on primary data collected from 165 respondents through a structured questionnaire. Basic statistical tools such as Factor analysis and ANOVA were used to analyse the data. The results show that social media significantly impacts consumer choices, especially through three key factors—belief, exposure, and dependency. Among these, belief was found to be the most important, as consumers tend to trust product reviews, influencer recommendations, and visual content shared on social media platforms. The findings also suggest that social media acts as an informal learning source where consumers gather information about products, compare options, and make better purchase decisions. Younger users, in particular, are more influenced and dependent on these platforms. Overall, the study shows that social media is not only a marketing tool but also a digital space that helps consumers become more aware and informed. The insights from this research can help businesses design better digital strategies and connect more effectively with their target audience.

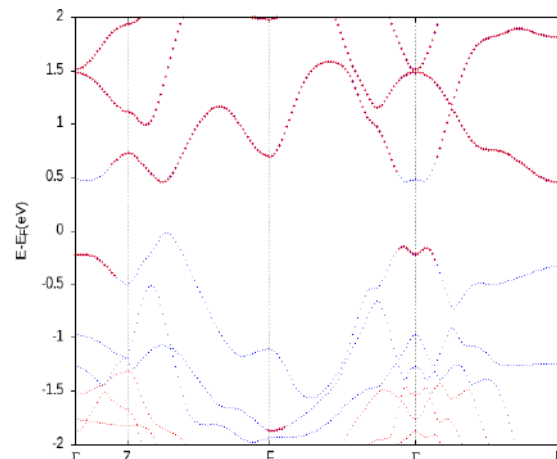
**Keywords:** Social Media, Consumer Buying Behaviour, Digital Awareness, Digital Transformation, Consumer Decision-Making

**AB-INITIO STUDY OF  $\text{Bi}_2\text{Se}_3$  AS TOPOLOGICAL INSULATOR****Bhanu Pratap and Ramesh Kumar\***Department of Physics, Guru Jambheshwar University of Science & Technology, Hisar  
125001, Haryana IndiaPresented author e-mail: [pratapbhanu1.a@gmail.com](mailto:pratapbhanu1.a@gmail.com)

Topological insulators are very interesting class of materials attracting the attention of scientific community due to their potential application in the fields of spintronics and quantum computing. This work presents a comprehensive investigation of the structural, electronic and topological properties of the three-dimensional topological insulator  $\text{Bi}_2\text{Se}_3$  using first-principles methods. Density functional theory (DFT) calculations are employed to analyze the structural and electronic characteristics, including band structure, density of states (DOS), and projected density of states (PDOS). The results confirm that  $\text{Bi}_2\text{Se}_3$  is a narrow band-gap semiconductor without SOC which have band gap of 0.13eV and with SOC, it becomes topological insulator with a inverted band gap of 0.48eV near the Fermi level at gamma point ( $\Gamma$ ). Band inversion leads to the emergence of topologically protected surface states characterized by Dirac-like linear dispersion, a hallmark of topological insulators. Overall, the study highlights the fundamental importance of spin-orbit interaction in determining both bulk and surface electronic properties. The findings provide valuable insights into the design and optimization of  $\text{Bi}_2\text{Se}_3$ -based materials for applications in spintronics, quantum computing, and next-generation electronic devices.

**Results:**

(a) Without SOC



(b) With SOC

**Abstract No.: A-067**

**Registration No.: 1220**

## **NAPHTHO-FUSED OXAZOLOPYRIDINES FOR SELECTIVE RECOGNITION OF NERVE AGENT MIMICS**

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Organophosphorus (OP) compounds, particularly chemical warfare agents (CWAs) such as Sarin, Soman, and Tabun are known for their toxicity against biological systems. These agents function by irreversibly inhibiting the enzyme acetylcholinesterase (AChE) in the nervous system, leading to a cholinergic crisis and respiratory failure, which ultimately leads to death. In the present study, we report the synthesis of naphtho-fused oxazolopyridines (NOP) specifically engineered for the sensitive and selective detection of diethyl chlorophosphate (DCP), a key nerve agent mimic. The synthesized compounds were characterized using various spectral techniques *i.e.*, FTIR, NMR and HRMS. Furthermore, the photophysical profiles of the synthesized compounds were systematically evaluated using UV-Vis and fluorescence spectroscopy. To examine the effect of solvent polarity on the photophysical properties of the synthesized compounds, a diverse range of solvents, including H<sub>2</sub>O, DMSO, ACN, DMF, MeOH, THF, CHCl<sub>3</sub>, DCM and glycerol were used. The compounds were then investigated for their sensing potential against a diverse range of analytes including metal ions, anions and organophosphates. The results revealed that synthesized compounds displayed excellent sensitivity and selectivity against DCP, which further established their ability to detect nerve agent mimics in complex environmental matrix.

**Abstract No.: A-068**

**Registration No.: 1222**

## **METAL-BASED COMPLEXES WITH SCHIFF BASE LIGANDS AS POTENTIAL CHEMOTHERAPEUTIC AGENTS**

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Cancer remains one of the leading causes of mortality worldwide, highlighting the need for the development of novel chemotherapeutic agents with higher therapeutic efficiency which can cause less adverse effect than old and traditional methods. Transition metal complexes act as promising candidates in anticancer drug discovery due to their structural diversity and ability to interact with multiple biological targets. After the success of platinum-based drugs such as Cisplatin, scientific interest has expanded toward complexes of other transition metals, including Cobalt, Nickel, Copper, and Zinc, many of these have shown remarkable cytotoxic activity against various cancer cell lines. To improve biological activity and selectivity toward cancer cells, a variety of ligands including Schiff bases, hydrazones, thiosemicarbazones have been

designed and incorporated into metal-based frameworks. These ligands play a crucial role in stabilizing the metal centre and influencing the biological properties of the resulting complexes. Furthermore, structure–activity relationship (SAR) studies have provided valuable insights into the structural factors that govern cytotoxicity, selectivity, and therapeutic efficiency, thereby supporting the rational design of more effective metal-based drugs. Numerous transition metal complexes have therefore been investigated for their potential in treating different diseases, particularly cancer. Overall, recent advancements emphasize the significant potential of transition metal complexes as versatile platforms for the development of innovative anticancer therapeutics.

**Abstract No.: A-069**

**Registration No.: 1224**

## **EVOLUTION OF WOMEN’S ROLE IN SCIENCE AND LEADERSHIP**

**Jyoti<sup>1</sup>, Santosh Rani<sup>2</sup>**

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The evolution of women’s role in science and leadership within the Indian Knowledge System (IKS) reflects a shift from early intellectual participation to contemporary underrepresentation, despite a strong foundation in traditional wisdom. Vedic and post-Vedic literature document women such as Gargi Vachaknavi and Maitreyi engaging in metaphysical inquiry, indicating access to formal knowledge systems. In classical health sciences, texts like the *Charaka Samhita* and *Sushruta Samhita* refer to women’s roles in obstetrics, dietetics, and preventive healthcare, demonstrating their involvement in applied scientific practices. Similarly, ethno botanical studies in India show that rural women possess extensive knowledge of over 150–200 medicinal plant species used in primary healthcare, highlighting their role in sustaining indigenous medical systems. In traditional agriculture, women contribute significantly to seed selection, varietal preservation, and soil fertility management. Empirical studies indicate that women manage nearly 60–70% of on-farm seed conservation activities in rain fed and tribal regions, supporting agro biodiversity and climate resilience. Their decision-making in mixed cropping, water use, and organic inputs reflects a systems-based scientific approach aligned with sustainability principles embedded in IKS. However, the colonial and post-colonial shift toward formalized, institution-centric science led to reduced visibility of women’s contributions. Contemporary data reveals that while women account for approximately 43% of STEM graduates in India, their representation drops to below 20% in senior scientific leadership positions, indicating structural barriers in career progression. This paper critically examines the historical continuity and transformation of women’s roles in science and leadership within IKS. It argues for systematic documentation of traditional knowledge, gender-inclusive research policies, and interdisciplinary integration to enhance women’s participation in scientific leadership and ensure context-specific, sustainable development outcomes.

Keyword : Indian Knowledge System, Leadership, Participation.

**INTUITIONISTIC FUZZY MULTI-OBJECTIVE RELIABILITY  
OPTIMIZATION USING A HESITATION-WEIGHTED SIGMOID  
MEMBERSHIP FUNCTION****Sujeeta Kumari**

Reliability optimization of engineering systems often involves multiple conflicting objectives and uncertain parameter information, making classical deterministic optimization approaches inadequate. To address this challenge, this study proposes a novel Hesitation-Weighted Sigmoid Membership Function (HWSMF) within an intuitionistic fuzzy optimization framework for solving multi-objective reliability optimization problems under uncertainty. The proposed membership structure explicitly incorporates the hesitation degree of intuitionistic fuzzy sets, enabling adaptive adjustment of satisfaction and rejection levels based on the degree of uncertainty present in system parameters. Component reliabilities are represented using triangular interval numbers, and the resulting interval-valued objectives are transformed into a deterministic intuitionistic fuzzy programming model. The optimization problem is solved using Particle Swarm Optimization (PSO), and the obtained results are compared with those produced by a Genetic Algorithm (GA) to evaluate solution quality and convergence performance. Numerical experiment on benchmark parallel system demonstrate that the proposed HWSMF framework provides improved compromise solutions between system reliability and cost. The results indicate that the PSO-based implementation consistently achieves better convergence and higher solution quality than GA. Overall, the proposed approach offers a flexible and robust decision-making framework for multi-objective reliability optimization in uncertain environments, making it suitable for practical engineering system design problems.

Keyword: Hesitation-Weighted Sigmoid Membership Function, Intuitionistic Fuzzy Sets (IFS), Multi-objective Reliability Optimization, Fuzzy Optimization, Hesitation degree, Pareto Optimal Solutions, Particle Swarm Optimization, Genetic Algorithm.

**TGF- $\beta$  INHIBITOR SB431542 DISRUPTS SARS-COV-2 REPLICATION THROUGH SYNERGISTIC TARGETED AND OFF-TARGET EFFECTS WITHOUT PRODUCING ESCAPE MUTANTS**

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The COVID-19 pandemic highlighted the critical need for broad-spectrum antivirals with high resistance barriers. Here, we demonstrate that SB431542, a selective TGF- $\beta$  receptor I inhibitor, exhibits potent antiviral activity against SARS-CoV-2 through unprecedented multitargeted mechanisms. Through comprehensive *in vitro*, isothermal titration calorimetry and *in silico* analyses, we identified that SB431542 directly binds to SARS-CoV-2 ORF3a, disrupting its canonical function in inhibiting autophagosome-lysosome fusion. This interaction restored lysosomal acidification and normalized perinuclear LAMP-1 localization, significantly impairing virion assembly as evidenced by disrupted nucleocapsid-RNA association and reduced intracellular viral titers. Additionally, SB431542 downregulated CLEAR network genes responsible for lysosomal biogenesis, restricting viral egress. Temporal analyses revealed that at later infection stages (36-48 hpi), SARS-CoV-2 exploits TGF- $\beta$ -induced lysosomal membrane permeabilization and apoptosis for release—processes effectively inhibited by SB431542 through suppression of GADD45b and BAX. These mechanisms resulted in an exceptional EC<sub>50</sub> of 751.8 nM against SARS-CoV-2. *In vivo* efficacy was demonstrated in embryonated chicken eggs, where SB431542 conferred dose-dependent protection against lethal infectious bronchitis virus challenge (therapeutic index: 34.54). Remarkably, sequential passaging of SARS-CoV-2 for 50 generations under SB431542 selection pressure failed to generate resistant variants, contrasting with the rapid resistance emergence typical of direct-acting antivirals. These findings establish SB431542 as a promising broad-spectrum coronavirus inhibitor with a unique triple-mechanism approach: targeting entry via TGF- $\beta$  modulation, disrupting ORF3a-mediated lysosomal dysfunction, and attenuating TGF- $\beta$ -induced apoptosis, collectively imposing selective constraints that impede escape mutations.

## **FROM REELS TO REDUCED FOCUS: THE IMPACT OF SCROLL-BASED MEDIA CONSUMPTION ON COGNITIVE ATTENTION AND ACADEMIC PERFORMANCE**

**Preeti and Dr. Annu**

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The rapid growth of digital media, particularly short-form video platforms such as TikTok, Instagram Reels, and YouTube Shorts, has significantly transformed the way individuals consume information and entertainment. These platforms offer brief, engaging, and highly stimulating content that captures users' attention instantly and encourages continuous scrolling. While this format provides quick access to information and entertainment, it also raises concerns regarding its impact on cognitive processes, especially attention span. Attention is a fundamental cognitive function that enables individuals to focus, process information, and engage in sustained mental activities such as learning and problem-solving. However, the increasing exposure to fast-paced, fragmented content may be reshaping how attention is allocated and maintained. Recent studies suggest that excessive consumption of short-form videos may lead to reduced sustained attention, increased cognitive load, and difficulties in concentrating on tasks requiring deep focus, such as academic work. The continuous intake of innovative and engaging content conditions the brain to want immediate pleasure, thereby diminishing the capacity to engage with lengthier and more intricate items. Furthermore, this pattern of media consumption has been associated with multitasking behaviours, procrastination, and declining academic performance among students. In addition, the widespread use of smartphones has made such content easily accessible at all times; further increasing screen time and dependency on digital media. This shift not only affects cognitive engagement but also influences lifestyle patterns, including sleep and daily productivity. Given the growing dependence on digital media in daily life, it is essential to examine how these evolving consumption patterns influence attention and overall cognitive functioning. This study aims to explore the relationship between short-form video consumption and attention span, providing insights into its implications for learning, productivity, and well-being.

**Key words:** Digital media, smart phones, short-sized video, cognitive load, gratification and procrastination.

**Abstract No.: A-073**

**Registration No.: 1251**

## **CRYSTAL STRUCTURE AND ENHANCED PROPERTIES OF $\text{BaTiO}_3$ WITH NI-SUBSTITUTED $\text{CoFe}_2\text{O}_4$ IN MULTIFERROIC**

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Lead free based multiferroics ceramics ( $y$ )  $\text{BaTiO}_3 + (1-y) \text{Ni}_{0.5}\text{Co}_{0.5}\text{Fe}_2\text{O}_4$  ( $y = 0.10, 0.30$  and  $0.50$ ) were successfully synthesized using the conventional solid-state reaction technique. These composites were designed to combine the ferroelectric properties of  $\text{BaTiO}_3$  (BT) with the magnetic properties of  $\text{Ni}_{0.5}\text{Co}_{0.5}\text{Fe}_2\text{O}_4$  (NCFO), aiming to achieve enhanced multiferroic behavior through phase coupling. X-Ray diffraction analysis confirms the cubic symmetry with  $Fd3m$  space group for ferrite (NCFO) and tetragonal symmetry with  $P4mm$  space group for ferroelectric (BT) without any impurity. Further confirmation of phase purity, lattice parameters, and structural refinement was achieved through Rietveld refinement analysis, indicating good agreement between observed and calculated patterns. The three-dimensional crystal structure of pure  $\text{BaTiO}_3$  and  $\text{Ni}_{0.5}\text{Co}_{0.5}\text{Fe}_2\text{O}_4$  and of composite  $0.50\text{BaTiO}_3$ - $0.50 \text{Ni}_{0.5}\text{Co}_{0.5}\text{Fe}_2\text{O}_4$  was generated with the help of VESTA Software. The variation of dielectric constant ( $\epsilon'$ ) and dielectric loss ( $\tan \delta$ ) with frequency and temperature was analyzed using an impedance phase analyzer. Ferroelectric properties were investigated through P-E hysteresis loops, while magnetic behavior was studied using M-H hysteresis loops.

**Keywords:** Multiferroics, XRD, Rietveld refinement, dielectric properties, ferroelectric properties, magnetic properties.

**Abstract No.: A-074**

**Registration No.: 1255**

## **SUSTAINABLE BIOCATALYST-BASED PATHWAYS FOR IMIDAZOLE DERIVATIVES**

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Imidazole derivatives belong to an important family of nitrogen-containing heterocyclic compounds with diverse roles in pharmaceuticals, agrochemicals, and materials science. Traditional methods for synthesizing imidazole derivatives often depend on harsh reaction conditions and toxic solvents raising concerns about environmental impact and sustainability. In contrast, biocatalysis offers a green alternative by utilizing catalyst in an effective way under mild reaction condition. In this study, we report a green and eco-friendly approach for the synthesis of imidazole derivatives using different amino acids and *Citrus limon* as bio-catalyst.

The use of lemon juice (*Citrus limon* extract) as a natural acid catalyst was also explored as a sustainable alternative to conventional reagents. The developed methodology demonstrated high efficiency, good yields, and broad substrate scope, making it a good strategy for heterocyclic synthesis. All the synthesized compounds were characterized using different spectral techniques such as NMR, FTIR, HRMS etc.

**Abstract No.: A-075**

**Registration No.: 1256**

## STUDY THE IMPACT OF TEMPERATURE AND CARRIER CONCENTRATION ON GRAPHENE'S THERMOELECTRIC RESPONSE

**Jyoti<sup>a</sup>, Anisha<sup>a</sup>, Ramesh Kumar<sup>a</sup>**

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Two-dimensional materials are excellent candidates for thermoelectric applications because to their exceptional mechanical and electrical characteristics. In this work using first principles calculations in combination with the Boltzmann transport equations, the structural, electronic, and thermoelectric characteristics of the Graphene under different temperature are examined. Due to improved electronic screening and less asymmetry in the density of states close to the Fermi level, the Seebeck coefficient ( $S$ ) shows a strong dependency on carrier density and decreases in magnitude with increasing carrier concentration.

Additionally, a strong temperature dependency is seen, with the Seebeck coefficient falling as the temperature rises. The Wiedemann–Franz law, which states that there is a proportionate connection between electrical conductivity and electronic thermal conductivity, is compatible with the observed behavior.  $ZT_e$  decreases as temperature rises due to the increasing electronic contribution to thermal conductivity. Despite graphene's remarkable electrical conductivity, this study demonstrate its inherent limits for thermoelectric applications at high temperatures.

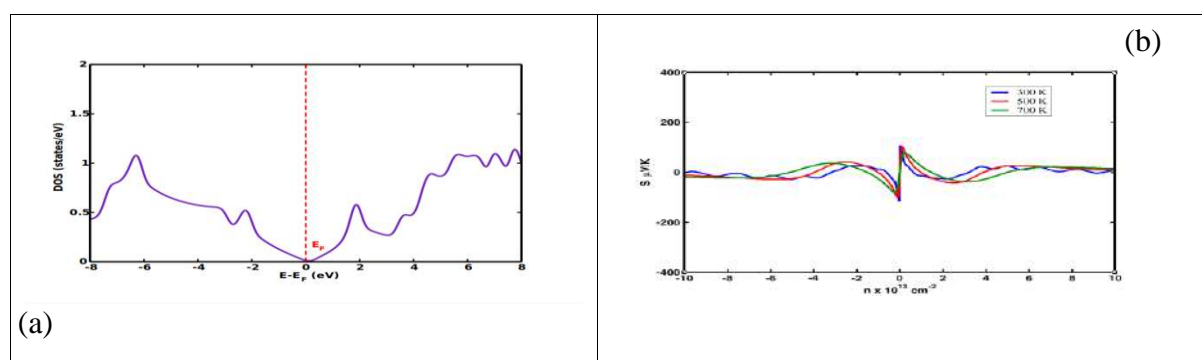


Figure1: (a) Electronic Density of states and (b) variation of Seebeck coefficient w.r.t carrier concentration of graphene monolayer.

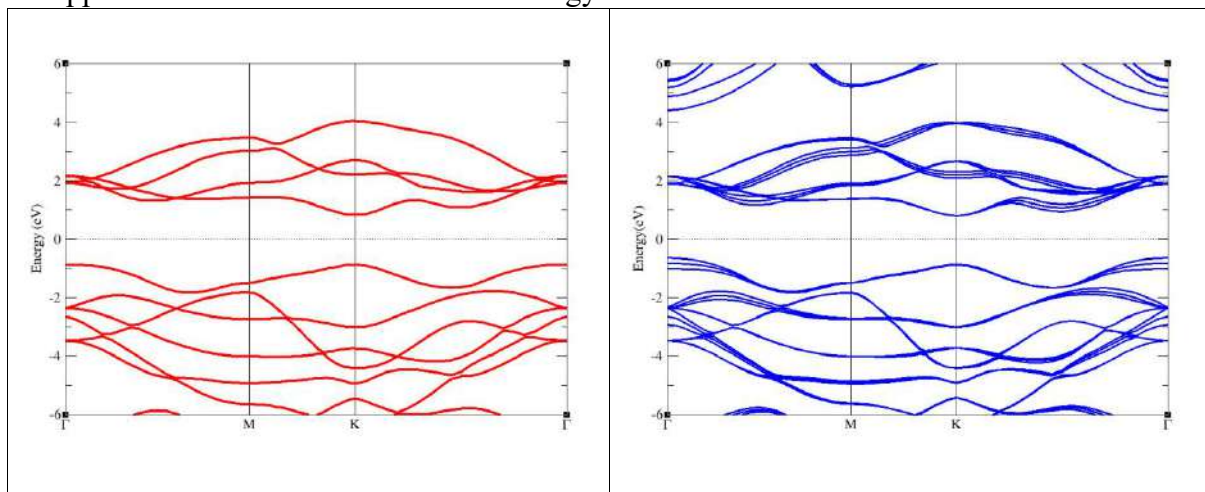
**Keywords:** Graphene, First Principles calculations, Thermoelectric properties, Seebeck coefficient

## DFT STUDY OF ELECTRONIC PROPERTIES OF 2H-MOLYBDENUM DISULFIDE

**Manisha<sup>1</sup>, Ramesh Kumar<sup>1</sup>**

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Two-dimensional materials have attracted significant attention due to their unique electronic properties and potential applications in nanoelectronics and energy devices. Among them, Molybdenum disulfide ( $\text{MoS}_2$ ) is a promising transition metal dichalcogenide with tunable electronic properties. The electronic properties of few-layer 2H-phase Molybdenum disulfide ( $\text{MoS}_2$ ) are investigated to understand the effect of layer thickness on its electronic behavior. The band structure and density of states (DOS) are analyzed using first-principles calculations based on Density Functional Theory (DFT). The results show that the electronic properties of  $\text{MoS}_2$  strongly depend on the number of layers. As the structure changes from multilayer to monolayer, the band gap increases from approximately 1.2 eV to 1.7 eV, indicating a transition from an indirect to a direct band gap. Additionally, the density of states near the Fermi level increases with the number of layers, suggesting enhanced electronic states and improved conductivity in multilayer structures. These results demonstrate that the electronic properties of  $\text{MoS}_2$  can be effectively tuned by controlling the number of layers, highlighting its potential for applications in nanoelectronics and energy-related devices.



**Figure: (a) Electronic Band Structure of 2H-MoS<sub>2</sub> 1L and (b) 2H-MoS<sub>2</sub> 3L**

**Keywords:** Density functional theory (DFT), Molybdenum disulfide ( $\text{MoS}_2$ ), Electronic band structure, Density of states (DOS), Layer-dependent properties.

**ENHANCING PRINT PERFORMANCE GUIDELINES FOR MESH AND SUBSTRATE SELECTION IN SCREEN PRINTING FOR THE EMPOWERMENT OF YOUTH OF RULER AREA FOR THE DEVELOPMENT OF NEW ENTREPRENEUR /STARTUP IN ACCORDANCE TO AATAM NIRBHAR BHARAT**

**Abhishek Vishwakarma**

**Guru Jambheshwar University Of Science & Technology, Hisar, Haryana**

Screen printing is a widely used printing technique in the packaging, including, flate, pre-formed regular & irregular surface and shapes, textile graphic and industry due to its versatility and ability to print on a wide range of substrates. However, achieving consistent and high-quality prints depends on several process parameters, among which mesh resolution and substrate characteristics play a crucial role. This study presents an empirical investigation into the optimization of print quality in screen printing by examining the effect of different mesh resolutions on various paper substrates.

The research evaluates how variations in mesh count influence key print quality parameters such as ink deposit, line sharpness, edge definition, print density and overall image clarity. Print proof for resilience of Screen Printing for the development of new opportunities of business to new entrepreneur/Startups and growth it contributes a significant role to Aatam Nirbhar Bharat. Different mesh resolutions were tested on multiple types of paper substrates with varying surface properties, including coated and uncoated papers. Controlled printing experiments were conducted under standardized conditions to ensure consistency in ink formulation, squeegee pressure and printing speed. The printed samples were analyzed using visual inspection and quantitative measurement techniques to assess print quality characteristics.

The results indicate that mesh resolution significantly affects ink transfer and image reproduction quality. Higher mesh counts generally produced finer details and improved edge sharpness, while lower mesh counts resulted in higher ink deposition but reduced image precision. Additionally, the interaction between mesh resolution and paper surface properties was found to influence the final print outcome. Coated papers showed better print definition,

The findings of this study contribute to a better understanding of the relationship between mesh resolution and substrate type in screen printing. The results provide practical guidelines for selecting appropriate mesh counts for different paper substrates to achieve optimum print quality. This research can assist printers, researchers, and industry professionals in improving process efficiency, reducing defects and enhancing overall print performance in screen printing applications.

## PREVALENCE AND DISTRIBUTION OF DENGUE STRAINS IN EASTERN UP, INDIA

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**Introduction:** - Dengue is one of the most common mosquito borne viral infection in India which is endemic in various states and regions of the country. This febrile illness occurs due to the infection of various dengue viruses (DENV-1, DENV-2, DENV-3 and DENV-4). This virus belongs to flaviviridae family and is transmitted through the bite of Aedes aegypti mosquito.

**Aim:** - To study and analyse the prevalence and serotypes of the dengue strains in three districts of Uttar Pradesh (Varanasi, Jaunpur and Ghazipur) along with its clinical findings and various complications in infected population.

**Material and Methods:** - A retrospective study is conducted for duration of one year in multiple hospitals in Eastern U.P. Blood samples were collected from 287 patients suspected with dengue infection. Various serological tests like Dengue NS1, Dengue IgG and IgM were performed to diagnose the infection and co-infections and later on serotyping was done for serotypes confirmation of positive dengue cases.

**Results:** - Out of total 287 registered patients, 37 were total positive with dengue infection comprising of 18 females and 19 male patients. NS1 was reactive in all positive 37 cases and Only 6 patients were found positive with dengue IgM, IgG infection. Out of 37 patients, 7 were also suffering with typhoid co-infection. In our study, more than 70% positive cases of Dengue were reported in post-monsoon season which shows ecological relation of dengue with environmental conditions. Elevated levels of SGOT and SGPT with thrombocytopenia were reported in all positive cases. In our study, most prevalent serotype was DENV-2 followed by DENV-3 and DENV-1 with Nil cases of DENV-4 serotype. Although in Varanasi, 2 cases of multiple serotype infection ( DENV-1+2 and DENV-2+3) also reported.

**Conclusion:** - The prevalence and distribution of dengue strains in Eastern Uttar Pradesh reveal a dynamic and evolving epidemiological pattern characterized by hyperendemicity and frequent co-circulation of multiple serotypes. DENV-2 remains the dominant strain, with DENV-3 also contributing significantly. The emergence of multiple serotypes over time indicates an increased risk of severe clinical outcomes due to secondary infections. Early detection and monitoring of serotype shifts are crucial for reducing disease burden and preventing future outbreaks in the region

## EVALUATION OF STRAIN SPECIFIC EFFECTS OF STRUCTURALLY DISTINCT HUMAN MILK OLIGOSACCHARIDES AGAINST *STAPHYLOCOCCUS AUREUS* AND *PSEUDOMONAS AERUGINOSA*

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**Background:** The global health concern of antimicrobial resistance limits the effect of conventional antibiotics against biofilm-associated infections. The need for alternative solutions has risen to reduce bacterial growth along with deterioration of bacterial virulence. Human Milk Oligosaccharides (HMOs) are natural complex glycans and third most abundant component present in breast milk known to possess antibacterial, antibiofilm, anti-adhesive and immunomodulatory activities. However, their strain-specific activity and their role in relation to virulence factors of bacteria are still unknown.

**Methods:** Distinct structural HMOs: 3' sialyllactose (3'SL, sialylated) and Lacto-N-neotetraose (LNnT, neutral) were evaluated against Gram-negative *Pseudomonas aeruginosa* PAO1 and Gram-positive *Staphylococcus aureus* SAW1 and MTCC 1430. Bacterial cells were treated with 1mg/ml concentration of HMOs in LB or TSB for 24 hours at 37° C and 150 rpm shaking conditions. The biocidal activity was analyzed by performing growth curve and enumerating bacterial cells to check cell viability of the treated bacterial cells. Furthermore, we tested *in vitro* effect of HMOs on motility and biofilm formation of bacteria.

**Results:** 3'SL and LNnT showed antibacterial activity against *Pseudomonas aeruginosa* PAO1 (76 % and 54% respectively). 3'SL reduced the swimming motility of *Pseudomonas aeruginosa* PAO1 whereas LNnT did not show any effect. HMOs exhibited significant inhibition of biofilm formation in *S. aureus* SAW1 by 99% but did not show any inhibition in *S. aureus* MTCC 1430. This result suggested that HMOs possess strain-dependent antibiofilm activity. 3'SL reduced biofilm formation in *Pseudomonas aeruginosa* PAO1 by 91.67% and LNnT by 62.50% respectively. We observed that only LNnT affected the swarming motility of *Pseudomonas aeruginosa* PAO1 with an increased swarming motility.

**Conclusion:** HMOs showed strain specific antibacterial and antibiofilm activity against *S. aureus* SAW1, MTCC 1430 and *P. aeruginosa* PAO1. Interestingly, HMOs showed enhanced antibiofilm activity against *S. aureus* SAW1 as compared to *S. aureus* MTCC 1430. HMOs not only displayed strain specific antibiofilm activity but also showed a structure dependent attenuation of bacterial virulence factors. Specifically, the sialylated HMO, 3'SL decreased swimming motility without affecting swarming motility in PAO1. On contrary to this, LNnT increased swarming motility but did not affect swimming motility. These divergent effects on bacterial locomotion suggests that HMOs differentially modulate regulatory pathways governing motility and biofilm formation, warranting focused mechanistic investigation to elucidate therapeutic potential and clinical relevance.

**Abstract No.: A-080**

**Registration No.: 1281**

## **SURFACE LOADS INDUCED PLAIN STRAIN CONSOLIDATION OF A SOIL LAYER OVER A SMOOTH RIGID BASE**

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The system of equations governing the plain strain consolidation of poroelastic media under surface loads have been solved analytically. This solution has been used to examine the settlement of a soil layer consisting impermeable surface and lying over smooth rigid base. Both solid and fluid constituents are assumed to be compressible. Explicit expressions for the pore pressure have been obtained by using the Laplace Fourier transform domain. Talbot method has been utilised for the inverse of Laplace transform and extended Simpson's formula for the inverse of Fourier transform. The results have been shown graphically through MATLAB software. It is observed from the graphs that drained Poisson's ratio has a significant effect on the dimensionless pore pressure with horizontal distance. This work could be helpful for a variety of fields, including soil foundations, petroleum engineering, geotechnical and geophysical engineering etc.

**Abstract No.: A-081**

**Registration No. 1283**

## **EVOLVING BURDEN OF JAPANESE ENCEPHALITIS IN INDIA (2018–2025): A SPATIO-TEMPORAL PUBLIC HEALTH ASSESSMENT**

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Japanese Encephalitis (JE) is a vector-borne zoonotic disease of major public health importance in India, involving a complex transmission cycle among mosquitoes, pigs, wading birds, and humans, and exhibiting marked spatial-temporal heterogeneity. This study analysed human JE incidence, mortality, and Case Fatality Rate (CFR) across Indian states from 2018 to 2025 (up to November) using data from the National Centre for Vector Borne Disease Control (NCVBDC) to understand disease trends and severity patterns. Temporal analysis revealed a cyclical pattern in JE transmission, with a peak in 2019 (2,554 cases and 266 deaths), followed by a sharp decline in 2020 (729 cases) and 2021 (787 cases). A resurgence was observed from 2022 (1,109 cases) to 2024 (1,472 cases), while 2025 data indicated a possible decline, requiring cautious interpretation due to incompleteness. The CFR varied from 5.9% to 11.7%, indicating persistent disease severity, with the highest value recorded in 2022 (11.7%),

followed by a decline in 2023 (5.9%) and an increase again in 2024–2025 (10.4%). Spatially, the burden exhibits pronounced clustering. Northeastern and eastern states, including Assam, Manipur, Meghalaya, Arunachal Pradesh, Nagaland, Bihar, Jharkhand, Odisha, and West Bengal, along with Uttar Pradesh, remain high-burden zones characterized by sustained endemic transmission. Moderate incidence is observed in central and southern regions, such as Madhya Pradesh, Chhattisgarh, Karnataka, and Telangana, suggesting intermittent, localized outbreaks. Conversely, western and northern regions report minimal, sporadic transmission. Regional ecological factors drive India's JE dynamics, requiring targeted surveillance and evidence-based interventions to effectively mitigate the evolving disease burden.

**Keywords:** *Japanese Encephalitis, Spatio-temporal analysis, India, Case Fatality Rate, Public health surveillance*

**Abstract No.: A-082**

**Registration No. 1288**

## **CARBON FOOTPRINT MITIGATION IN SUPPLY CHAINS: AI-DRIVEN FRAMEWORK FOR SUSTAINABILITY**

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The conventional supply chain management struggles to overcome the complexities of global climate change. Innovative digital technologies like Artificial Intelligence (AI), Machine Learning (ML), Blockchain, Digital Twins etc. can assist in dealing with. To mitigate carbon emissions, different stack holders of supply chains must reduce wastage in optimized way. This study explores how an AI-enabled framework helps to mitigate carbon emissions in supply chains. It synthesizes existing research and reports by exploring the existing literature, reports through systematic literature review to develop a framework for smart sustainable supply chains. The findings indicate that digital technologies like IoT devices help to monitor real-time data at each stage. AI and ML are used in making better predictive decisions and along with Agentic AI, which automate tasks for resource optimization. Digital Twins help to make a virtual model of the complete supply chain to analyze and solve any disruption that harms sustainability. Furthermore, Blockchain enhances the traceability of carbon footprint to improve strategies to achieve the net-zero goal. To conclude, this research contributes to decarbonization for a sustainable future by providing the proper framework of an AI-enabled supply chain and future research directions. This study can help policymakers to make better decisions by analyzing authentic data and reducing carbon emissions. Industries can also get advantages by having proper framework for efficiently manage the resources and mitigate the carbon footprint.

**Keywords:** Sustainability, Artificial Intelligence, Net-Zero Goals, Carbon Footprint, Agentic AI, Supply Chain.

**GEOSPATIAL ANALYSIS OF AGRICULTURE RELATED ACTIVE FIRES INCIDENTS IN HARYANA USING REMOTE SENSING DATA****Sandeep Gupta<sup>\*,§</sup>, Rahul<sup>\*</sup>**<sup>\*</sup>Institute of Environmental Studies  
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In India, paddy straw stubble burning is a major environmental and public health issue in rice growing States like Haryana. The scientific studies suggests that historically low cost of open field stubble burning has kept farmers easy to dispose the stubble. This study aimed to find the number of agriculture active fire incidents in Haryana from the year 2021 to 2024 using remote sensing satellite data and geospatial techniques. For this, thermal infra-red sensors of VIIRS (375m resolution) of NOAA-20 satellite, passing twice a day, were used to detect temperature (or heat) anomalies against background temperatures which is higher due to paddy straw stubble burning. The near real-time, thermal anomaly data from both the satellites sensors were obtained from NASA's FIRMS (Fire Information for Resource Management System). These data were filtered and utilized in QGIS environment to determine distribution of post-harvest paddy straw stubble burning incidents and identify major fire hotspot districts of Haryana. The result after analysis showed that during all four year period stubble burning incidents started in the month of September when the paddy harvesting is started, gradually rising in October, peaked in November and gradually declined in the month of December when the paddy harvesting season ends. The analysis also indicate that there is a yearly decline in the total number of fire incidents which could be a combined impact of environmental governance decisions, financial incentives, increased availability of machineries, in-situ and ex-situ management, strict enforcement and raised awareness among farmer community.

**Keywords:** Crop Residue Burning, Active Fire Events, NASA FIRMS, QGIS.**ANTIBACTERIAL PROPERTIES OF RUBIA CORDIFOLIA MEDIATED ZINC OXIDE NANOPARTICLES ON GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA****Poonam<sup>\*</sup> and Ankit yadav<sup>2</sup>**<sup>1</sup>Department of Zoology, CCSHAU, Hisar – 125004<sup>2</sup>Department of Zoology, MDU, Rohtak – 124001

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Due to their distinct physicochemical characteristics and wide range of uses in a variety of industries, such as food, cosmetics and biomedicine, nanoparticles (NPs) have attracted a lot of scientific attention in recent decades. Zinc oxide (ZnO) nanoparticles distinguish

distinguished among them due to their huge band gap, high binding energy, low toxicity and adjustable surface area, shape and size. The current study focuses on the environmentally friendly synthesis of ZnO nanoparticles utilizing *Rubia cordifolia* root extract, which acts as a natural stabilizing and reducing agent. This environmentally friendly method improves the biocompatibility and performance of the nanoparticles while reducing the use of dangerous chemicals. Zeta potential analysis, FTIR, TEM and UV-visible spectroscopy were used to evaluate the biosynthesized ZnO nanoparticles, which ranged in size from 12.3 to 28 nm. Using the agar well diffusion method, their antibacterial effectiveness was assessed against both Gram-positive (*Staphylococcus aureus*) and Gram-negative (*Pseudomonas aeruginosa* and *Klebsiella pneumoniae*) bacteria. Tests were conducted at five different doses (25–200 mg/ml in 2 ml DMSO). Strong antibacterial activity was demonstrated by the greatest zone of inhibition of 8 mm for *K. pneumoniae* and 6 mm for *P. aeruginosa* at the highest concentration (200 mg/ml). The control groups showed no signs of inhibition. Additionally, PVA-ZnO nanocomposites demonstrated antibacterial activity at lower concentrations (5–20 mg/ml), while *Rubia cordifolia*-assisted ZnO NPs required higher concentrations (50–200 mg/ml) for similar effects. This study also explores the structural and morphological characteristics of the synthesized nanoparticles and proposes potential mechanisms of bacterial inhibition, highlighting the interaction of ZnO NPs with bacterial cell walls that may lead to membrane disruption and cell death. Overall, green synthesis offers a sustainable, cost-effective and efficient alternative to conventional nanoparticle fabrication methods, with promising antibacterial applications.

**Keywords:** Green synthesis, Zinc oxide nanoparticles, *Rubia cordifolia*, Antibacterial activity, Nanotechnology

**Abstract No.: A-085**

**Registration No. 1299**

## **An Efficient Deep Learning based Fabric Defects Detection Technique**

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The textile industry has an aim to produce high quality defect free fabric. Historically, this has been achieved through manual inspection which is very difficult for human being, prone to inaccuracies, a time consuming process and also costly due to the necessity of highly skilled personnel. Therefore, this paper presents a deep-learning-based fabric inspection system with an objective to reduce human efforts. The proposed system employs a computer vision technique in order to identify fabric defects via images automatically. In this, a Convolution Neural Network (CNN) based deep learning model is deployed to detect the fabric condition (defects) and further classify the fabric images into defect-free and defective images. The network architecture of CNN consists of four convolution layers and four max-pooling layers, arranged in such a manner so that it can optimize the feature. Experimental results showcase the superiority of proposed model with an average loss of approx. 2.56 %. Thus, the proposed

deep learning based model demonstrates its potential for practical applications for fabric industry.

**Keywords:** Classification, CNN, Deep Learning, Fabric Detection

**Abstract No.: A-086**

**Registration No. 1301**

## **THE HYDROGEN-BATTERY NEXUS: SYNERGIZING INTEGRATED STORAGE SYSTEMS FOR A RESILIENT GLOBAL ENERGY TRANSITION**

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As the global energy landscape shifts toward decarbonization, the intermittent nature of renewable sources demands a robust, multi-scalar storage framework. The global push towards a hydrogen economy represents a pivotal strategy for decarbonizing energy systems, with batteries serving as critical enablers for storage, grid stability, and efficient energy management. This approach explores the synergistic integration of hydrogen production, storage and utilization with advanced battery technologies to accelerate the transition to sustainable energy. While batteries offer high round-trip efficiency and rapid response for short-duration storage, hydrogen provides an unparalleled solution for long-duration energy storage, seasonal shifting and other applications. Recent technological advancements, including solid-state batteries and proton exchange membrane (PEM) electrolyzers, have significantly enhanced the technical viability of integrated energy storage systems. "Hydrogen" acts as a versatile energy carrier that complements the localized grid-balancing capabilities of battery energy storage systems. Innovations in hybrid systems, such as vehicle-to-grid (V2G) with hydrogen fuel cells, further enhance the flexibility of electric vehicle ecosystems. Despite these prospects, deployment challenges persist, notably the high capital expenditure (CAPEX) required for hydrogen infrastructure and energy conversion losses. Addressing these challenges requires a multifaceted approach involving policy incentives, scaling "Power-to-X" technologies, and developing dedicated infrastructure for hydrogen as a means of energy storage. The study highlights that an integrated hydrogen-battery ecosystem is not merely an alternative but a necessity for achieving grid resilience. By leveraging the complementary strengths of both technologies, stakeholders can mitigate the limitations of standalone systems, ultimately accelerating the trajectory toward a net-zero emission future.

**GREEN SYNTHESIS OF SILICA OXIDE NANOPARTICLES USING BIOMASS RESIDUE FOR EFFECTIVE DESALINATION OF WATER: AN ECOFRIENDLY APPROACH**

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Freshwater scarcity and increasing salinity of water resources have become major global challenges due to rapid industrialization, population growth, and climate change. Conventional desalination methods are effective but often require high energy, high operational costs, and may cause environmental concerns. Therefore, sustainable and eco-friendly alternatives are urgently needed. This study focuses on the green synthesis of silica oxide nanoparticles (SiO<sub>2</sub> NPs) using biomass residues for effective water desalination. Agricultural biomass residues rich in silica were used as a low-cost and renewable precursor for nanoparticle synthesis through an environmentally friendly process, reducing chemical usage and promoting waste valorization. The synthesized nanoparticles were characterized using XRD, FTIR, SEM, and UV–Visible spectroscopy, confirming the formation of porous, crystalline, and Nano sized silica particles with high surface area. The desalination efficiency of SiO<sub>2</sub> nanoparticles was evaluated for the removal of dissolved salts and ionic impurities from saline water. Significant reduction in total dissolved solids (TDS), electrical conductivity (EC), and major ions such as sodium and chloride was observed under optimized conditions. The study demonstrates that biomass-derived silica nanoparticles are an economical, efficient, and sustainable solution for desalination and support green nanotechnology for future water treatment applications.

**Keywords:** - Agricultural biomass, Salinity, Nano-sized Silica, Sustainable.

## EXPLAINABLE FOOD QUALITY AND SAFETY INSPECTION USING DEEP LEARNING AND XAI TECHNIQUES

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The integration of Artificial Intelligence (AI) in food quality and safety assessment has significantly enhanced efficiency, scalability, automation and detection capabilities across the food industry. However, conventional AI models, particularly deep learning systems, often function a “black box”, limiting transparency and trust among stakeholders in food industries. This research explores the application of Explainable AI (XAI) techniques to improve interpretability while maintaining high predictive performance in food quality and safety evaluation. The research proposes a hybrid framework combining convolutional neural networks (CNNs) for feature extraction and XAI methods such as SHAP (SHapley Additive exPlanations) and Grad-CAM (Gradient-weighted Class Activation Mapping) for interpretability. The system can be evaluated on food image datasets and sensor-based contamination data to achieves high classification accuracy while providing meaningful explanations that support decision-making, regulatory compliance, and consumer trust. The findings highlight the potential of XAI to transform intelligent food inspection systems by ensuring transparency, accountability, and reliability in industrial AI applications.

## INTELLIGENT FOOD SUPPLY CHAIN OPTIMIZATION USING AI, IOT, AND ENSEMBLE LEARNING FOR DYNAMIC SHELF-LIFE PREDICTION

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The global food industry faces significant challenges in ensuring supply chain efficiency and reducing food waste, largely due to traditional shelf-life estimation methods that rely on static expiration dates and fail to reflect dynamic environmental conditions. Factors such as temperature, humidity and gas emissions strongly influence food degradation, yet existing systems lack real-time adaptability and predictive intelligence, leading to inefficiencies, spoilage, and economic losses. This research presents an AI-powered predictive analytics framework for optimizing food supply chain efficiency and shelf-life management. The proposed approach integrates a range of machine learning models, including regression models, tree-based methods, ensemble learning techniques, deep learning models, and reinforcement learning for adaptive decision-making. By leveraging IoT sensor data, environmental parameters, and demand patterns, the system enables accurate real-time prediction of remaining shelf life and demand fluctuations. The optimization of the food supply chain is achieved through intelligent inventory control, dynamic routing, demand forecasting, and cold-chain monitoring, that ensures minimal spoilage and efficient resource utilization. It shows significant improvements in prediction accuracy, logistics efficiency, and waste reduction. The study highlights the transformative potential of AI-driven, ensemble-based approaches in building scalable, sustainable, and intelligent food supply chain systems while addressing challenges related to data quality, scalability, and interpretability.

**Keywords:** Artificial Intelligence (AI), Machine Learning (ML), Food Supply Chain Optimization, Shelf-Life Prediction, Ensemble Learning, Internet of Things (IoT)

**Abstract No.: A-090**

**Registration No. 1308**

**Crystal Structure and enhanced properties of BaTiO<sub>3</sub> with Ni-substituted CoFe<sub>2</sub>O<sub>4</sub> in multiferroic**

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Lead free based multiferroics ceramics (y) BaTiO<sub>3</sub> + (1-y) Ni<sub>0.5</sub>Co<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> (y = 0.10, 0.30 and 0.50) were successfully synthesized using the conventional solid-state reaction technique. These composites were designed to combine the ferroelectric properties of BaTiO<sub>3</sub> (BT) with the magnetic properties of Ni<sub>0.5</sub>Co<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> (NCFO), aiming to achieve enhanced multiferroic behavior through phase coupling. X-Ray diffraction analysis confirms the cubic symmetry with Fd3m space group for ferrite (NCFO) and tetragonal symmetry with P4mm space group for ferroelectric (BT) without any impurity. Further confirmation of phase purity, lattice parameters, and structural refinement was achieved through Rietveld refinement analysis, indicating good agreement between observed and calculated patterns. The three-dimensional crystal structure of pure BaTiO<sub>3</sub> and Ni<sub>0.5</sub>Co<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> and of composite 0.50BaTiO<sub>3</sub>-0.50 Ni<sub>0.5</sub>Co<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> was generated with the help of VESTA Software. The variation of dielectric constant ( $\epsilon'$ ) and dielectric loss ( $\tan \delta$ ) with frequency and temperature was analyzed using an impedance phase analyzer. Ferroelectric properties were investigated through P-E hysteresis loops, while magnetic behavior was studied using M-H hysteresis loops.

**Keywords:** Multiferroics, XRD, Rietveld refinement, dielectric properties, ferroelectric properties, magnetic properties.

**Abstract No.: A-091**

**Registration No. : 1314**

**HANDLING MISSING VALUES IN AGRICULTURAL PRODUCTION TIME SERIES: A COMPARISON OF LINEAR INTERPOLATION, MOVING AVERAGE, KALMAN SMOOTHING AND REGRESSION**

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Missing data is a common issue in agricultural statistics and can adversely affect the reliability of analysis and decision-making. This study evaluates the performance of selected imputation methods for handling missing values in annual citrus production data. The data were obtained from India Stat for the period 1991–2023 for selected Indian states. Complete datasets from Punjab and Gujarat were used to generate missing values under a Missing Completely at

Random (MCAR) mechanism at a 15% missingness level. Four imputation techniques—linear interpolation, moving average, regression imputation, and k-nearest neighbours (KNN)—were applied to estimate missing observations. The performance of these methods was assessed using Root Mean Square Error (RMSE) and Mean Absolute Error (MAE). The results indicate that linear interpolation consistently outperformed the other methods across both datasets, yielding the lowest error measures, while regression and KNN methods showed comparatively poor performance. The best-performing method was subsequently applied to the Uttarakhand and Bihar datasets containing actual missing observations. The findings highlight the importance of selecting appropriate imputation techniques for agricultural time series data and demonstrate the effectiveness of interpolation-based methods in this context.

**Abstract No.: A-092**

**Registration No. : 1315**

## **PHOTOACTIVE ZINC(II) SCHIFF BASE COMPLEXES FOR VISIBLE-LIGHT DRIVEN DYE DEGRADATION**

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The development of sustainable and non-toxic materials for environmental remediation is an important challenge in modern chemistry. In this work, we report the design and synthesis of a series of zinc(II) complexes **1-3** derived from hydrazone-based Schiff base ligands containing an ONO donor framework and a thiophene chromophore. These ligands were systematically modified to understand how structural variations influence the properties of the resulting metal complexes. The synthesised complexes were thoroughly characterised using a combination of spectroscopic (<sup>1</sup>H-NMR, <sup>13</sup>C-NMR, HRMS, FT-IR, Confocal Raman Spectroscopy and UV-Vis-NIR Absorption Spectroscopy), elemental (CHNS Elemental Analysis and AAS), crystallographic (Powder XRD and Single Crystal XRD), microscopic (FE-SEM, EDX and Elemental Mapping) and thermal techniques (DSC), confirming the formation of stable, six-coordinate zinc systems. Subtle changes in ligand substituents were found to significantly affect both the structural features and electronic behaviour of the complexes. Importantly, the photo-responsive nature of these materials was evaluated through visible-light-driven degradation of common organic dyes. Among the series, the complex bearing electron-withdrawing substituents showed greater photocatalytic activity, highlighting the role of ligand design in promoting efficient charge-transfer processes. Overall, this study provides useful insights into how ligand engineering can be used to develop zinc-based photoactive materials, offering a promising approach toward environmentally friendly photocatalysts for pollutant degradation.

**Abstract No.: A-093**

**Registration No.:1318**

**Synthesis of (1-(2-oxo-2-(10*H*-phenothiazin-10-yl)ethyl)-1*H*-1,2,3-triazol-4-yl)methyl benzoate/halobenzoates**

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*N*-heterocyclics have played a vital role in medicinal chemistry mainly because of their presence in majority of therapeutically active compounds. 1,2,3-Triazoles have been established as an important class of heterocyclic compounds because of their variegated application in the field of drug invention, bioconjugation, material science and pharmaceutical chemistry. Here, we have used click synthetic protocol involving copper (I) catalysed 1,3-dipolar cycloaddition reaction between alkenyl benzoate/halobenzoates and azides obtained from phenothiazine based bromides for the synthesis of (1-(2-oxo-2-(10*H*-phenothiazin-10-yl)ethyl)-1*H*-1,2,3-triazol-4-yl)methyl benzoate/halobenzoates. The structures of the synthesized compounds were confirmed by various analytical techniques like <sup>1</sup>H NMR, <sup>13</sup>C NMR, FTIR and HRMS techniques.

**Abstract No.: A-094**

**Registration No.:1324**

**REMOVAL OF BRILLIANT GREEN DYE FROM WASTE WATER USING LOW COST BIOSORBENT AND ITS ADSORPTION STUDY**

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Human and aquatic health is frequently at risk due to dye pollution in aquatic environments. In order to remediate water contaminated with cationic dye namely brilliant green (BG) dye, a chemically modified almond shell adsorbent was developed in the present study. The physico-chemical characteristics of modified almond shell (MAS) were investigated using a variety of characterization techniques, including  $pH_{pzc}$ , FTIR, FE-SEM, and EDS. Studies have been conducted on the impacts of different adsorption parameters, including the  $pH$ , dye concentrations, adsorbent dose contact time, and temperature. The optimized conditions were  $pH=8$ , 0.8 g/L of adsorbent dose, 120 minutes of contact time and temperature 50°C. The BG uptake by modified almond shell was explained by the monolayer adsorption onto energetically

equivalent sorption sites. The Langmuir model yielded a maximal adsorptive capacity of 121.73 mg BG per g MAS. The kinetic models also showed that the rate depends on the adsorbent's adsorptive capacity. The pseudo-second order model works well for BG adsorption, and its  $R^2 > 0.99$  adsorption. Thermodynamic studies indicated that adsorption is feasible, spontaneous and endothermic in nature. This work suggests that MAS can be investigated further as a possible adsorbent for the removal of BG dye.

**Key words:** Biosorbent, adsorption, brilliant green dye, isotherm studies

**Abstract No.: A-095**

**Registration No.:1328**

## **STRESS FIELDS CAUSED BY DIP SLIP FAULT IN AN ELASTIC MEDIUM**

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The stress field distribution of a homogeneous, isotropic, uniformly thick elastic layer on a smooth base caused by a fault inside the elastic layer has been examined. The integral expressions for stresses have been achieved by applying appropriate boundary conditions at the free surface and utilizing the Airy stress function technique. Extended Simpson's formula has been used to assess integral expressions. The distribution of stress fields has been analyzed numerically and shown graphically through MATLAB software. The study can be beneficial in geophysical engineering and its applications.

**Abstract No.: A-096**

**Registration No.:1330**

## **CUB MONOLAYER AS AN ELECTRODE MATERIAL FOR SUPERCAPACITOR: A DFT STUDY**

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Supercapacitors are emerging as an imminent energy storage device for future energy innovations. A lot of research on supercapacitors has been concentrated on producing inexpensive and highly efficient electrodes, as the electrode material greatly impacts its performance [1]. Transition-metal borides, popularly known as MBenes, are a unique class of

2D materials [2] with outstanding physical and chemical characteristics owing to their layered structure, akin to MXenes [3]. In this study, first-principles calculations were used to evaluate the electrochemical properties of 2D Copper Boride (CuB) monolayer for determining its application as an electrode material for supercapacitors. The negative Formation energy ( $E = -8.673$  eV) of CuB monolayer confirms its stability. Electronic structural calculations reveal the metallic nature of CuB monolayer. The electronic density of states at a specific thermodynamic equilibrium, or fermi-level, determines the quantum capacitance. The quantum capacitance of CuB monolayer is found to be  $QC \sim 5150$  uF/cm<sup>2</sup> which is greater than that of graphene ( $QC \sim 420$  uF/cm<sup>2</sup>) [4]. The large quantum capacitance and metallicity of 2D MBene CuB monolayer suggest it to be an effective electrode material for Supercapacitors.

**Abstract No.: A-097**

**Registration No.:1338**

## **Nano-materials for Safe Drinking Water: Removal of Toxic Heavy Metals from Aqueous Systems**

**Anushka**

Pollutants of water by harmful heavy metals have become a serious problem for both the environment and people's health and safety of human due to pollution, especially due to the presence of (things that affect the environment) such as Chromium (VI) and Lead (PB II), which are broadly found in industrial wastewater and natural water resources.

These metals are not capable of being broken down by the action of organisms and torn to pieces in living systems, making their removal super important.

However, normal treatment strategies fall short due to finite, high cost and the trouble of creating secondary (affect water resources, air, etc.)

To recover from these challenges, Nano-materials have come up as a saviour for water resources cleanliness, providing a high surface area and advanced probability.

This study focuses on the use of advanced Nano-materials, including Iron oxide nanoparticles, Graphene -based materials, and Nano-composites, for the output of a lot, with very little waste from heavy metals from water-based systems.

The review emphasises key removal methods such as adsorption, ion exchange, and redox interactions, while also examining important factors influencing performance, including pH, contact time, and initial metal concentration.

A correlation process of assessment is presented to test or evaluate the effectiveness and practicality (ability to be used for something) of different Nano-materials.

Furthermore, using nanotechnology, materials can adequately be made stronger, lighter, more durable, more reactive, more sieve-like, or better electrical conductors, among many other traits.

Overall, nanotechnology gives a sustainable and efficient pathway toward cleaner water systems, with a strong chances of being put into real-world use. Future research should focus on developing and producing a lot of Nano-materials that are good for environment and population and scaling up these technologies to secure and make sure of safe and easy to get to use water bodies.

**Abstract No.: A-098**

**Registration No.:1343**

## **ROLE OF IMIDAZOLE SCAFFOLD IN ANTIDIABETIC DRUG DISCOVERY**

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Diabetes mellitus involves abnormal blood glucose levels caused by defects in insulin action or secretion. Imidazole is a privileged heterocyclic scaffold widely explored in medicinal chemistry due to its unique electronic properties and strong ability to interact with biological targets. In the past, antidiabetic drug development primarily focused on conventional classes such as insulin, sulfonylureas, and biguanides, with limited emphasis on imidazole-containing molecules. However, the structural similarity of imidazole to biologically active systems encouraged early investigations into its potential role in glucose metabolism and enzyme inhibition. In the present era, imidazole derivatives have gained significant attention as promising antidiabetic agents. Recent studies highlight their ability to act through multiple mechanisms, including inhibition of carbohydrate-hydrolysing enzymes, modulation of insulin signalling pathways, and interaction with targets such as DPP-4 and PPAR- $\gamma$  receptors. Advances in synthetic chemistry, structure–activity relationship (SAR) studies, and molecular docking have facilitated the design of potent imidazole-based compounds with improved efficacy and reduced toxicity. Looking toward the future, imidazole derivatives offer vast potential for the development of multi-target antidiabetic drugs. Emerging strategies such as hybrid molecule design, computational drug discovery, and nanotechnology-based delivery systems are expected to enhance their therapeutic performance. Furthermore, addressing limitations like bioavailability and side effects will be critical for clinical translation. Overall, imidazole-based scaffolds represent a promising avenue for next-generation antidiabetic drug development.

**Abstract No.: A-099**

**Registration No.:1346**

**COMPARATIVE ANALYSIS OF PRISTINE AND NaBH<sub>4</sub> DOPED SnSe:  
EXPERIMENTAL AND DFT INVESTIGATION**

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The effect on crystallite size of SnSe thermoelectric material has been studied with NaBH<sub>4</sub> doping. SnSe is one of the most emerging materials in the thermoelectric field, although it has a low electrical conductivity in its pristine form. Efforts have been made to improve its properties. It's an alternative to lead based toxic materials that shows promising results in recent past. The solvothermal method is used to synthesize SnSe in low cost and environment friendly way. X-ray diffraction confirmed the formation of nano crystallite size. The FESEM micrograph shows the difference in morphology of synthesized particles. Density functional theory (DFT) approach has been utilized to investigate the electronic properties of SnSe.

**Keywords:** Thermoelectric, DFT

**Abstract No.: A-100**

**Registration No.:1348**

**THE IMPACT OF BIOSYNTHEZIZED SILVER NANOPARTICLES ON  
*EISENIA FETIDA***

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With the growing use of silver nanoparticles (AgNPs) in consumer products, there is a growing need for sustainable approaches for synthesizing these nanoparticles and evaluating their toxicity to the environment. In this study, the green synthesis of silver nanoparticles (AgNPs) from aqueous leaf extract of *Ocimum sanctum* (Holy Basil), which is known to contain a variety of phytochemicals, was conducted as the reducing and stabilizing agents, and their effects on the growth of the earthworm species *Eisenia fetida* were evaluated. The green synthesis of the AgNPs was confirmed by UV-Vis spectroscopy, FTIR, and TEM analyses. The earthworm species *Eisenia fetida* were then exposed to various amounts of synthesized AgNPs in standard soils within a 120 days laboratory exposure experiment. It was found that there was a dose-

dependent effect on growth dynamics where higher doses had a pronounced inhibitory effect on biomass accumulation and reduced growth rate compared to the control, while low levels had minimal impacts. A significant reduction in feed consumption and rate of cocoon production correlated with these physiological responses. It was concluded that although the green synthesis technique is an eco-friendly approach for nanoparticle synthesis, the synthesized nanoparticles still posed risks to soil macrofauna. These findings challenge the longstanding belief that biogenic nanoparticles are inherently biocompatible. This study exposes an essential paradox of nanotechnology: although the synthesis of nanomaterial products can be chemically safe and environmentally sustainable, the manufactured nanomaterials continue to exhibit significant biological activity, posing a serious risk to the physiological health of large soil macro-fauna. Therefore, this study recommends that all engineered nanomaterials must be subjected to rigorous ecotoxicological assessment prior to their release into the environment, irrespective of the nanomaterials' manufacturing pathways.

**Keywords:** Silver nanoparticles, green synthesis, *Ocimum sanctum*, characterization, growth performance

**Abstract No.: A-101**

**Registration No.: 1349**

**FROM PLANTS TO PONDS: EFFECT OF BIOLOGICALLY SYNTHESIZED SILVER NANO PARTICLES ON GROWTH PERFORMANCE OF *CYPRINUS CARPIO***

**Rishu, Rajender Kumar Gupta, Sunidhi**

Silver nanoparticles (AgNPs) are among the most widely utilized nanomaterials and, due to their distinctive characteristics, have been incorporated into various consumer products such as cosmetics, plastics, food packaging, toys and medical devices. However, their extensive use has resulted in the release of AgNPs into the environment, raising concerns about potential ecological risks. Since aquatic systems often serve as the final sink for these nanoparticles, so silver nano particles enter the aquatic bodies. The common carp ranks as the third most widely introduced species globally. Due to its strong adaptability to various environments and food sources, it is being evaluated as a promising candidate for commercial aquaculture in several Asian and European nations. In the experiment, silver nano particles were synthesized and characterized using various techniques like TEM, PSA, UV- VISIBLE and FTIR. Later, different groups were taken to observe the growth performance of common carp when silver nano particles were given in the fish feed. It was found that the growth performance of common carp was higher in treatment 1(0.05mg/kg) as compared to control and other groups while in treatment 4 (0.20mg/kg) growth retarded due to chronic toxicity of silver nano particles.

**Keywords:** Silver nano particles, Growth performance, Fish Feed

**Abstract No.: A-103**

**Registration No.: 1351**

## **REMOVAL OF BRILLIANT GREEN DYE FROM WASTE WATER USING LOW COST BIOSORBENT AND ITS ADSORPTION STUDY**

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Human and aquatic health is frequently at risk due to dye pollution in aquatic environments. In order to remediate water contaminated with cationic dye namely brilliant green (BG) dye, a chemically modified almond shell adsorbent was developed in the present study. The physico-chemical characteristics of modified almond shell (MAS) were investigated using a variety of characterization techniques, including  $pH_{pzc}$ , FTIR, FE-SEM, and EDS. Studies have been conducted on the impacts of different adsorption parameters, including the  $pH$ , dye concentrations, adsorbent dose contact time, and temperature. The optimized conditions were  $pH=8$ , 0.8 g/L of adsorbent dose, 120 minutes of contact time and temperature 50°C. The BG uptake by modified almond shell was explained by the monolayer adsorption onto energetically equivalent sorption sites. The Langmuir model yielded a maximal adsorptive capacity of 121.73 mg BG per g MAS. The kinetic models also showed that the rate depends on the adsorbent's adsorptive capacity. The pseudo-second order model works well for BG adsorption, and its  $R^2 > 0.99$  adsorption. Thermodynamic studies indicated that adsorption is feasible, spontaneous and endothermic in nature. This work suggests that MAS can be investigated further as a possible adsorbent for the removal of BG dye.

**Key words:** Biosorbent, adsorption, brilliant green dye, isotherm studies

**Abstract No.: A-104**

**Registration No.: 1355**

## **SYNTHESIS OF TITANIUM DIOXIDE NANOPARTICLES VIA THE SOL-GEL METHOD AND THEIR INTEGRATION INTO A NANO-EMULSION SYSTEM**

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Nanotechnology offers versatile strategies for the development of advanced material systems with enhanced physicochemical properties. Among these, titanium dioxide (TiO<sub>2</sub>) nanoparticles have gained significant attention due to their stability, biocompatibility, and multifunctional characteristics. However, challenges such as particle aggregation and poor dispersion often limit their practical applications. To address these limitations, the present study focuses on the synthesis of TiO<sub>2</sub> nanoparticles via the sol-gel method, followed by their incorporation into nano-emulsion systems to enhance dispersion and formulation stability. The sol-gel approach enables controlled nanoparticle formation through hydrolysis and

condensation of suitable precursors, resulting in particles with uniform size distribution and well-defined structural properties. Following synthesis, the TiO<sub>2</sub> nanoparticles were incorporated into nano-emulsion systems formulated using appropriate oil phases and surfactants, aiming to achieve a stable and homogeneous dispersion within the emulsion matrix. The integration of TiO<sub>2</sub> nanoparticles into nano-emulsions represents an effective strategy to minimize aggregation and improve their physicochemical performance. Overall, this study underscores the significance of formulation-based approaches in optimizing nanomaterial functionality and establishes a foundation for future application-driven research.

Keywords: Nanoparticles, Sol-gel, Nano-emulsions,

**Abstract No.: A-105**

**Registration No.: 1356**

**TITLE: PENETRATION INTO BRAIN VIA NASAL ROUTE**

**Rajni**

Delivery of drug to the central nervous system (CNS) remains a major challenge due to presence of blood brain barrier (BBB), which restrict drug permeation and limited therapeutic efficacy. Conventional route such as oral and intravenous administration often result in poor bioavailability, first pass metabolism and systemic side effects. Intranasal delivery has emerged as a promising non-invasive approaches that enable direct nose to brain targeting via olfactory and trigeminal pathway, thereby bypassing the BBB. In the present study, a nano-emulsion based formulation was developed by a low energy emulsification method to enhance the drug solubility, permeability, and brain uptake using suitable oils like (castor oil, olive oil, gultheria oil) and surfactants (Tween 80, SLS, LAS) and cosurfactants (propylene glycol) the prepared nanoemulsion was characterized by particle size, polydispersity index, zeta potential, drug content, viscosity, and pH. Furthermore, the formulation was evaluated for in vitro permeation across nasal mucosa, stability studies and antibacterial activity. The optimized nanoemulsion demonstrate improve bioavailability and efficient brain targeting.

**Keywords:** Intranasal drug delivery, nose to brain targeting, nanoemulsion, blood brain barrier, drug permeation.

**TREATING PSORIASIS : BY FORMULATING 5FU LOADED NANO LIPID CARRIERS****Janvi**

Psoriasis is a long-term skin disorder that causes excessive proliferation and abnormal differentiation of keratinocytes. Despite the ability of 5-fluorouracil (5-FU) to inhibit keratinocyte proliferation, the topical delivery of this compound suffers from poor permeability of the skin and skin irritability. The objective of this research is to design and characterize NLCs loaded with 5-FU using microwave-assisted synthesis technique. The synthesis of NLC was achieved by the application of microwave technology. A combination of solid and liquid lipids was utilized to develop a stable lipid matrix that was capable of entrapping 5-FU. The formulations were analyzed for their size, polydispersity index, zeta potential, encapsulation efficiency, and loading capacity. The optimized formulation showed nano-scale particles, high encapsulation efficiency, and good stability. Drug release was studied in vitro, showing that it was characterized by a sustained and controlled nature. Physicochemical characteristics such as viscosity, spreadability, and pH were measured in the NLC-containing gel, ensuring its effectiveness as a topical formulation. In vivo experiments showed better anti-psoriasis potential by reducing erythema, scales, and plaques. Hence, it may be concluded that microwave-assisted loading of 5-FU into NLCs could be a promising, effective, and scalable approach for the topical management of psoriasis.

**Keywords :** 5-Fluorouracil, Nanostructured Lipid Carriers (NLCs), Microwave Synthesizer, Psoriasis, Topical Drug Delivery

**Abstract No.: A-107**

**Registration No.:1362**

## **POLYMERIC WAFERS: A PROMISING APPROACH FOR WOUND-HEALING**

**Swaliya**

Wound healing is a biological phenomenon, which calls for an efficient delivery of the drug in the injured tissue. In this research, an investigation into a drug delivery system through topical application using ampicillin for improved wound healing activity has been undertaken. Ampicillin, being a broad-spectrum antibiotic, was chosen for the study owing to its efficacy against the different wound-infecting microorganisms. Topical wafers were prepared using the freeze-drying technique in order to produce porous and light-weight drug carriers that allow fast release and permeation of the drug into the wound area. The two polymers chosen for preparing the formulations included sodium alginate and gelatin because of their biocompatibility, bio-degradability, and film-forming ability. Formulations of different compositions were developed using various polymer compositions. The physicochemical properties like thickness, weight variation, swelling index, and drug content, and drug release profile were tested for the optimized formulation. Results indicated that the optimum formulation possessed desirable mechanical strength, swelling capacity, and controlled release rate over a period of 7 hrs. The porous nature provided by freeze drying also contributed to improved drug permeation and adherence to the wound site. Hence, the findings of this study suggest that ampicillin-loaded topical wafers could prove to be effective for wound healing applications.

**Keywords:** Wound-healing. Sodium alginate. Gelatin. Freeze-drying. Ampicillin. Topical delivery.

**Abstract No.: A-108**

**Registration No.: 1364**

## **NAVIGATING THE DIGITAL WORLD SAFELY: DIGITAL HYGIENE AMONG UNDERGRADUATE GIRL STUDENTS**

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The rapid expansion of digital technologies in higher education and everyday life has significantly increased students' dependence on online platforms for learning, communication, information access, and social interaction. Recent national and international studies highlight growing concerns related to unsafe digital practices, excessive screen exposure, cyber risks, and limited awareness regarding responsible technology use among young learners. Reports from UNESCO and UNICEF emphasize that strengthening digital awareness, safe online behaviour, and cyber security competencies has become essential for ensuring meaningful participation in digitally transformed education systems. In the Indian context, initiatives such

as the Digital India Programme and Cyber Swachhta Kendra further stress the need to promote responsible digital engagement and protection from emerging cyber threats among students. Contemporary research indicates that improving students' knowledge related to digital hygiene supports safer navigation of online environments and reduces vulnerability to cyber risks and misinformation. Evidence also suggests that strengthening behavioural practices associated with responsible social media use, cyber security awareness, and management of digital routines contributes to healthier patterns of technology engagement. Increasing attention is also being given to digital wellbeing as an important component of students' academic productivity, psychological comfort, and balanced digital lifestyles. These concerns are particularly relevant for undergraduate learners, including girl students who actively participate in digital learning environments and social media platforms as part of their routine academic and personal interactions. Strengthening awareness, behavioural competencies, and wellbeing-oriented digital practices among students is therefore essential for promoting safe, responsible, and sustainable participation in emerging digital university ecosystems aligned with the goals of NEP-2020 and the vision of Viksit Bharat.

**Keywords:** Digital Hygiene, Digital Wellbeing, UG Girl Students, NEP-2020 and Viksit Bharat.

**Abstract No.: A-109**

**Registration No.: 1366**

## **SYNTHESIS AND CHARACTERIZATION OF PYRAZOLE CLUBBED 1,2,3-TRIAZOLE HYBRIDS**

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Molecular hybrids have attracted considerable attention due to their increased potency compared to their parent scaffolds showing pharmacological properties. In this regards, various heterocyclic entities including 1,2,3-triazole and pyrazole have been extensively studied for the synthesis of new hybrid molecules. In the present study, a series of novel pyrazole–1,2,3-triazole hybrids were synthesized through a stepwise and efficient synthetic strategy. Initially, commercially available pyrazole derivative was propargylated to get a dipolarophile for a 1,3-dipolar cycloaddition with various azide derivatives *via* click reaction. Structural characterization of the synthesized molecular hybrids was carried out using FT-IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR spectral methods. The formation of the target hybrids was confirmed by the disappearance of terminal alkyne absorption bands and the appearance of characteristic signals corresponding to the triazole ring in FTIR and NMR spectra. This work demonstrates a convenient and reliable approach for the synthesis of structurally diverse molecular hybrids with high yield, which may serve as promising candidates for further pharmacological investigation. The details of the work will be discussed in the conference.

**Keywords:** Pyrazole; 1,2,3-Triazole; Click reaction; Molecular hybridization.

**ANALYSIS OF COOLING CHARACTERISTICS OF AN AI BASED  
FLUID-ASSISTED MATRIX CHILLER****Atish<sup>1\*</sup>, Dr. P S Minz<sup>2</sup>, Yashwant<sup>3</sup>, Sahil<sup>4</sup>**Research Scholar<sup>1,2,3</sup>, Senior Scientist<sup>4</sup>

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Preserving raw milk at rural collection centers requires chilling equipment that balances fast heat extraction with low running costs. To address this practical challenge, an integrated fluid-assisted, matrix-based milk cooling system underwent extensive thermal and economic testing. The experimental setup adapts a standard chest freezer attachment by adding a specialized cooling energy storage cell, which circulates heat transfer fluid across the milk container's surrounding matrix structure controlled by AI sensors. This specific design intends to boost conductive and convective heat exchange while maintaining strict control over the milk's temperature.

A testing framework was built to monitor the system using a standard 20 to 30-liter milk volume. To establish a reliable performance baseline, the matrix cooler's thermal behavior is compared side-by-side with three alternative methods: ambient air-cooling, cold-water dipping, and normal low-temperature cooling. During these comparative tests, the research tracks several critical thermodynamic metrics. The primary focus remains on measuring the total temperature drop, the speed of the cooling rate, the total amount of heat removed, and the overall temperature uniformity. These factors dictate whether the batch cools down evenly without leaving warm pockets that might encourage bacterial growth.

In addition to gathering thermal data, the project includes a techno-economic analysis to determine if the proposed setup makes financial sense for small-scale operations. Total energy consumption is recorded in kilowatt-hours, allowing for the calculation of exact cooling costs in rupees based on the equipment's power rating, running time, and local electricity tariffs. Standard thermodynamic equations link the electricity used directly to the actual thermal energy pulled from the milk. This combined thermal and economic evaluation aims to prove that a fluid-assisted matrix design offers a faster, more affordable alternative to traditional decentralized cooling methods.

**Keywords:** Chest freezer integration, Cooling characteristics, Energy consumption, Matrix-based cooling, Performance evaluation, Temperature uniformity, Thermal analysis

**Abstract No.: A-111**

**Registration No.: 1377**

**ELUCIDATING STRUCTURE AND MORPHOLOGICAL FEATURES  
OF  $\text{Ba}_3\text{CuTa}_2\text{O}_9$  &  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$  FRUSTRATED OXIDES**

**Monika Sheoran<sup>1</sup>, Himanshu Tanwar<sup>1</sup>, Sanjay Kumar<sup>1</sup>, Ashish Agarwal<sup>1</sup>,  
Sujata Sanghi<sup>1,\*</sup>**

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In the present work,  $\text{Ba}_3\text{CuTa}_2\text{O}_9$  and  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$  frustrated oxides were successfully synthesized using the conventional solid-state reaction route. X-ray diffraction was performed to assess the phase purity. The Crystallography Open Database (COD) was used to identify the possible space groups associated with these oxides. Rietveld refinement via the FullProf program reveals dual-phase ( $P63mc$  &  $Pm-3m$ ) refinement for  $\text{Ba}_3\text{CuTa}_2\text{O}_9$  and single-phase ( $F-43m$ ) refinement for  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$ . The atomic distribution within the unit cell was analysed using the VESTA software. The triangular arrangement of  $\text{Cu}^{2+}$  ions within the space group ( $P63mc$ ) predicts the frustration in the material. On the other side,  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$  is frustrated due to the pyrochlore geometry of  $\text{Yb}^{2+}$  ions. The  $\text{Cu}^{2+}$  and  $\text{Yb}^{3+}$ , both spin- $\frac{1}{2}$  ions, lead to frustration in the material. FESEM and EDX were performed for both samples for the surface morphology and the elemental composition, respectively. These combined structural and morphological studies confirmed the successful synthesis of these frustrated oxides. This study enables a basis for the other electric and magnetic properties. Our work offers a direction to explore the structural information in  $\text{Cu}^{2+}/\text{Yb}^{3+}$  based frustrated materials.

**Keywords:**X-ray diffraction , Crystal structure, Rietveld refinement, Frustrated

**Abstract No.: A-112**

**Registration No.: 1380**

**ENHANCED BIODIESEL PRODUCTION FROM ALGAE USING ULTRASOUND-  
ASSISTED EXTRACTION AND ARTIFICIAL INTELLIGENCE**

**Poonam Yadav<sup>1</sup>, Research Scholar, UIET MDU, Rohtak, Dr Manjeet Kaur<sup>2</sup>, Professor,  
UIET MDU, Rohtak**

The increasing demand for sustainable and renewable energy sources has led to significant interest in biodiesel production from algae due to its high lipid content, rapid growth rate, and non-competition with food crops. But traditional methods for extracting lipids frequently use a lot of energy, take a long time, and need a lot of solvents. This research examines an innovative methodology that combines ultrasound-assisted extraction (UAE) with Artificial Intelligence (AI) to improve the efficiency of biodiesel synthesis from algal biomass. Ultrasound-assisted extraction uses acoustic cavitation, which occurs when tiny bubbles burst rapidly, breaking down algal cell walls and making it easier for lipids to leave the cells. This approach cuts down on the time, solvents, and energy needed for extraction while increasing the amount of lipids produced. To make the extraction process even better, AI tools like machine learning and neural networks are used to explore at and forecast the best operating conditions, such as ultrasonic

frequency, power intensity, temperature, and extraction time. AI-driven models let you keep an eye on the extraction process in real time and adjust it as needed, making sure it runs as efficiently and consistently as possible. Combining UAE and AI not only improves lipid recovery but also lowers expenses and the effect on the environment. The combined strategy shows a lot of promise for making biodiesel in a way that is both scalable and cost-effective. It helps with better process optimization, more output, and long-term energy development. In general, the combination of ultrasound-assisted extraction and artificial intelligence is a potential step forward for algae biofuel technology. It helps the world move toward cleaner and greener energy systems.

**Keywords:** Algae, Biodiesel, Ultrasound-Assisted Extraction, Artificial Intelligence, Machine Learning, Lipid Extraction, Renewable Energy, Process Optimization, Biofuels, Sustainable Technology.

**Abstract No.: A-113**

**Registration No.: 1384**

**SYNTHESIS AND IN-VITRO BIOLOGICAL EVALUATION OF  
NOVEL 1,3-THIAZINE DERIVATIVES FOR ANTIOXIDANT,  
ANTIBACTERIAL AND ANTI-INFLAMMATORY POTENTIAL**

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Thiazine are six-membered heterocyclic compounds contains one nitrogen and one sulphur atom. Among them, 1,3-thiazine derivatives are pharmacologically significant due to their presence in several biologically active molecules such as cephalosporin derivatives, xylazine, and chlormezanone, and are known to exhibit diverse biological activities including antibacterial, antimicrobial, antitumor, and anti-inflammatory effects. A series of novel substituted 1,3-thiazine derivatives were synthesized. Initially, substituted aromatic aldehydes were condensed in the presence of base. These intermediates were subsequently reacted with thiourea to form corresponding thiourea derivatives, which upon intramolecular cyclization yielded the desired 1,3-thiazine derivatives. The synthesized compounds were purified by recrystallization and their purity was confirmed using thin-layer chromatography (TLC). Structural characterization of the synthesized derivatives was carried out using infrared (IR) spectroscopy and <sup>1</sup>H NMR spectroscopy. The synthesized compounds were evaluated for their in-vitro antioxidant activity using radical scavenging assay methods, antibacterial activity against selected Gram-positive and Gram-negative bacterial strains, and anti-inflammatory activity using the protein denaturation inhibition method. The results indicated that the synthesized 1,3-thiazine derivatives exhibited promising antioxidant, antibacterial, and anti-inflammatory activities, suggesting their potential as candidates for further pharmacological investigation.

## A MODIFIED ADOMIAN DECOMPOSITION APPROACH FOR FRACTIONAL ADVECTION-DIFFUSION EQUATIONS WITH INITIAL-BOUNDARY CONDITIONS

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The time-fractional advection-diffusion equation effectively captures anomalous transport and memory phenomena in complex systems. This study presents a modified Adomian decomposition technique for fractional advection-diffusion problems involving spatially variable coefficients and initial-boundary conditions. The method employs an iterative step that satisfies both initial and boundary conditions at each iteration. The proposed approach decomposes the fractional governing equation into an iterative sequence of solvable sub-problems. Solutions are formulated using the Caputo fractional derivative and are validated through illustrative examples with variable-coefficient structures. The resulting approximations demonstrate close agreement with exact analytical solutions and outcomes from established numerical methods. Graphical representations across different fractional orders provide consistent convergence and the distinctive anomalous diffusion behavior absent from classical integer-order models. The method offers the advantages for simulating solute transport in heterogeneous porous media where it captures both advective motion and non-Fickian dispersion. The findings suggest that this modified decomposition framework can be effectively extended to a broader class of fractional partial differential equations with initial-boundary conditions. Thus, the approach provides a reliable analytical tool for informing decisions in contamination mitigation, precision water management, and environmental risk assessment.

**Keywords:** Fractional differential equations, Modified Adomian Decomposition Method, Initial- boundary conditions, Caputo fractional derivative

**Abstract No.: A-115**

**Registration No.: 1386**

## **CHEMICAL AND GREEN SYNTHESIS OF MANGANESE OXIDE NANOPARTICLES: A COMPARATIVE APPROACH**

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Manganese oxide nanoparticles (MnO NPs) have attracted significant attention due to their unique physicochemical properties and wide-ranging applications in biomedicine, environmental remediation, and catalysis. In the present study, MnO nanoparticles were synthesized using both conventional chemical methods and eco-friendly green synthesis approaches, followed by a comparative evaluation of their characteristics. The chemical synthesis route involves the use of manganese precursors, typically manganese salts, in combination with reducing agents under controlled conditions, enabling precise control over particle size and morphology. However, this approach often relies on toxic chemicals, generates hazardous by-products, and requires high energy input. In contrast, green synthesis offers a sustainable and environmentally benign alternative by employing biological resources such as plant extracts or microbial systems. For instance, extracts of *Chenopodium album* act as both reducing and stabilizing agents, facilitating nanoparticle formation while minimizing environmental impact.

**Keywords:** Nanoparticles, green synthesis, *Chenopodium album*

**Abstract No.: A-116**

**Registration No.: 1396**

## **OPTIMIZATION OF CULTURE CONDITIONS AND FUNCTIONAL EVALUATION OF PROBIOTIC BACTERIA IN *CYPRINUS CARPIO***

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The increasing global demand for sustainable aquaculture has highlighted the need to improve fish growth and health through eco-friendly means. This study focuses on optimizing culture conditions and evaluating the effect of microbial consortia on the growth performance of *Cyprinus carpio*, a commercially significant freshwater species. The research was conducted in two phases. In the first phase, the impact of various environmental parameters—temperature,

pH, dissolved oxygen, and salinity—on growth metrics such as weight gain, length gain, specific growth rate (SGR) and feed conversion efficiency (FCE) was analysed. Optimal growth was observed at temperatures ranging from 26–30°C and at dissolved oxygen levels >5 mg/L.

In the second phase, a probiotic bacterial consortium containing strains of *Weissella cibaria*, *Leuconostoc mesenteroides*, and *Pediococcus pentosaceus*—isolated from natural fruit peels—was introduced in the water. The experiment was conducted with different conditions: control, fed with bacterial isolates at a concentration of 0.1% (v/v). In order to isolate the probiotic bacteria, a streaking method using fish gut supernatant on agar medium plates is utilized. Morphological and biochemical analyses are used in the screening process for isolating pathogens. The susceptibility of isolated bacteria is tested using the agar well diffusion method in order to characterize and evaluate their probiotic qualities in vitro. In 15 days, the growth parameters, such as body weight and length, will be recorded for the fish. Results demonstrated a significant improvement in fish growth parameters, survivability, digestive enzyme activities (amylase, lipase and protease) and haemoglobin levels in treated groups compared to controls.

This research emphasizes the synergistic role of optimized environmental conditions and cost-effective, naturally derived probiotics in enhancing aquaculture productivity. These findings support sustainable practices in freshwater aquaculture, potentially reducing dependency on antibiotics and improving fish health and yield.

**Keywords:** Aquaculture, probiotics, ecological approach, growth and development, pathogen-tolerant, bacterial isolates, fish feed, growth parameters, probacterial doses

**Abstract No.: A-117**

**Registration No.: 1397**

## **IOT-BASED FOOD QUALITY MONITORING AND CONTROL SYSTEM**

**Vikas malik**

The quality and safety of food in supply chains has become one of the most important issues due to globalization, intricacies of storage, and consumer consciousness. The proposed study will also provide an IoT-based food quality monitoring and control system that will make it possible to track the food conditions in real-time, automatically and intelligently, both during storage and transportation. The system is a combination of a network of smart sensors to continuously monitor key environmental and biochemical parameters, such as temperature, humidity, pH level, gas concentration (e.g. CO<sub>2</sub>, ammonia) and bioactivity indicators.

The architecture suggested in the current paper utilizes embedded hardware and wireless communication devices (e.g., Wi-Fi, LoRa, or Zigbee) to transmit sensor data to a cloud-based system where the information is processed and analyzed. The trends of food spoilage and anomalies are detected with sophisticated data analytics and machine learning algorithms and the quality of the food is categorized with a high degree of accuracy. The interface of a convenient dashboard and a mobile app will enable the stakeholders to see real-time data and issue warnings on the potential quality decrease, such as suppliers, distributors, and consumers.

The system also includes automated control mechanisms (such as setting on refrigeration or ventilation systems) to maintain the optimal possible storage conditions, as well as to prolong shelf life. Experimental validation shows that it is more accurate in the detection of spoilage, less wastage to food and more compliant to food safety standards than the conventional monitoring techniques.

Overall, the proposed solution in the form of the IoT-based solution is a scalable, cost-effective, and reliable solution to the intelligent management of the quality of the food that will allow improving the quality of health and wellbeing of people, reducing the economic losses, and enhancing the degree of transparency of the food distribution chain.

**Keywords:** IoT, Food Quality Monitoring, Smart Food Storage Systems, Real-Time Monitoring, WSN, Environmental Sensing, Predictive Analytics, Machine Learning, Edge Computing

**Abstract No.: A-118**

**Registration No.: 1398**

## **ZINC OXIDE NANOPARTICLE-BASED SURFACE FUNCTIONALIZATION OF URINARY CATHETERS FOR PREVENTING BACTERIAL ADHESION AND BIOFILM FORMATION IN CAUTIS**

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Medical devices such as urinary catheters are widely used in hospitalized patients, particularly those requiring long-term bladder drainage. However, the increasing incidence of catheter-associated urinary tract infections (CAUTIs) poses a significant clinical challenge, primarily driven by early microbial adhesion and subsequent biofilm formation on catheter surfaces, which limits the effectiveness of conventional antibiotic therapies. In this study, we investigated zinc oxide nanoparticles (ZnO NPs), synthesized via a chemical precipitation method, as a potential alternative antimicrobial strategy.

The synthesized ZnO NPs were physicochemically characterized by X-Ray Diffraction (XRD), Field Emission-Scanning Electron Microscopy (FESEM), Energy Dispersive X-ray spectroscopy (EDAX), and Dynamic Light Scattering (DLS). These analyses confirmed a crystalline wurtzite-hexagonal structure, uniform nanoscale morphology and high elemental purity. The nanoparticles exhibited strong antibacterial and antibiofilm activity against clinically relevant pathogen, *Escherichia coli*, by reducing bacterial viability, impairing surface adhesion, and inhibiting biofilm development in a dose-dependent manner. Mechanistic insights, supported by qRT-PCR analysis, demonstrated the downregulation of key adhesion- and biofilm-associated genes, including *fimH*, *csgD*, and *iha*.

Furthermore, ZnO NP-coated urinary catheter surfaces formed stable nanostructured layers that significantly inhibited bacterial adhesion and subsequent biofilm formation. These coatings enhanced surface properties and demonstrated sustained antibacterial efficacy against both tested pathogens.

Overall, our findings highlight the potential of ZnO NP-based surface functionalization as an effective non-antibiotic approach to prevent CAUTIs. This strategy offers promising implications for improving the safety and performance of indwelling medical devices.

**Abstract No.: A-119**

**Registration No.: 1399**

**SYNTHESIS AND MULTI-TECHNIQUE CHARACTERIZATION OF GO@ZNO CORE-SHELL NANOSTRUCTURES: INTEGRATED (C+/C++) COMPUTATIONAL MODELING FOR ENHANCED HUMIDITY NANOSENSING APPLICATIONS**

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Humidity nanosensors represent a cutting edge in environmental monitoring and industrial automation, requiring high sensitivity and rapid response to water vapor fluctuations at the molecular level. This study details the development of GO@ZnO core-shell nanostructures specifically engineered for advanced sensing applications. Utilizing a precise solution mixing method, these nanostructures combine the high surface area of Graphene Oxide (GO) with the semiconducting properties of Zinc Oxide (ZnO) to optimize moisture adsorption sites.

The materials were thoroughly characterized using XRD to confirm successful formation of the core-shell structure and UV-Vis Spectroscopy to analyze the electronic transitions at the heterojunction. To understand the electrical response under varying conditions, LCR studies were performed, focusing on the dielectric constant and AC Conductivity as functions of frequency and humidity levels.

The implementation of C+ and C++ computational environments to stimulate the charge transport and dipole orientation within the nanostructure. These simulations provide a theoretical basis for the sensor's behavior, allowing for the precise stimulations of carrier concentration changes during hydration. Experimental results demonstrate that the humidity nanosensor fabricated from these core-shell structures achieve superior sensitivity, low hysteresis, and enhanced stability, establishing a robust platform for real-time moisture detection in complex environments.

**Keywords:** Humidity Nanosensors, GO@ZnO, Core-Shell, LCR Studies, C+, C++ Simulation, Dielectric Analysis.

**Abstract No.: A-120**

**Registration No.: 1403**

**REVIEW OF INTERESTING EXPERIMENTAL RESULTS ON  
MULTIWALL CARBON NANOTUBE/POLYPYRROLE COMPOSITES**

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We have reviewed interesting experimental results related to electrical and magnetic properties of multiwall carbon nanotube (MWNT) / polypyrrole (PPy) coaxial fibrils prepared by electrochemical deposition of PPy over MWNTs. Fe- filled MWNTs were first grown by chemical vapour deposition of a mixture of liquid phase organic compound and ferrocene by one step method. Then the MWNTs / PPy fibrils were prepared by electrochemical polymerization process. The coaxial composite fibrils sample was characterized by electron microscopy, electrical and magnetic measurements. Scanning and transmission electron microscopy studies reveal that PPy coating on the surface of nanotube is quite uniform throughout the length. The temperature dependence electrical resistance and magnetization studies were done in the temperature range of 300-10 K.

**Abstract No: A-121**

**Registration No: 1404**

**SOIL MOISTURE MEMORY: DECIPHERING PHYSICAL DYNAMICS,  
BIOINFORMATICS INTEGRATION AND MULTI-SCALE  
TEMPORAL–SPATIAL VARIABILITY A BRIEF REVIEW**

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The Soil Moisture Memory emerges as one of the basic properties of terrestrial systems defining the persistence period of antecedent soil moisture anomalies as well as the effect exerted by these anomalies on climatic, hydrological, and ecologic systems. As a low-pass filter of the climate system, The Soil Moisture Memory links together the low frequency signals in the landscape surface with high frequency atmospheric driving to produce a hydrologic response at the sub seasonal-decadal time scale. Despite significant progress achieved in the field of remote sensing, modelling, and machine learning techniques, there is still insufficient information about Soil Moisture Memory properties from the point of view of its temporal and spatial variability under various biomes, soils, and climates. The present paper reviews the modern concept of Soil Moisture Memory, timescales and spatial variability involved, land-surface feedbacks and possible ways of its forecasting based on space-based observations. In addition, this paper opens an important research front for the investigation of bioinformatics and metagenomics methods for understanding the biological side of Soil Moisture Memory related to soil moisture changes driven by microorganisms. This review presents a comprehensive evaluation of the Soil Moisture Index, satellite sensors, Remote Sensing & Geographic Information System techniques, and future modelling perspectives using the papers published between 2020-2026.

**Keywords** Soil moisture memory; e-folding timescale; land surface feedback; Soil Moisture Index; metagenomics; bioinformatics; remote sensing; machine learning; climate variability

**Abstract No.: A-122**

**Registration No: 1406**

## **EXPLORING AND UNDERSTANDING THE INTERCONNECTION OF QUANTUM SCIENCE WITH INDIAN KNOWLEDGE SYSTEM**

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Indian Knowledge System (IKS) is the vast knowledge generated and accumulated since ancient times in India. It constitutes the age-old Vedas, Upanishads, Shrimad Bhagwat Gita, Jambh-Wani and Shri Guru Granth Sahib that was compiled around 500 years back only. IKS offers an ocean with innumerable pearls of wisdom to be explored, which are relevant to modern discoveries. Starting from theories on the creation of the universe, such as the Big Bang, to the origin of life, both science and IKS seem to agree. The principles of quantum mechanics developed a century ago, behind phenomena such as quantum entanglement in migratory birds, tunneling by enzymes, and proton tunneling in the Sun, etc., relate well to IKS. In 1957, astrophysicists found that the elements present in the human body had come from distant stars, which was already mentioned in IKS around 8000 years ago. Some information is rather advanced, which science has yet to discover. The Nobel Prize winners of 2022 in Physics put forward that “the universe is not locally real,” which has been stated in IKS since ancient times. The recent Nobel Prize of 2025 for research on macroscopic quantum mechanical tunneling and energy quantization in an electric circuit further demonstrated the implementation of this conceptual knowledge at macroscopic scale in the development of quantum computers, quantum sensors, and quantum encryption technologies. It is now that science is unraveling some of the knowledge given in IKS.

**Abstract No.: A-123**

**Registration No: 1409**

## **ARTIFICIAL INTELLIGENCE IN EDUCATION: ENHANCING LEARNING IN THE DIGITAL ERA**

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Artificial Intelligence (AI) is playing an increasingly significant role in reshaping education by turning traditional teaching and learning practices into more adaptive, efficient and inclusive systems. This paper presents a broad analysis of AI’s contribution to education by synthesizing recent research, theoretical perspectives, and real-world applications. It traces the evolution of AI from simple rule-based models to advanced data-driven and machine learning systems, highlighting their growing influence on global educational practices. The study explains how AI supports personalized learning through adaptive tools, intelligent tutoring systems, and learning analytics that tailor instruction to individual student needs. In addition, AI helps educators by minimizing administrative tasks, enhancing assessment methods, and providing

data-driven insights for better decision-making. Emerging tools such as AI-powered chatbots and virtual learning platforms are also expanding educational access and enabling learning beyond conventional classroom settings. Despite these advantages, the adoption of AI in education raises several concerns, including ethical issues, data privacy risks, unequal technological access and the need for proper teacher training and institutional preparedness. The paper emphasizes that AI should be implemented alongside a human-centered approach to preserve the quality and relevance of education. Overall, the findings suggest that AI holds strong potential to advance inclusive and high-quality education by fostering innovation, improving learning outcomes and increasing accessibility. However, realizing these benefits requires well-designed policies, strategic investment and ongoing research to ensure ethical and sustainable use.

**Keywords:**

Artificial Intelligence, Education Technology, Personalized Learning, Intelligent Tutoring Systems, Digital Education, Educational Innovation.

**Abstract No.: A-124**

**Registration No: 1412**

**THERMOELECTRIC PROPERTIES OF CHALCOGENIDE-FUNCTIONALIZED MXENE: A FIRST-PRINCIPLES STUDY OF Nb<sub>2</sub>CSe<sub>2</sub>**

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In the class of 2D layered materials MXenes have gained a broad interest due to their unique structural configuration. In the present study, we performed first-principles density functional theory calculations to investigate the electronic structure of functionalised Nb<sub>2</sub>CSe<sub>2</sub>. Formation energy confirms the stability of Nb<sub>2</sub>CSe<sub>2</sub>. Furthermore, the Boltzmann transport theory is implemented to study many thermoelectric properties such as Seebeck coefficient, electrical conductivity, and power factor over a temperature range of 300 to 900 K. The computed electronic band structure shows the opening of a modest indirect bandgap of 0.33 eV upon selenium functionalisation, signifying a transition from metallic to semiconducting behaviour. At 300 K, the Seebeck coefficient approaches 486.45  $\mu\text{V/K}$ , showing significant carrier asymmetry near the fermi level. The high electrical conductivity of  $9.18 \times 10^{19} \Omega^{-1} \text{m}^{-1} \text{s}^{-1}$  ( $\sigma/\tau$ ) which leads to a corresponding power factor of  $1.3 \times 10^{11} \text{W m}^{-1} \text{K}^{-2} \text{s}^{-1}$  ( $\text{S}^2\sigma/\tau$ ) at 300 K. These findings suggest that Nb<sub>2</sub>CSe<sub>2</sub> could be an effective platform for thermoelectric device and sensor applications.

## **SYNTHESIS AND MULTI-TECHNIQUE CHARACTERIZATION OF GO@ZNO CORE-SHELL NANOSTRUCTURES: INTEGRATED (C+/C++) COMPUTATIONAL MODELING FOR ENHANCED HUMIDITY NANOSENSING APPLICATIONS**

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Humidity nanosensors represent a cutting edge in environmental monitoring and industrial automation, requiring high sensitivity and rapid response to water vapor fluctuations at the molecular level. This study details the development of GO@ZnO core-shell nanostructures specifically engineered for advanced sensing applications. Utilizing a precise solution mixing method, these nanostructures combine the high surface area of Graphene Oxide (GO) with the semiconducting properties of Zinc Oxide (ZnO) to optimize moisture adsorption sites. The materials were thoroughly characterized using XRD to confirm successful formation of the core-shell structure and UV-Vis Spectroscopy to analyze the electronic transitions at the heterojunction. To understand the electrical response under varying conditions, LCR studies were performed, focusing on the dielectric constant and AC Conductivity as functions of frequency and humidity levels. The implementation of C+ and C++ computational environments to stimulate the charge transport and dipole orientation within the nanostructure. These simulations provide a theoretical basis for the sensor's behavior, allowing for the precise stimulations of carrier concentration changes during hydration. Experimental results demonstrate that the humidity nanosensor fabricated from these core-shell structures achieve superior sensitivity, low hysteresis, and enhanced stability, establishing a robust platform for real-time moisture detection in complex environments.

**Keywords:** Humidity Nanosensors, GO@ZnO, Core-Shell, LCR Studies, C+, C++ Simulation, Dielectric Analysis.

**Abstract No.: A-126**

**Registration No.: 1416**

**SYNTHESIS AND MULTI-TECHNIQUE CHARACTERIZATION OF  
GO@ZNO CORE-SHELL NANOSTRUCTURES: INTEGRATED  
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Humidity nanosensors represent a cutting edge in environmental monitoring and industrial automation, requiring high sensitivity and rapid response to water vapor fluctuations at the molecular level. This study details the development of GO@ZnO core-shell nanostructures specifically engineered for advanced sensing applications. Utilizing a precise solution mixing method, these nanostructures combine the high surface area of Graphene Oxide (GO) with the semiconducting properties of Zinc Oxide (ZnO) to optimize moisture adsorption sites. The materials were thoroughly characterized using XRD to confirm successful formation of the core-shell structure and UV-Vis Spectroscopy to analyze the electronic transitions at the heterojunction. To understand the electrical response under varying conditions, LCR studies were performed, focusing on the dielectric constant and AC Conductivity as functions of frequency and humidity levels. The implementation of C+ and C++ computational environments to stimulate the charge transport and dipole orientation within the nanostructure. These simulations provide a theoretical basis for the sensor's behavior, allowing for the precise stimulations of carrier concentration changes during hydration. Experimental results demonstrate that the humidity nanosensor fabricated from these core-shell structures achieve superior sensitivity, low hysteresis, and enhanced stability, establishing a robust platform for real-time moisture detection in complex environments.

**Keywords:** Humidity Nanosensors, GO@ZnO, Core-Shell, LCR Studies, C+, C++ Simulation, Dielectric Analysis.

**Abstract No.: A-127**

**Registration No: 1418**

**Current Advancements on Pyrimidine-1,2,3-Triazole hybrids as Leads in  
Medicinal Chemistry**

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Molecular hybridization has attracted a lot of interest as an innovative approach to drug design and development incorporating various biologically active entities to create a new hybrid molecule with better selectivity and less toxicity than parent medications. Considering pyrimidine, a six membered heterocycle containing two nitrogen atoms in the ring is of great pharmacological importance and have attracted a huge attention of researchers throughout the

world due to their potential applications in chemosensors, anti-corrosive materials, photochromes, photoproduct of DNA as well as in medicinal chemistry. The existence of pyrimidine as a base in thymine, uracil and cytosine which are crucial building blocks of nucleic acids, is one of the probable reasons for their therapeutic and pharmacological activities such as antimicrobial, anti-inflammatory, anticancer, antiviral, anticonvulsant, anti-HIV, *etc.* Further, one of the most studied heterocyclic motifs such as 1,2,3-triazole scaffold exhibit various interactions with biological targets through hydrogen bonding, specific ligand-receptor interaction and also displayed various biological activities *viz.* anticancer, anti-inflammatory, antimicrobial, anti-analgesic, antiviral, anti-HIV activity. The covalent linking of pyrimidine and 1,2,3-triazole scaffolds led to molecular hybrids with high biological potency. Herein, efforts have been made to review the literature studies describing medicinal significance of pyrimidine-1,2,3-triazole hybrids. This review would be helpful to develop new pyrimidine and triazole based potential drug candidates after careful designing of new hybrids based on structure activity relationship.

**Keywords:** Molecular hybridization, pyrimidine, 1,2,3-triazole, pharmacophore.

**Abstract No.: A-128**

**Registration No: 1420**

## **TAILORING THE OPTOELECTRONIC PROPERTIES OF TRIANGULAR GRAPHENE QUANTUM DOTS WITH -CN AND -NO GROUPS FOR ENHANCED PHOTOVOLTAICS AND BIOMEDICAL APPLICATIONS.**

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The ability of Graphene Quantum dots (GQDs) to full fill the demand of third generation photovoltaic technology makes it a promising candidate. This computational study has been conducted to figure out the effect of functionalization of nitrogen containing group on the optoelectronic properties of GQDs. The calculations are performed for all QDs using 6-311g (d) basis set and PCM model using Gaussian 09 software. GaussView 5.0 has been utilized as a visualization tool. Optoelectronic properties including HOMO-LUMO gap, charge density difference (CDD), transition density matrix (TDM) and absorption spectra are calculated. In order to analyze the electron excitation, data of absorption spectra is used which is extracted by Multiwfn software. HOMO-LUMO isosurfaces of all GQDs are also analyzed which represents  $\sigma$ -bond properties along with some  $\pi$ -bond characteristics in all GQDs. It has been analyzed that in functionalised GQDs, the charge density shifts towards the functionalised group due to their electronegative nature. The UV- absorption peak of pristine GQD C<sub>13</sub>H<sub>9</sub> is found to be at 335.52 nm. Doping of nitrogen group strongly influence the spectra, absorption peak shifts to 364.95 nm due to -C=N (cyano) group and to 345.86 nm due to -N=O (nitroso) group. In -N=O containing GQD, another sharp peak arises in IR region at 959.92 nm indicating its possible usage in biomedical field. In case of -C=N functionalised GQD, a sharp peak also arises at 273.76 nm with oscillator strength 0.22 in UV region. Our findings indicate that the absorption spectra shows a red shift in visible and NIR region, which allow them to utilize in biomedical field and in optoelectronic devices.

**Keywords:** Graphene Quantum Dots, Gaussian09, Optoelectronic devices

**Abstract No.: A-129**

**Registration No: 1422**

## **INTRANASAL DELIVERY: A NON-INVASIVE STRATEGY FOR NEURODEGENERATIVE DISEASES**

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Neurodegenerative diseases progressively damage neurons, causing symptoms like memory loss (Alzheimer's disease), tremors/stiffness (Parkinson's disease), muscle weakness/paralysis (Amyotrophic lateral sclerosis), and uncontrolled movements/cognitive decline (Huntington's disease). Alzheimer's disease, the most prevalent, poses a staggering global health challenge and immense socio-economic burden, making it a public health concern. Alzheimer's disease is characterized by  $\beta$ -amyloid plaques, neurofibrillary tau tangles, neuroinflammation, oxidative stress, and neuronal loss, Alzheimer's disease leads to progressive cognitive decline and functional dependency. Conventional treatments like cholinesterase inhibitors and NMDA antagonists, offer symptomatic relief but fail to halt progression due to blood-brain barrier limitations and delivery route like oral/intravenous/subcutaneous/transdermal. The disease-modifying therapies, including anti-amyloid and anti-tau antibodies, show modest efficacy but face poor blood-brain barrier penetration, amyloid related imaging abnormalities risks, and invasive administration. Intranasal nanoformulation, such as mucoadhesive nanostructured lipid carriers and curcumin-functionalized nanoparticles, bypass the BBB via olfactory/trigeminal pathways, enhancing CNS delivery, residence time, and therapeutic outcomes. Phytoconstituents such as curcumin, quercetin, resveratrol etc, provide multi-target benefits, including antioxidant, anti-inflammatory, AChE inhibition, and anti-aggregation effects, when delivered via nano-systems for neuroprotection. Despite challenges such as phytoconstituent standardization, limited clinical data, and future directions include biosensor-integrated intranasal nanostructured lipid carriers with multi-target phytoactives, promising scalable, non-invasive disease-modifying therapies to transform Alzheimer's disease management.

**Abstract No.: A-130**

**Registration No: 1423**

## **INSIGHTS OF QUANTUM CAPACTANCE IN $Ti_2C$ AND $Nb_2C$ FOR ENERGY STORAGE APPLICATIONS: A DFT STUDY**

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The growing energy demand prompted the scientific community to develop alternative energy resources. The supercapacitor can be the next-generation sustainable energy storage device. A high value of quantum capacitance (QC) is required for the device application and implementation. The MXenes serve as a potential candidate for the high QC electrodes due to

their unique properties, such as high electrical conductivity and large surface area, which enhance energy storage capabilities. In the present study, we explored the band structure, density of states, and QC for the  $Ti_2C$  and  $Nb_2C$ . The formation energy confirms that  $Nb_2C$  is more stable than  $Ti_2C$ . The magnitude of QC for  $Ti_2C$  and  $Nb_2C$  is 331.545 mF/cm<sup>2</sup> and 221.345 mF/cm<sup>2</sup>, respectively. The high density of states near the Fermi energy level leads to the enhanced QC of  $Ti_2C$  as compared to  $Nb_2C$  in both positive and negative bias regions. Our findings indicate that  $Ti_2C$ -based MAX phases can pave new ways in the supercapacitor-based energy storage applications.

**Abstract No.: A-131**

**Registration No: 1429**

## **Beyond Antibiotics: Eco-Friendly Phyto actives for Biofilm-Infected Chronic Wounds**

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The increasing prevalence of biofilm-associated wound infections, together with the environmental burden of conventional antimicrobials, has intensified the search for sustainable phyto-derived therapeutics. This work presents an advanced green therapeutic approach that integrates plant bioactive compounds such as curcumin, quercetin, catechins, and azadirachtin with eco-friendly strategies to enhance antibiofilm activity and promote regenerative wound healing. These naturally derived molecules offer dual antimicrobial and anti-inflammatory effects while originating from renewable resources and requiring low-toxicity processing methods. Phytocompounds have demonstrated potential to disrupt established biofilms, reduce extracellular polymeric substance (EPS) production, and interfere with quorum sensing pathways in both Gram-positive and Gram-negative pathogens, thereby limiting microbial resilience and virulence. In parallel, they may support wound repair by enhancing fibroblast migration, collagen deposition, and angiogenesis, while maintaining low cytotoxicity toward mammalian cells. Green extraction and processing methods employing water- or ethanol-based systems, minimal synthetic additives, and energy-efficient protocols further strengthen the sustainability of this approach by reducing toxic solvent use, chemical waste, and energy consumption. By integrating the intrinsic therapeutic value of plant-derived molecules with environmentally responsible manufacturing, this strategy bridges ecological sustainability with translational clinical relevance. The proposed green phyto-based platform offers a promising alternative to antibiotic-dependent wound care and supports the global transition toward eco-conscious, biofilm-inhibitory solutions for chronic wound management.

**DYNAMICS OF BIDIRECTIONAL TASEP-ELK MODELS WITH LOCALIZED INHOMOGENEITIES AND PARTICLE CONSERVATION****Sanchit<sup>1</sup>, Vikash Siwach<sup>2</sup>**<sup>1</sup>Ph.D. Scholar, Department of Mathematics and Statistics, College of Basic Sciences and Humanities, CCSHAU, Haryana, 125004, India.<sup>2</sup>Assistant Professor, Department of Mathematics and Statistics, College of Basic Sciences and Humanities, CCSHAU, Haryana, 125004, India.\*Corresponding author mail id: [gawri\\_sanchit@hau.ac.in](mailto:gawri_sanchit@hau.ac.in)

The characterization of non-equilibrium steady states in bidirectional transport is essential for understanding systems where particles move in opposing directions under strict resource limitations. While previous studies have examined Extended Langmuir Kinetics (ELK) in open systems with infinite particle supplies, a significant research gap exists regarding the interplay between density-dependent exchange rules and finite reservoir constraints. This research develops a generalized bidirectional TASEP model to investigate how the coupling of ELK, localized lane effects, and a dynamic finite reservoir co-regulate transport efficiency. The model utilizes the ELK framework to capture local correlations where neighborhood occupancy dictates the probability of particle attachment and detachment, simulating physical constraints such as steric hindrance. A primary objective of this study is to determine how the strict conservation of the total particle count establishes a global feedback loop that alters the system's phase behavior. The analysis explores the hypothesis that localized inhomogeneities drive a dynamic partitioning of particles between the lattice and the reservoir; specifically, it examines whether lane congestion leads to a depletion of the finite pool that subsequently throttles global injection rates. The framework is designed to reveal emergent phase transitions and steady-state density profiles that may remain inaccessible to models utilizing infinite sources or simplified kinetics. Ultimately, this work aims to provide a robust mathematical foundation for analyzing how microscopic local correlations and macroscopic global constraints interact in resource-constrained environments.

**Keywords:** Bidirectional TASEP, Extended Langmuir Kinetics, Finite Reservoir Dynamics, Particle Conservation, Localized Effects, Density-Dependent Exchange, Non-equilibrium Steady States

**Abstract No.: A-133**

**Registration No: 1433**

## **COUPLED THREE-LANE TRANSPORT IN TASEP WITH EXTENDED LANGMUIR KINETICS**

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Motivated by a wide range of non-equilibrium transport phenomena, including vehicular traffic, intracellular transport, and multi-channel flow systems, a three-lane open totally asymmetric simple exclusion process (TASEP) with symmetric lane switching is considered in the presence of extended Langmuir kinetics. In this model, the hopping, attachment, and detachment dynamics depend on the occupancy of neighboring lanes, and the rightmost lane is treated as a preferential fast lane. Starting from the discrete master equations, the corresponding continuum equations are derived using coarse-graining techniques and systematic expansion. The steady-state behavior of the system is intended to be analyzed in terms of density profiles, phase diagrams, and phase transitions within a mean-field framework. Due to the nonlinear and strongly coupled nature of the governing equations, exact analytical solutions are not feasible in general. Therefore, the system is proposed to be studied using numerical approaches, where the equations will be discretized via finite difference methods to obtain density distributions. In addition, Monte Carlo simulations will be employed to validate the theoretical predictions and capture fluctuation effects beyond the mean-field description. The study aims to provide a generalized and flexible framework for understanding complex multilane transport processes in a variety of non-equilibrium systems and applications.

**Keywords:** TASEP, Multilane Transport, Langmuir Kinetics, Lane Switching, Nonequilibrium Systems, Density Profiles, Phase Behavior, Monte Carlo Simulation

**Abstract No.: A-134**

**Registration No: 1439**

## **DETECTION OF ABNORMAL RED BLOOD CELLS (RBCS) USING HYPERPARAMETER OPTIMIZED CNN FOR DIAGNOSIS OF ANAEMIA IN ANIMALS**

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Anemia is reduction in the quantity and/or quality of blood components, especially red blood cells (RBCs) and haemoglobin. RBCs play an important role in oxygen transport, and their morphology is critical diagnostic indicator of anaemia in animals. Evaluation of RBC morphology is therefore a key diagnostic tool in haematological examination, helping clinicians to identify the type and severity of anaemia and guide appropriate therapeutic

management. In the present study, data set comprising of microscopic images of total 1400 different abnormal RBCs [burr cells (204), nucleated RBCs (207), target cells (208), tear drop cells (204), and spherocytes (217)] were taken from dogs and serve as the dataset for building a Convolutional Neural Network (CNN) model. The architecture included convolutional and pooling layers for feature extraction and fully connected layers for classification. The baseline CNN model achieved an accuracy of 90%. To enhancing performance of CNN model, hyperparameter optimization techniques were applied for improving accuracy using different algorithms like Genetic algorithm, Bayesian optimization and Random search. The experimental results showed that optimized CNN model demonstrated improved performance, with genetic algorithms yielded the highest accuracy (97%), followed by Bayesian optimization (93.8%) and Random search (92.3%) demonstrating their effectiveness in improving diagnosis. This approach can support veterinarians in rapid and accurate anemia diagnosis, improving better clinical outcomes. The integration of veterinary haematological examination with advanced deep learning techniques enables rapid, objective and accurate detection of anaemia, thereby improving decision-making and therapeutic outcomes.

**Keywords:** Anaemia, CNN model, Hyperparameter optimization.

**Abstract No.: A-135**

**Registration No: 1441**

**UNDERSTANDING STUDENTS' SCREEN TIME BEHAVIOR ACROSS  
REGIONAL BACKGROUNDS THROUGH USES AND  
GRATIFICATION THEORY: EVIDENCE FROM A QUANTITATIVE  
STUDY**

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Digital technologies now permeate students' daily activities which leads to major changes in their academic performance and social behaviour. This quantitative study investigates how screen time impacts users by applying Uses and Gratification Theory. The researchers used a descriptive research design to collect data from 402 participants. The researchers conducted hypothesis testing through One-Way ANOVA and Tukey HSD testing. The test results show that students from different backgrounds demonstrate distinct patterns of 'academic information search' and 'online identity expression' while using 'digital devices for stress relief' shows a difference that reaches highly significant levels. The institutions need to think differently because rural, semi-urban and urban groups showed different results. The institutions need to reduce digital opportunity gaps and establish equal access to educational technologies.

**Keywords:** Screen Time, Uses and Gratification Theory, ANOVA, Academic Information, Online Identity Expression, Stress Relief

**NANOCARBON-DRIVEN INTENSIFICATION OF  
METHANOGENESIS IN ANAEROBIC DIGESTION SYSTEMS****Jyoti Yadav\*, Kamla Malik, Shikha Mehta, Pragati Dhand, Pushpa  
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Anaerobic digestion (AD) is a sustainable biochemical process for converting organic waste into biogas, primarily methane, through the activity of complex microbial consortia. However, limitations such as slow microbial kinetics, process instability, and low methane yield often hinder its efficiency. During biogas production, anaerobic processes suffer from long start-up times, low removal rates of organic pollutants and susceptibility to disruptions by the organic overload. The addition of low-cost conductive materials (e.g., granular activated carbon, biochar, magnetite, graphene-like materials) to anaerobic systems is an attractive strategy to promote the interspecies electron transfer (IET) between fermentative bacteria and the methanogens. Recent advances in nanotechnology have highlighted the potential of carbon-based nanoparticles as functional additives to enhance methanogenesis. Graphene, owing to its high electrical conductivity, large surface area, and excellent electron mobility, facilitates direct interspecies electron transfer (DIET) between syntrophic bacteria and methanogens, thereby accelerating methane-producing pathways. In parallel, the production of graphene from agricultural residues such as rice husk, wheat straw, and sugarcane bagasse offers a cost-effective and eco-friendly alternative to conventional synthesis methods. Thermochemical conversion processes, including pyrolysis and chemical activation, enable the transformation of biomass into graphene-like nanostructures with desirable physicochemical properties. This approach not only reduces production costs but also supports waste valorization and circular bioeconomy principles. Experimental findings demonstrate improved biogas yield, higher methane content, reduced lag phases, and enhanced degradation of complex substrates in nanoparticle-assisted systems. This study explores the role of graphene oxide nanoparticles in improving the performance of anaerobic digestion systems, with an added focus on the sustainable production of graphene from agricultural waste.

**Keywords:** Carbon, nanoparticles, graphene, anaerobic digestion, conductive material

## EXOPOLYSACCHARIDES FROM MICROALGAE: EMERGING OPPORTUNITIES FOR SUSTAINABLE AND INDUSTRIAL APPLICATIONS

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Microalgae are increasingly explored as a sustainable source of high-value bioproducts with exopolysaccharides (EPS) gaining attention due to their functional and biological properties. These extracellular polymers are mainly composed of complex carbohydrates along with proteins, lipids and uronic acids which contribute to their structural diversity. EPS production in microalgae is influenced by environmental conditions such as nitrogen limitation, salinity stress and light intensity often leading to enhanced EPS synthesis under stress. Species such as *Porphyridium* and *Chlorella* have been widely reported for their ability to produce significant amount of EPS.

Microalgal EPS exhibit useful physicochemical properties including viscosity, emulsification and metal-binding capacity, supporting their application in different industrial sectors. In addition, studies have shown that these biopolymers possess antioxidant, antimicrobial, and anti-inflammatory activities indicating their potential in pharmaceutical and nutraceutical applications. Their role in wastewater treatment particularly in the removal of heavy metals and pollutants has also been increasingly reported.

Applications of EPS are expanding in the food and cosmetic industries where they are used as natural stabilizers and bioactive components. Advances in cultivation strategies and process optimization can further improve EPS yield and quality. Overall, microalgal exopolysaccharides are emerging as promising natural polymers with wide-ranging applications and growing industrial relevance.

**Keywords:** Microalgae, exopolysaccharides, optimization, salinity stress, nutraceuticals.

**Abstract No.: A-138**

**Registration No: 1446**

**UNDERSTANDING STUDENTS' ARTIFICIAL INTELLIGENCE (AI)  
USAGE BEHAVIOUR THROUGH TECHNOLOGY ACCEPTANCE  
MODEL (TAM): EVIDENCE FROM A QUANTITATIVE STUDY**

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Students frequently utilise artificial intelligence tools like ChatGPT, Gemini and Copilot in academics. This quantitative study examines the students' artificial intelligence (AI) usage behaviour through Technology Acceptance Model (TAM). The researchers used a descriptive research design to collect data from 496 participants. The researchers conducted hypothesis testing through One-Way ANOVA and Tukey HSD testing. The one-way ANOVA results show that the Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Use (ATU) and Behavioural Intention demonstrated significant differences between AI usage frequency groups. It is suggested that institutions should integrate AI-based activities into assignments and coursework. This will help students move from low to high usage levels, where meaningful adoption occurs.

**Keywords:** Artificial Intelligence, Technology Acceptance Model (TAM), Higher Education, Perceived Usefulness, Perceived Ease of Usefulness, Attitude, Behavioural Intention

# Theme B: Agricultural Science & Technology

# **Sub Theme I**

**Next-Generation Crop Improvement, Production  
Systems and Nutritional Security**

**Abstract No: B-I-001**

**Registration No: 1018**

**Optimizing operational parameters of developed pneumatic planter to attach track type robot**

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The performance of a developed robotic pneumatic planter attached to a track-type robot. The planter metering mechanism was evaluated to optimise operating parameters for accurate cotton seed placement under field conditions. The study examined the effect of forward speed and suction pressure on seed metering performance, including seed spacing, missing index, multiple index, quality of feed index, and precision. Forward speed and suction pressure were varied from 0.79 to 2.2 km h<sup>-1</sup> and 1.5 to 4.4 kpa, respectively. The mean seed spacing ranged from 59.1 to 60.9 cm, remaining close to the desired spacing. The missing index varied from 1.2% to 5.6%, while the multiple index ranged from 0.9% to 4.0%. The quality of feed index was observed between 90.4% and 93.5%, and precision ranged from 2.00% to 9.33%. The lowest missing index 1.2% and highest quality of feed index 93.5% were recorded at 1.0 km h<sup>-1</sup> and 2 kpa, whereas the highest missing index 5.6% occurred at 2.0 km h<sup>-1</sup> and 4 kpa. Higher speeds and suction pressures increased the occurrence of missed seeds, while lower values led to more multiple seed drops. Regression analysis showed good agreement between observed and predicted values, with coefficients of determination R<sup>2</sup> ranging from 0.80 to 0.99. The optimum operating condition was identified at 1.5 km h<sup>-1</sup> forward speed and 3 kpa suction pressure, resulting in 60.0 cm seed spacing, 3.0% missing index, 2.2% multiple index, 92.6% quality of feed index, and 5.0% precision. The study indicates that proper adjustment of operating parameters improves seed metering efficiency and ensures uniform crop establishment.

**Key words:** Cotton, optimization, response surface methodology, robotic pneumatic planter, seed spacing, suction pressure

**Abstract No: B-I-002**

**Registration No:1035**

**Next-generation crop systems for nutritional security**

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Addressing the challenges of climate change, land degradation, and resource limitations to ensure nutritional security necessitates a paradigm shift from traditional to next-generation systems-based approaches to agriculture. This review highlights recent progress made in breeding and production systems that contribute towards increased productivity, improved nutrition, and sustainability. Advanced techniques like genomic selection, gene editing, and speed breeding have significantly improved the efficiency of developing cultivars with high yields, resistance to climatic stresses, and improved nutritional qualities. These innovations

require the application of new production strategies, such as precision farming, conservation agriculture, and climate smart agriculture, to enhance input use efficiency and minimize environmental impact. Nutrient management that includes the use of inorganic fertilizers, organic inputs, and microbial inoculants is critical in improving soil fertility and nutrient cycling. Crop production diversification using pulses, millets, and neglected crops provides a feasible solution for overcoming the problem of hidden hunger and increasing dietary diversity. Digital agriculture techniques and remote sensing are essential in achieving real-time site-specific management of agroecosystems, thereby enhancing system adaptability and resilience. This review proposes a holistic approach to breeding and sustainable agronomy for the simultaneous improvement of crop productivity, nutrition, and environment. While progress has been made, issues related to scalability and uptake persist, particularly in small-scale farming systems. It is critical to enhance interdisciplinary research, policy support, and stakeholder collaboration for successful implementation.

**Keywords:** Climate change, climate-smart agriculture, precision farming, conservation agriculture

**Abstract No: B–I-003**

**Registration No:1039**

**Genetic variability and heritable components of yield traits in bottle gourd  
(*Lagenaria siceraria*)**

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The present investigation was conducted at the Research Farm, Department of Vegetable Science, CCS Haryana Agricultural University during *Kharif* 2021 and *spring-summer* 2022 to assess the extent of genetic variability for fruit yield and its component traits in bottle gourd. Eight parental genotypes and their sixteen derived hybrids were evaluated for eighteen quantitative traits related to phenology, vegetative growth and yield. Analysis of variance revealed highly significant differences among the genotypes for all the characters studied, indicating the existence of substantial genetic variability in the experimental material. Yield per hectare exhibited moderate genotypic coefficient of variation (11.32%) and phenotypic coefficient of variation (12.53%), along with high heritability (81.62%) and high genetic advance (21.07%). The narrow difference between genotypic and phenotypic coefficients of variation for most traits suggested limited environmental influence on their expression. High heritability coupled with high genetic advance for yield indicated the predominance of additive gene effects and the possibility of effective selection for improvement of fruit yield and related traits in bottle gourd.

**Keywords:** Genetic variability, heritability, genetic advance, phenotypic coefficient of variation, genotypic coefficient of variation.

**Abstract No: B–I-004**

**Registration No:1040**

**Assessment of yield and morphological traits in barley (*Hordeum vulgare*) genotypes using a weighted selection index**

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Barley (*Hordeum vulgare*) is the fourth most cultivated cereal in the world after wheat, rice and maize. It is mostly grown for feed grain, animal feeding and malting to produce alcoholic beverages. Present investigation was conducted at CCS HAU, Regional research station, Bawal during *rabi* 2024-25, to estimate the performance of 14 barley entries against four checks *viz.*, BH-946, DWRB-101, DWRB-137, DWRB-219. Evaluation was done under randomized block design with four replications. Data was recorded for three randomly selected plants in each replications for all the ten morphological traits namely days to heading, days to maturity, plant height, spike length, grains per spike, effective tillers/meter, grain yield per plot, biological yield per plot, harvest index and test grain weight. Grain yield-based genotype ranking and selection index analysis were employed to identify elite genotypes. To enhance selection efficiency, a weighted selection index was constructed using grain yield (0.5), harvest index (0.3) and test grain weight (0.2). Grain yield ranged from 37.53 to 67.38 q ha<sup>-1</sup> with a mean of 52.95 q ha<sup>-1</sup>. Harvest index varied from 31.75 to 48.86 %, while test grain weight ranged from 37.06 to 57.34 g. The selection index consistently identified BH-22-09 and BH-21-03 and BH-23-01 as superior genotypes, combining high productivity, efficient biomass partitioning and desirable grain traits.

**Abstract No: B–I-005**

**Registration No:1106**

**Oilseed-based functional ingredients: A sustainable approach to global nutritional security**

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Functional foods are increasingly recognized for providing health benefits beyond basic nutrition, often through the inclusion of bioactive components known as functional food ingredients. These ingredients such as polyphenols, phytosterols, tocopherols, flavonoids, dietary fibers, vitamins, and minerals are incorporated during food processing to support specific physiological functions and potential health claims. Although they may share chemical similarities with dietary supplements, functional food ingredients differ in their mode of delivery and integration within whole foods. Oilseeds represent a natural and rich source of functional food ingredients due to their high content of oleochemicals and phytochemicals. These compounds exhibit strong antioxidant properties, contributing to the reduction of oxidative stress and lowering the risk of chronic diseases such as cancer. In addition to these

bioactive compounds, oilseeds are valuable sources of macronutrients (proteins, fats, carbohydrates) and micronutrients (vitamins and minerals), although they may also contain certain antinutritional factors like glucosinolates and phytates. Globally, oilseed production has grown significantly, reflecting their importance in both food and industrial applications. While oils extracted from oilseeds are widely used in food products and non-food industries, the by-products, particularly oilseed cakes or meals, offer substantial nutritional and functional potential. Rich in proteins, fibers, and antioxidants, these by-products can be processed to enhance palatability and incorporated into low-cost, nutrient-dense food formulations. Furthermore, oilseed cakes can be transformed into protein isolates, hydrolysates, and substrates for the production of value-added compounds such as enzymes, vitamins, and antimicrobial agents. This highlights their potential in sustainable food systems and functional food development. Overall, oilseeds and their derivatives present versatile opportunities for enhancing nutritional quality and supporting health-oriented food innovations.

**Keywords:** Bioactive, functional foods, glucosinolates, oilseeds, phytochemicals, phytates

**Abstract No: B-I-006**

**Registration No:1156**

**Effect of GA<sub>3</sub> Priming on the Seed Quality of Fresh and Aged Pea (*Pisum sativum* L.) Seeds**

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India is the largest producer of pulses and relies greatly on crops such as garden pea (*Pisum sativum* L.) as a significant source of dietary protein and for maintaining agricultural productivity. However, seed quality often deteriorates during storage due to natural ageing, resulting in reduced germination. Pre-sowing seed treatments and priming techniques are considered effective approaches to enhance germination performance. The present study was conducted at the Seed Laboratory of the Department of Seed Science and Technology, Chaudhary Charan Singh Haryana Agricultural University, Hisar to evaluate the effect of different priming and seed treatments on pea seeds of varying ages. Five priming treatments were applied, namely hydropriming for 2 hours, GA<sub>3</sub> at 50 ppm and 100 ppm, KNO<sub>3</sub> at 1% and 2% and five seed treatments were used: KH<sub>2</sub>PO<sub>4</sub> at 1% and 2%, *Rhizobium* culture at 5 ml kg seed, *Trichoderma harzianum* at 5 g kg<sup>-1</sup> seed and Bavistin at 2 g kg<sup>-1</sup> seed. These treatments were tested on freshly harvested, one-year-old, and two-year-old seed lots. Among the treatments, seed priming with GA<sub>3</sub> at 100 ppm significantly enhanced seed quality parameters across all seed ages. The highest performance was observed in freshly harvested seeds, recording maximum speed of germination (42.85%), root length (13.81 cm), shoot length (11.86 cm) and seedling dry weight (1.61 mg). The results suggest that GA<sub>3</sub> priming at 100 ppm is an effective method for improving overall seed quality of pea under laboratory conditions.

**Keywords:** GA<sub>3</sub>, germination, seed lots, seed quality

**Abstract No: B-I-007**

**Registration No:1190**

**Enhancing seed quality traits through priming techniques in okra  
(*Abelmoschus esculentus*)**

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The presented investigation was conducted at the Seed Testing Laboratory of Department of Seed Science and Technology, CCS HAU, Hisar. The experiment was carried out for the Varsha Uphar variety of Okra in a completely randomized design (CRD) comprising of ten priming treatments, each replicated four times. The treatments included seed priming with GA<sub>3</sub> @ 200 ppm, GA<sub>3</sub> @ 100 ppm, NAA @ 200 ppm, NAA @ 100 ppm, *Trichoderma sp.*, *Pseudomonas sp.*, Phosphorus solution @1%, Beejamrit, hydro-priming and a control (untreated). Seed quality parameters such as standard germination (%), seedling length (cm), seedling dry weight (mg), seed vigour index I, seed vigour index II, accelerated ageing (%) and radicle emergence (mm) were recorded and the analysis was performed using the O.P. Stat software developed by CCS HAU. It was observed that seed priming with GA<sub>3</sub> @ 200 ppm performed best for most of the seed quality parameters, while NAA treatments showed statistically similar results in several traits. GA<sub>3</sub> @ 200 ppm resulted in an overall increase in standard germination of 16.56%. Hence, it can be concluded that hormonal priming, particularly with GA<sub>3</sub> @ 200 ppm, proved out to be most effective across all the parameters, followed by bio-priming treatments.

**Keywords:** Okra, Priming, Hormonal priming, Bio-priming, Varsha uphar, *Trichoderma sp.*, *Pseudomonas sp.*

**Abstract No: B-I-008**

**Registration No:1191**

**Assessment of yield advantage in pearl millet intercropping in semi-arid**

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A field investigation entitled “Evaluation of pearl millet-based intercropping systems for higher farm productivity” was carried out during the Kharif season of 2024 at Regional Research Station, Bawal (Rewari), CCS Haryana Agricultural University, Hisar. The experiment aimed to evaluate the performance of pearl millet intercropped with legumes i.e. green gram and cluster bean in terms of yield advantages under semi-arid conditions. The experiment was laid out in randomized block design (RBD) with ten treatments and three replications. Treatments included sole cropping of pearl millet, green gram and cluster bean, along with various intercropping combinations of pearl millet with green gram and cluster bean in different row proportions (2:2, 3:3, 4:2) and paired row geometry. Varieties used were HHB 299 (pearl millet), MH 1142 (green gram) and HG 2-20 (cluster bean). The highest pearl millet equivalent yield (PEY) of 4512 kg ha<sup>-1</sup> was recorded under pearl millet + green gram (30:60 cm), followed by 4154 kg ha<sup>-1</sup> under pearl millet + green gram (3:3). These systems also recorded maximum

land equivalent ratio (LER), area time equivalent ratio (ATER) and relative crowding coefficient (RCC), indicating better compatibility between component crops and enhanced utilization of available resources. From one year study, it may be concluded that intercropping of pearl millet with green gram in paired row or 3:3 proportions proved to be superior in improving in yield advantage for sustainable intensification of rainfed farming systems in semi-arid regions of Haryana.

**Keyword:** Intercropping, pearl millet, cluster bean, green gram, land equivalent ratio

**Abstract No: B-I-009**

**Registration No:1214**

**Effect of mechanized crop establishment methods on productivity and profitability of onion (*Allium cepa* L.)**

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Onion is a major vegetable crop in the Indian subcontinent, where cultivation largely depends on labor-intensive hand transplanting, leading to higher production costs and limited productivity gains. To explore efficient alternatives under labour-scarce conditions, a field study was conducted to evaluate mechanized crop establishment through direct seeding. The experiment compared pelleted and non-pelleted seeds sown using a seed driller and broadcasting with the conventional transplanting method over three consecutive Rabi seasons (2018–19 to 2020–21). Treatments were assessed for germination, crop establishment, growth, yield, bulb quality, post-harvest storage, and economic returns. Results indicated that pelleted seeds exhibited higher germination than non-pelleted seeds. Hand transplanting recorded superior plant establishment, growth, bulb size, and yield performance. However, among direct seeding methods, seed drilling with pelleted seeds consistently performed better, showing improved plant survival, yield, and marketable produce compared to other direct seeding treatments. Broadcasting methods were comparatively inferior due to poor establishment and uneven crop stand. Importantly, mechanized sowing with pelleted seeds significantly reduced sowing time, labour requirement, and seed rate, leading to improved cost efficiency. Consequently, the highest benefit: cost ratio was achieved under seed drilling with pelleted seeds. The study demonstrates that direct seeding using pelleted seeds with a seed driller is a viable, cost-effective alternative to traditional transplanting for sustainable onion production.

**Keywords:** Direct seeding, onion, post-harvest storage, seed driller, seed pelleting

**Abstract No: B-I-010**

**Registration No:1229**

**Research advances in pollination management for enhanced yield and quality in fruit crops**

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Pollination remains one of the most critical yet complex factors determining productivity in global fruit production. Despite India being the world's second-largest fruit producer, unit area productivity remains low due to various physiological and pollination-related constraints, including self-incompatibility, dichogamy, and pollinizer deficiencies. This study reviews recent research advances in pollination strategies across diverse fruit crops, including mango, citrus, litchi, date palm, and apple.

Key findings underscore the indispensable role of biotic pollinators, particularly honeybees (*Apis* spp.), which contribute to a 35% increase in global crop production. Research data indicates that open pollination and honeybee augmentation significantly improve fruit set and quality parameters; for instance, honeybee pollination in litchi can increase yield by over 180% compared to pollinator-excluded conditions. Furthermore, the integration of optimized pollinizer ratios (ranging from 10% to 33% depending on the species) is essential for overcoming self-sterility in crops like apple and almond.

The study also evaluates emerging technological interventions, such as robotic pollination, unmanned aerial vehicles (UAVs/drones), and electrostatic pollination. While traditional hand pollination and manual spray methods currently offer higher fruit set efficiency in crops like date palm, robotic and drone-assisted systems show promise for reducing labour intensity in large-scale orchards. Ultimately, a multi-faceted approach combining the conservation of natural insect pollinators with advanced mechanical techniques and strategic orchard layouts is vital for sustainable fruit production and food security.

**Keywords:** Pollination management, Fruit crops, Honeybees, Pollinizers, Robotic pollination, Fruit set, Yield quality

**Abstract No: B-I-011**

**Registration No:1248**

**Evaluation of total saponin content variation in *Asparagus racemosus* for the identification of elite genotypes**

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The investigation was carried out to evaluate the variability in total saponin content among thirty genotypes of *Asparagus racemosus* (Shatavari) from the Research Farm, Medicinal, Aromatic & Potential crops Section, Department of Genetics and Plant Breeding, CCS HAU, Hisar. The objective of the study was to quantify total saponin content (TSC) and to identify elite

germplasm with enhanced phytochemical potential. Roots from mature plants were shade-dried, finely powdered, and extracted using 50% methanol. Saponin levels were then quantified spectrophotometrically using diosgenin as the reference standard. The results revealed significant variability in saponin content, ranging from  $1.16 \pm 0.04$  to  $10.29 \pm 0.40$  g/100 g diosgenin equivalent (DE), with a mean of  $4.48$  g/100 g DE. Among the tested genotypes, HAR-27 ( $10.29 \pm 0.40$  g/100 g DE) recorded the highest saponin concentration, followed by HAR-25 ( $9.58 \pm 0.04$  g/100 g DE) and HAR-6 ( $8.72 \pm 0.10$  g/100 g DE), whereas HAR-29 ( $1.16 \pm 0.04$  g/100 g DE) showed the lowest. The study demonstrates substantial genetic variability in saponin accumulation within *A. racemosus* and identifies HAR-27, HAR-25 and HAR-6 as promising elite germplasms for future utilization in breeding and cultivation programs aimed at enhancing the pharmaceutical value of Shatavari.

**Key words:** *Asparagus racemosus*, Shatawari, Total Saponin Content

**Abstract No: B-I-012**

**Registration No:1272**

### **Pollen collection from major bee flora and its effect on colony performance**

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Honey bee collect pollen during foraging trips in specialized structures viz. corbicula present on their hind legs. Pollen traps are used to dislodge pollen loads from forager legs to collect in the tray. An experiment was carried out to evaluate the effect of pollen collection on *Apis mellifera* L. colony performance during flowering months of Indian mustard, sunflower and berseem. Impact of pollen collection was studied on colony growth parameters viz. honey, nectar, pollen store, brood area, egg area and bee strength. The mean pollen collected was highest in Indian mustard (366.44 g/colony/week) followed by berseem (219.47 g/colony/week) and sunflower (122.98 g/colony/week). During Indian mustard flowering, the honey area expanded by 35.03 % in trapping, compared to 136.52% for control colonies. During sunflower and berseem flowering, honey area declined in both pollen trapped and control colonies. Pollen area in daily pollen trapped colonies during Indian mustard, sunflower and berseem recorded a growth of 24.69, -23.79 and 7.48 per cent, respectively over the initial value. Pollen availability is directly related to brood development. The brood area in daily trapped colonies increased by 19.01 per cent during Indian mustard bloom but during sunflower and berseem flowering, declined of 32.47 and 28.71 per cent, respectively was recorded over the initial value. Same trend was seen in egg laying area in colonies during Indian mustard, sunflower and berseem. It was concluded that pollen collection during flowering of Indian mustard was recorded highest as compared to other with least impact on the colony growth parameters.

**Keywords:** honey bee, pollen, Indian mustard, sunflower, berseem

**Abstract No: B-I-013**

**Registration No:1275**

**Identification of micrnas and their targets involved in iron and zinc homeostasis in wheat**

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Iron (Fe) and zinc (Zn) are essential micronutrients required for plant growth and human nutrition and their deficiency in staple crops such as wheat contributes significantly to global malnutrition. MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression at the post-transcriptional level and play an important role in nutrient homeostasis. The present study aimed to identify miRNAs and their target genes involved in Fe and Zn homeostasis in wheat using a bioinformatics approach. Wheat miRNA sequences were retrieved from Ensembl Plants and potential target genes were predicted using the psRNATarget server. The metal transporter genes were identified as miRNA targets including ZIP (ZRT/IRT-like proteins) involved in iron and zinc uptake, NRAMP genes responsible for divalent metal transport and YSL (Yellow Stripe-Like) genes associated with iron–nicotianamine transport. This in-silico study provides insights into the potential role of miRNAs in regulating Fe and Zn accumulation in wheat. The identified miRNA–target interactions may serve as valuable candidates for future experimental validation and could contribute to the development of miRNA-based biofortification strategies aimed at enhancing iron and zinc content in wheat grains. Publicly available genomic and miRNA databases were utilized to predict conserved and novel miRNAs, followed by target gene identification and functional annotation. The findings highlight the potential of digital biology and computational genomics in understanding micronutrient regulation and offer insights for crop biofortification strategies.

**Keywords:** miRNA, biofortification, metal transporter genes, Iron and Zinc, psRNA Target

**Abstract No: B-I-014**

**Registration No:1276**

**Sucrose-induced modulation of ethylene-responsive genes and miRNAs associated with vase life in carnation**

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Carnation (*Dianthus caryophyllus L.*) exhibits significant variation in the expression of ethylene-responsive genes when subjected to different vase solutions. The present study aimed to evaluate the influence of sucrose on post-harvest physiological parameters particularly vase life, along with the transcriptional and post-transcriptional regulation of ethylene-responsive genes. The carnation cultivar Kloe was maintained in a 2% sucrose solution and compared with flowers placed in distilled water as control. A total of seven ethylene-responsive genes and four miRNAs were analysed to determine their relative expression levels in sucrose-treated and

untreated flowers. The results indicated that ACO and WRKY-75 exhibited the highest expression levels, with Ct values ranging from 18 to 22, suggesting strong transcriptional activity. However, transcripts of ACO-1, ACS-1, SAG-29, SAG-12 and miR-004 were markedly downregulated, with log fold changes ranging from -1.35 to -3.58, indicating suppression of ethylene-related gene expression under sucrose treatment. In contrast, miR-001 and miR-002 showed significant upregulation in sucrose-treated samples. Meanwhile, WRKY-75, EIL-4, EIL-3-1 and miR-003 did not show notable changes in expression. Among the analysed genes, ACO-1, an important enzyme involved in ethylene biosynthesis, showed the highest level of downregulation (-3.58 log fold change). These findings suggest that sucrose may initiate signaling mechanisms that suppress ethylene biosynthesis and response pathways, thereby delaying senescence and extending the vase life of carnation flowers. The study also highlights the potential role of miRNA-mediated regulation of ethylene biosynthesis genes which could be explored further to enhance post-harvest longevity in ornamental crops.

**Keywords:** Carnation, sucrose, vase life, ethylene-responsive genes, miRNA regulation

**Abstract No: B-I-015**

**Registration No:1278**

**Enhancing nutritional quality of cowpea (*Vigna unguiculata* L.) through foliar application of zinc oxide nanoparticles: Insight into micronutrient partitioning and nutrient interactions**

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Zinc deficiency remains a critical constraint to crop nutritional quality and human health, particularly in grain legumes that serve as protein-rich dietary staples across food-insecure regions. This study evaluated zinc oxide nanoparticles (ZnO-NPs) as a foliar biofortification strategy in cowpea (*Vigna unguiculata* L.), with emphasis on nutrient interactions, quality indices, and micronutrient partitioning. A pot experiment was conducted at CCS Haryana Agricultural University, Hisar, during the Kharif season of 2023, employing three zinc concentrations (400, 500, and 600 ppm) delivered as ZnO-NPs or bulk zinc alongside an untreated control. Foliar sprays were imposed at pre-flowering and full-flowering stages, and seed nutritional parameters protein, nitrogen, total soluble sugars, total phenolics, potassium, zinc, iron, copper, manganese, and zinc nutrient harvest index (Zn-NHI) were comprehensively assessed. Zinc application significantly enhanced seed nutritional quality, with ZnO-NP treatments consistently and substantially outperforming bulk zinc across all parameters. Maximum protein (27.81%), soluble sugars (39.57 mg g<sup>-1</sup>), phenolics (931.10 mg GAE 100 g<sup>-1</sup>), iron (70.78 ppm), zinc (56.52 ppm), and Zn-NHI (61.72%) were recorded under dual applications of 600 ppm ZnO-NPs, remaining statistically comparable to the 500 ppm dual-application treatment. Collectively, these findings establish ZnO-NPs at 500 ppm with two strategic foliar applications as a scientifically sound, efficient, and agronomically integrative approach for zinc biofortification and holistic nutritional quality improvement in cowpea.

**Keywords:** Cowpea, Zinc Nutrient Harvest Index, Foliar Application, ZnO and biofortification

**Screening of elite wheat genotypes for terminal heat stress tolerance based on morpho-physiological traits****Jaswant Singh, O. P. Bishnoi**

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Bread wheat (*Triticum aestivum* L.), a member of the Poaceae family, is an allohexaploid species ( $2n = 6x = 42$ ) with 21 pairs of chromosomes organized into three subgenomes: A, B and D (BBAADD). In the current scenario of escalating global population, wheat production and productivity are increasingly vulnerable to biotic and abiotic constraints, with terminal heat stress emerging as a critical limiting factor. This stress generally results from delayed sowing, frequently caused by late rice harvesting, which exposes the crop's reproductive and grain-filling stages to elevated temperatures ( $>30^{\circ}\text{C}$ ), adversely affecting grain formation and overall yield. The response to terminal heat stress was examined under both non-stress and stress conditions, with all heat stress indices showing significant genotype-specific differences. Variance analysis confirmed considerable genetic diversity among thirty-three wheat genotypes for nineteen morpho-physiological and seed vigor parameters. High heritability along with moderate genetic advance expressed as a percentage of the mean was recorded for effective tillers per meter, days to heading, thousand-grain weight, grain yield per plot, days to maturity, biological yield per plot, spike length, germination percentage, seedling length and vigor indices-I. The results suggest that additive genetic effects primarily regulate these traits, indicating substantial scope for enhancement through selection-based breeding. Correlation and path coefficient analyses identified the major yield-contributing traits, with biological yield per plot, harvest index, spike length, thousand-grain weight, effective tillers per meter, grains per spike, spikelets per spike, NDVI, total chlorophyll content, germination percentage, seedling length, seedling dry weight and vigor indices-I exhibiting positive and significant correlations with grain yield and exerted strong direct effects. Based on integrated assessment of grain yield per plot and heat susceptibility index (HSI) demonstrated that SA-1001, SA-1012 and SA-1045 surpassed the elite check HD-3086 by achieving higher yields with lower HSI values. Combining heat-tolerant genotypes and major traits can produce wheat cultivars resilient to heat stress. The combination of heat-tolerant genotypes and major yield-determining traits presents a promising strategy for advancing the development of terminal heat stress-resilient wheat cultivars.

**Keywords:** Wheat, heat tolerance, crop resilience, wheat grain yield

**Abstract No: B-I-017**

**Registration No:1286**

**Assessment of crop growth rate under organic and conventional farming in pearl millet–mustard cropping system**

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**Abstract:** A field experiment was conducted during the kharif and rabi seasons of 2023–24 and 2024–25 to evaluate the effect of organic, natural, and inorganic nutrient management practices on crop growth dynamics of a pearl millet–mustard cropping sequence. The study primarily focused on crop growth rate (CGR) as a key indicator of biomass accumulation and growth performance. Different nutrient sources including farmyard manure, vermicompost, poultry manure, their combinations with biofertilizers, cow-based formulations, and recommended dose of fertilizers (RDF) were compared under a randomized block design. The results revealed that CGR varied significantly among treatments and crop growth stages. In pearl millet, CGR increased progressively from early growth stages and reached its peak during the active vegetative phase (20–40 DAS), followed by a gradual decline towards maturity, indicating reduced assimilatory efficiency at later stages. The highest CGR was recorded under RDF (T9), reflecting rapid biomass accumulation due to readily available nutrients. Among organic treatments, poultry manure combined with biofertilizer (T7) exhibited comparatively higher CGR, which may be attributed to improved nutrient mineralization and enhanced microbial activity in soil. Organic and natural farming treatments showed relatively moderate but sustained CGR throughout the crop growth period, indicating a steady nutrient release pattern. Although inorganic fertilization resulted in superior CGR values, integrated nutrient management practices demonstrated promising potential by maintaining comparable growth rates while improving soil health. Thus, the study highlights that poultry manure integrated with biofertilizers can serve as a sustainable alternative to chemical fertilizers without substantial compromise in crop growth performance.

**Keywords:** Crop Growth Rate (CGR), Pearl Millet–Mustard Cropping System, Nutrient Management, Organic Farming, Natural Farming, Inorganic Fertilization

**Strategic Interventions for Enhancing Pre and Post-Harvest Quality in Fruit Crops****Vaishali<sup>1</sup> and Rajesh Lathar<sup>2</sup>**<sup>1</sup>Department of Horticulture, CCSHAU, Hisar -125004, Haryana<sup>2</sup>Department of Horticulture, KVK Panchkula

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Fruit quality is a multidimensional concept defined by a combination of physical, sensory, and nutritional attributes that ultimately dictate consumer acceptance and market value. As the demand for high-quality produce grows, it becomes essential to implement integrated management strategies across different stages of production. This review examines various pre-harvest and post-harvest interventions designed to improve both the external appearance and intrinsic quality parameters such as sugar-to-acid ratios, soluble solids, and antioxidant profiles in major fruit crops including mango, pomegranate, guava, and pear. Key pre-harvest strategies include the selection of superior genetic varieties and compatible rootstocks, which establish the foundation for fruit traits. Precision in mineral nutrition, particularly through foliar applications of calcium, potassium, and boron, plays a critical role in regulating physiological processes and enhancing fruit firmness. Furthermore, the use of plant growth regulators (PGRs) and cultural practices such as fruit bagging, canopy management, and strategic thinning are highlighted for their effectiveness in optimizing fruit size, color development, and pest resistance. To maintain quality after harvest, the review discusses the application of edible coatings, heat treatments, and proper grading techniques to extend shelf life and reduce post-harvest losses. By integrating these diverse horticultural practices, producers can consistently deliver superior fruit that meets both commercial standards and consumer expectations.

**Keywords:** Fruit Science, Pre-harvest Management, Post-harvest Technology and Plant Growth Regulators (PGR)

**Abstract No: B-I-019**

**Registration No:1295**

### **Impact of edible coatings on shelf life and storage quality of ber**

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The present experiment was conducted to evaluate the impact of bio coatings on the shelf life and storage quality of ber (*Ziziphus mauritiana* L.) cv. Apple ber at the PG Laboratory, Department of Horticulture, CCS Haryana Agricultural University, Hisar. Uniform and disease-free fruits were harvested in February from the university orchard. The fruits were subjected to different edible coating treatments, namely turmeric extract (10% and 20%), chitosan (1.5% and 2.0%), guar gum (1% and 2%), aloe vera extract (100%) and lemongrass oil (0.1% and 0.2%), along with an untreated control. After applying treatments, the fruits were packed in corrugated fiber box (CFB) and stored under ambient conditions ( $25 \pm 2^\circ\text{C}$ ). Observations were recorded at 3-day intervals for physiological loss in weight (PLW), decay loss (%), total soluble solids (TSS), ascorbic acid content and sugar content. The results revealed that Aloe vera extract (100%) was most effective in maintaining fruit quality, recording the lowest physiological weight loss (19.6%), decay loss (11.4%), TSS (13.1%), ascorbic acid degradation (53.4 mg/100 g), and sugar loss (8.9%) followed by chitosan (2%) and guar gum (2%). In contrast, untreated fruits exhibited the highest deterioration. Therefore, aloe vera-based coating proved to be the most promising treatment for extending shelf life and preserving quality of ber fruits under ambient storage conditions.

**Abstract No.: B-I-020**

**Registration No.: 1369**

### **Decoding botanical nematicides: Combining GC–MS profiling with molecular docking for sustainable nematode management**

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Gas chromatography–mass spectrometry (GC–MS) has emerged as a powerful analytical tool for the characterization of secondary metabolites present in botanical nematicides. Plant-derived nematicidal compounds such as alkaloids, terpenoids, phenolics, and essential oils play a crucial role in sustainable nematode management by offering eco-friendly alternatives to synthetic chemicals. GC–MS enables precise separation, identification, and quantification of these bioactive constituents, providing detailed chemical fingerprints of plant extracts. This facilitates the discovery of novel compounds responsible for nematicidal activity and helps in standardizing botanical formulations. In addition to chemical profiling, molecular docking serves as a complementary computational approach to predict the interaction between identified phytochemicals and specific molecular targets in nematodes, such as enzymes or receptors essential for survival, mobility, and reproduction. By simulating ligand–target binding affinities and interaction patterns, docking studies help in understanding the probable mode of action of botanical compounds at the molecular level. This approach also assists in prioritizing the most promising compounds for further biological validation. The integration of

GC–MS analysis with molecular docking accelerates the screening of potential nematicidal agents, reduces time and experimental costs, and enhances the efficiency of developing next-generation bio-nematicides. Moreover, it supports structure–activity relationship studies and aids in designing targeted, safer formulations. Overall, this combined approach provides a robust and innovative platform for advancing eco-friendly, sustainable, and precise nematode management strategies in modern agriculture.

**Keywords:** GC–MS, botanical nematicides, molecular docking, secondary metabolites, phytochemicals, nematode management

**Abstract No.: B-I-021**

**Registration No.: 1371**

**Interaction effect of soilless media and rooting hormones to stimulate root development in cuttings of carnation (*Dianthus caryophyllus* L.)**

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The present investigation was conducted in polyhouse located at the Agri-Tourism Centre of Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana) during the winter season of 2024–25. The experiment was carried out in split-plot design, using three different rooting media viz. river sand, cocopeat and river sand + cocopeat (v/v 1:1) and six concentrations of two rooting hormones (IBA & NAA). The results revealed that river sand + cocopeat (1:1) in combination with IBA 400 ppm proved to be the most effective medium in enhancing root traits and overall sapling growth. Terminal shoot cuttings when planted in this medium, after the application of IBA 400 ppm, exhibited the earliest root initiation (9.03 days) and were ready for transplanting in the shortest period. The above combination also resulted in maximum number of primary roots (7.46), longest roots (141.66 mm). Overall, cuttings immersed in IBA 400 ppm solution and planted in river sand + cocopeat medium performed comparatively better in contrast to other treatments.

**Keywords:** *Dianthus caryophyllus*, Terminal cuttings, River sand, Cocopeat, IBA, NAA

**Abstract No.: B-I-022**

**Registration No.: 1411**

**PCR-based diagnostics for rapid and accurate detection of plant pathogens**

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Polymerase Chain Reaction (PCR)-based diagnostics have revolutionized the detection and identification of plant pathogens by offering high sensitivity, specificity, and rapid turnaround compared to conventional methods. Accurate and early detection is critical for effective disease management and prevention of crop losses. PCR techniques enable the amplification of pathogen-specific DNA or RNA sequences, allowing detection even at very low concentrations, often before symptom expression. Various PCR variants, including conventional PCR, quantitative real-time PCR (qPCR), multiplex PCR, and reverse transcription PCR (RT-PCR), have been widely employed for detecting fungi, bacteria, viruses, and nematodes. The development of species-specific primers targeting conserved genomic regions such as ITS, 16S rRNA, or effector genes has enhanced diagnostic precision. Real-time PCR further enables quantification of pathogen load, facilitating disease forecasting and epidemiological studies. Multiplex PCR allows simultaneous detection of multiple pathogens in a single reaction, improving efficiency and reducing costs. Loop-mediated isothermal amplification (LAMP) enables rapid, sensitive pathogen detection under constant temperature without the need for thermal cycling, while digital droplet PCR (ddPCR) provides highly precise and absolute quantification of target DNA by partitioning the sample into thousands of nanodroplets. Additionally, advancements such as portable PCR systems and integration with isothermal amplification methods are making diagnostics more accessible for field applications. Despite these advantages, challenges such as PCR inhibitors in plant tissues, requirement for skilled personnel, and infrastructure costs remain. However, ongoing innovations in sample preparation, primer design, and device miniaturization are addressing these limitations. Overall, PCR-based diagnostics represent a powerful tool in modern plant pathology, contributing significantly to integrated disease management, biosecurity, and sustainable agriculture by enabling precise, early, and reliable pathogen detection.

**Keywords:** quantitative real-time PCR, multiplex PCR and reverse transcription PCR; LAMP

**Plant tissue culture: An approach for raising disease-free plants****Sanyam Vats, Dhruv**Department of Biotechnology, Guru Jambheshwar University of Science and Technology,  
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Plant tissue culture has emerged as a powerful biotechnological tool for the rapid multiplication of genetically uniform and disease-free planting material. This technique involves the *in vitro* cultivation of plant cells, tissues, or organs under aseptic and controlled environmental conditions using defined nutrient media. One of the most significant applications of plant tissue culture is the production of pathogen-free plants, particularly through meristem culture, where actively dividing apical meristems are excised and cultured to eliminate systemic infections caused by viruses, bacteria, and fungi. The success of this approach relies on the principle that meristematic tissues are often free or contain very low concentrations of pathogens due to their high metabolic activity and lack of vascular connections. Combined techniques such as thermotherapy, chemotherapy, and micrografting further enhance the efficiency of pathogen elimination. Tissue culture-derived plants are routinely screened using advanced diagnostic tools to ensure their disease-free status before field establishment. This technology has been widely applied in crops like potato, sugarcane, banana, and ornamentals, significantly improving yield, quality, and uniformity. Additionally, it supports germplasm conservation and facilitates the rapid dissemination of elite cultivars. Despite challenges such as high initial costs and the need for skilled labor, plant tissue culture remains a cornerstone in modern agriculture for sustainable crop production. Overall, it provides a reliable and efficient strategy for raising disease-free plants, contributing to enhanced agricultural productivity and biosecurity.

**Keywords:** Plant tissue culture, disease-free plants, meristem culture, micropropagation, pathogen elimination

**Digital agriculture, AI, IoT & big-data analytics****Khushboo, J.S. Malik**Department of Agricultural Extension, CCS Haryana Agricultural University, Hisar-125004,  
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Rapid climate variability and the increasing frequency of abiotic and biotic stresses pose significant constraints on agricultural productivity, functional crop performance, and agro-industrial sustainability. Climate-resilient and functional crops are critical components of future food systems; however, their effective deployment requires precise, data-driven approaches capable of addressing spatial and temporal heterogeneity in agro-ecosystems. The convergence of digital agriculture with artificial intelligence (AI), Internet of Things (IoT), and big-data analytics provides a robust framework to decipher and enhance the adaptive potential of such crops under changing climatic regimes. IoT-enabled sensor networks, unmanned aerial systems, and satellite-based remote sensing platforms generate high-resolution, real-time datasets on soil physicochemical properties, plant physiological responses, microclimate dynamics, and stress indicators. These multidimensional datasets, when integrated with AI-driven machine learning and deep learning algorithms, facilitate early stress diagnosis, predictive modeling of crop growth and yield, and dynamic risk assessment for climate-induced uncertainties. Advanced analytics enable the identification of complex, non-linear interactions among genotype, environment, and management (G×E×M), which is essential for optimizing climate-resilient and functionally superior crop systems. Big-data analytics further strengthens this paradigm by enabling the integration of multi-omics data (genomics, transcriptomics, phenomics), long-term climate datasets, and farm-level management records into decision-support systems. Such integration accelerates precision breeding, site-specific crop management, and resource optimization, enhancing resilience to drought, heat, salinity, and emerging pest–pathogen complexes. Moreover, digital platforms improve traceability, quality control, and process optimization across agro-industrial value chains, thereby supporting sustainable processing, storage, and market integration of functional crops. This theme highlights the role of digital intelligence in transforming conventional agriculture into predictive, adaptive, and climate-smart systems. By coupling computational tools with crop and climate sciences, digital agriculture enables scalable solutions for sustainable intensification, reduced environmental footprints, and enhanced farmer profitability. The deliberations under this theme aim to foster interdisciplinary collaboration and translational research, bridging advanced digital innovations with practical field and agro-industrial applications to strengthen resilient food and bio-based systems in the face of global climate change.

**Keywords:** Digital agriculture; Artificial intelligence (AI); Internet of Things (IoT); Big-data analytics; Climate-resilient crops; Sustainable agro-industries

**Integrating nutritional assessment and knowledge paradigms: A  
Comprehensive study on dietary behaviours****Neha, Rajni Khanna**

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Adequate nutrition remains central to the overall well-being and health outcomes of general populations, yet the prevention of dietary-related ailments increasingly depends on baseline nutritional knowledge and accurate assessment strategies. In contemporary communities, where traditional food systems have historically been the backbone of daily diets, ongoing processes of dietary transition, including expanding processed food availability, lifestyle shifts and exposure to diverse culinary avenues, have begun to reshape the consumption choices and nutritional perceptions of individuals. These changing consumption patterns raise important questions regarding the sustainability of dietary practices and the role of nutritional literacy in shaping future health outcomes. This study examines the prevailing levels of nutritional knowledge and dietary engagement within the broader framework of sustainable health practices and nutritional assessment planning. The research explores the social, economic and cultural factors influencing individual attitudes toward balanced nutrition as a viable and meaningful preventative measure. Particular emphasis is placed on the influence of socio-economic background, educational attainment, access to nutritional information and changing social perceptions of dietary habits in contemporary society. The study also highlights the potential of comprehensive nutritional assessments to act as important tools of change that can contribute to early intervention, health sustainability and dietary modernization. By analysing the relationship between nutritional awareness and dietary engagement, the study seeks to underline the significance of routine assessments in ensuring sustainable health development and balanced lifestyle practices. The findings aim to contribute to the broader discourse on public health by emphasizing that the long-term sustainability of nutritional well-being depends not only on clinical advancement but also on the active involvement, motivation and awareness of the general population. Encouraging populations to actively participate in nutritional education can therefore play a crucial role in promoting resilient health frameworks and sustainable dietary transformation.

**Keywords:** Nutritional Knowledge, Dietary Assessment, Public Health, Sustainable Diets, Health Transformation

**Evaluation of nutritional knowledge, dietary diversity, and nutrient intake patterns: A comprehensive study****Jyoti, Neha Kamboj**

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Nutrition and dietetics are central to the physiological and metabolic well-being of the human body, yet the nutritional status of a population increasingly depends on individual knowledge and the selection of nutrient-dense foods. In contemporary dietary settings, where traditional whole foods are being supplemented or replaced by processed alternatives, technological advancement in food fortification and exposure to diverse food systems have begun to reshape the dietary choices and nutritional perceptions of individuals. These changing consumption patterns raise important questions regarding the sustainability of balanced diets and the role of nutritional literacy in preventing chronic lifestyle disorders. This study examines the level of nutrition knowledge and its direct correlation with dietary diversity and nutrient adequacy within the broader framework of clinical nutrition and health planning. The research explores the biochemical, physiological and environmental factors influencing the selection of macronutrients and micronutrients as a viable means of maintaining homeostasis. Particular emphasis is placed on the influence of nutritional education, awareness of food labeling, access to therapeutic nutrition information and the changing perceptions of functional foods in contemporary dietetics. The study also highlights the potential of nutrition literacy to act as an important agent of change that can contribute to improved health outcomes, metabolic efficiency and modernization within the food science sector. By analyzing the relationship between theoretical knowledge and actual dietary intake, the study seeks to underline the significance of informed food choices in ensuring long-term nutritional security and balanced metabolic practices. The findings aim to contribute to the broader discourse on clinical and community nutrition by emphasizing that long-term health sustainability depends not only on food security but also on the active involvement, motivation, and nutritional aspirations of the individual.

**Keywords:** Nutrition Knowledge, Dietary Diversity, Nutrient Intake, Food Science, Metabolic Health

**Abstract No.: B-I-027**

**Registration No.: 1440**

**Metagenomics: A Major Game Changer for Sustainable Agriculture**

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Metagenomics has emerged as a major game changer in sustainable agriculture by enabling a deeper understanding of soil microbial communities and their functional roles in maintaining soil fertility, plant growth, nutrient cycling, and stress resistance. Traditional culture-based methods are limited in studying soil microorganisms, as a large proportion of beneficial microbes remain unculturable under laboratory conditions. Advanced molecular tools such as high-throughput sequencing, 16S rRNA and ITS analysis, and whole-genome shotgun metagenomics allow comprehensive identification of both culturable and unculturable microorganisms and their metabolic potential. For example, beneficial microbes such as *Rhizobium*, *Azotobacter*, *Pseudomonas*, and arbuscular mycorrhizal fungi play important roles in nitrogen fixation, phosphate solubilization, disease suppression, and improved nutrient uptake. The integration of culturomics, metagenomics, and metabolomics has significantly improved soil microbiome preservation and the development of microbiome-based solutions for sustainable crop production. In addition, Synthetic Microbial Communities (SynComs) provide a precise and eco-friendly approach to enhance nutrient uptake, improve disease resistance, and strengthen plant tolerance against biotic and abiotic stresses, thereby reducing dependence on chemical fertilizers and pesticides. For instance, SynComs developed for wheat and rice crops have shown improved drought tolerance and resistance against soil-borne pathogens. These microbiome-driven strategies offer strong potential for restoring soil health, improving crop productivity, and supporting climate-resilient agriculture. However, major research gaps remain in field-level validation, long-term microbial stability, and understanding complex plant–microbe–environment interactions under diverse agro-climatic conditions. Future research should focus on integrating metagenomics with multi-omics approaches, artificial intelligence, bioinformatics, and precision agriculture to develop stable, efficient, and field-adapted microbial consortia for sustainable and high-yield farming systems.

**Keywords:** Metagenomics, SynComs, Multi-omics, Sustainable crop production

**Abstract No.: B-I-028**

**Registration No.: 1442**

**Screening of elite wheat genotypes for terminal heat stress tolerance based on morpho-physiological traits**

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Bread wheat (*Triticum aestivum* L.), a member of the *Poaceae* family, is an allohexaploid species ( $2n = 6x = 42$ ) with 21 pairs of chromosomes organized into three subgenomes: A, B and D (BBAADD). In the current scenario of escalating global population, wheat production and productivity are increasingly vulnerable to biotic and abiotic constraints, with terminal heat stress emerging as a critical limiting factor. This stress generally results from delayed sowing, frequently caused by late rice harvesting, which exposes the crop's reproductive and grain-filling stages to elevated temperatures ( $>30^{\circ}\text{C}$ ), adversely affecting grain formation and overall yield. The response to terminal heat stress was examined under both non-stress and stress conditions, with all heat stress indices showing significant genotype-specific differences. Variance analysis confirmed considerable genetic diversity among thirty-three wheat genotypes for nineteen morpho-physiological and seed vigor parameters. High heritability along with moderate genetic advance expressed as a percentage of the mean was recorded for effective tillers per meter, days to heading, thousand-grain weight, grain yield per plot, days to maturity, biological yield per plot, spike length, germination percentage, seedling length and vigor indices-I. The results suggest that additive genetic effects primarily regulate these traits, indicating substantial scope for enhancement through selection-based breeding. Correlation and path coefficient analyses identified the major yield-contributing traits, with biological yield per plot, harvest index, spike length, thousand-grain weight, effective tillers per meter, grains per spike, spikelets per spike, NDVI, total chlorophyll content, germination percentage, seedling length, seedling dry weight and vigor indices-I exhibiting positive and significant correlations with grain yield and exerted strong direct effects. Based on integrated assessment of grain yield per plot and heat susceptibility index (HSI) demonstrated that SA-1001, SA-1012 and SA-1045 surpassed the elite check HD-3086 by achieving higher yields with lower HSI values. Combining heat-tolerant genotypes and major traits can produce wheat cultivars resilient to heat stress. The combination of heat-tolerant genotypes and major yield-determining traits presents a promising strategy for advancing the development of terminal heat stress-resilient wheat cultivars.

**Keywords:** Wheat, heat tolerance, crop resilience, wheat grain yield

# **Sub Theme II**

**Climate-Resilient and Resource-Efficient Farming Systems  
for Sustainable Agriculture**

**Abstract No: B-II-001**

**Registration No:1004**

**Evaluation of mustard under Ber based cropping system for sustainability in Agri-Horticulture systems**

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In an agri-horticultural system, incorporating intercrops with ber (*Ziziphus mauritiana*) can be a calculated move to optimize land use and raise total farm productivity. In this regard, field experiment was undertaken during *Rabi*, 2024-25 at Regional Research Station, Bawal in RBD with five treatments (Ber + Pearl millet- Mustard, Ber + Cluster bean- Mustard, Ber + Cowpea – Mustard, Ber + Marigold – Mustard and Sole Mustard) with three replications. 24 Ber plants cv. Gola were planted on 15 September, 2022. All the ber plants were in juvenile stage. The highest seed yield of mustard was obtained from Ber + Sole Mustard (20.98 q / ha) followed by Cluster bean- Mustard (19.89 q / ha) and lowest yield obtained from Ber + Marigold - Mustard (17.88 q/ha). Similar trend was followed in case of gross return, net return and B:C ratio. Considering all results it can be concluded that by combining horticultural and agricultural crops, agri-horticulture systems present a viable strategy for sustainable farming. Although ber plants are still in their juvenile stage, several researchers have discovered that over time, these systems may boost biodiversity, raise farm revenue and improve resource use efficiency with less investment, all of which contribute to more resilient and sustainable agricultural practices.

**Keywords:** Farm productivity, farm revenue, juvenile stage, resilient and sustainable

**Abstract No: B-II-002**

**Registration No:1006**

**Analysis of Morphophysiological responses in Linseed genotypes mediated by ZnO Nanoparticle seed priming for elucidating salinity stress tolerance in field conditions**

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*Linum usitatissimum* L. is an economically important oilseed crop within family *Linaceae*. In terms of cultivation areas and production it ranks second to rapeseed mustard but its productivity in India (~650-700kg/ha) is far lower than world productivity (~1000-1200kg/ha). To analyze various morphophysiological traits including, Specific leaf area, Specific leaf weight, Relative growth rate in Shoot length (RGR-SL), Normalized Difference Vegetative Index (NDVI), Total chlorophyll content, Canopy temperature and Na<sup>+</sup> and K<sup>+</sup> content the experiment was conducted with forty linseed genotypes (previously seed primed with ZnO nanoparticle (500ppm)) at *Research field area of CCSHAU, Hisar* under controlled and salinity conditions (10dS<sup>-1</sup>) in Randomized Block Design during *Rabi* season of 2021-22 & 2022-23.

Salinity stress hampers plant growth and development as there is significant reduction was observed in specific leaf area, specific leaf weight, RGR-SL, total chlorophyll content, NDVI along with ionic imbalance indicated by altered Na<sup>+</sup> and K<sup>+</sup> accumulation in stem and increased canopy temperature. However, seed priming with ZnO NPs noticeably mitigated the adverse effect of salinity stress and improves these morpho-physiological attributes under both control and saline environment in field conditions. The study from forty linseed genotypes identified several genotypes accession no. as IC0276956, EC244634, IC0567357, IC0510929, IC0096725, EC00541222, IC113107 and IC0498949 depicts key morpho-physiological traits which represent valuable genetic resources with enhanced resilience and promising tolerance with application of ZnO nanoparticle highlighting its potential as an effective strategy to mitigate salinity stress and its importance for future breeding programs.

**Keywords:** Linseed, ZnO nanoparticle, seed priming, morphophysiological traits, salinity stress

**Abstract No: B-II-003**

**Registration No:1010**

**Salinity induced changes in growth and physiological processes of onion  
(*Allium cepa* L.)**

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Salinity stress is a critical environmental constraint that significantly affects the growth, physiology and yield potential of onion (*Allium cepa* L.), a crop sensitive to salt accumulation. This study was conducted to evaluate the impact of salinity on morpho-physiological traits in different onion varieties subjected to four salinity levels, control (0 dS/m), 2 dS/m, 4 dS/m and 6 dS/m. A comprehensive assessment of key morphological parameters including plant height, number of leaves, leaf length and bulb diameter, and physiological traits such as chlorophyll content (SPAD), chlorophyll fluorescence (Fv/Fm) and relative water content (RWC) was carried out at different growth stages. The results demonstrated a significant decline in all morpho-physiological parameters with increasing salinity levels, particularly at 4 and 6 dS/m. Due to salinity stress, the crop showed a more pronounced reduction in plant height, leaf number, and bulb size, indicating higher sensitivity to salt stress. In contrast, some onion varieties maintained relatively stable chlorophyll content and RWC under moderate salinity, suggesting a better adaptive response. At the physiological level, salinity stress impaired photosynthetic efficiency and water retention capacity, especially at higher EC levels, leading to compromised growth and early senescence. Overall, the study revealed distinct varietal differences in salt tolerance, with NHRDF red onion variety exhibiting superior morpho-physiological resilience. These findings underline the importance of varietal selection and provide a basis for breeding programs aimed at improving salinity tolerance in onion cultivation, particularly in salt-affected regions.

**Keywords:** Chlorophyll fluorescence, onion, physiological efficiency, salinity

**Abstract No: B–II-004**

**Registration No:1013**

**Physio-biochemical changes under waterlogged conditions in pearl millet  
(*Pennisetum glaucum* L.)**

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Waterlogging is a major abiotic stress that adversely affects crop productivity by disrupting root metabolism and soil aeration by creating hypoxic conditions. Pearl millet (*Pennisetum glaucum* L.), a climate-resilient cereal, exhibits tolerance to drought; however, its performance is significantly compromised under prolonged waterlogged conditions. The present study investigates physio-biochemical responses of pearl millet under waterlogging stress. Seedlings were subjected to controlled waterlogged conditions at specific growth stages, and key morphological, physiological, and biochemical parameters were evaluated. Waterlogging stress resulted in a marked decline in plant growth, chlorophyll content, and relative water content, along with impaired photosynthetic efficiency. A significant increase in oxidative stress markers such as lipid peroxidation was observed, indicating cellular damage. However, adaptive responses were evident through enhanced accumulation of osmolytes such as proline and increased activity of antioxidant enzymes including superoxide dismutase, catalase, and peroxidase. These responses suggest activation of defence mechanisms to mitigate oxidative damage and maintain cellular homeostasis under stress conditions. The study highlights the dynamic balance between stress-induced damage and inherent tolerance mechanisms in pearl millet. Overall, the findings provide insights into the physiological and biochemical basis of waterlogging tolerance, which can facilitate the development of climate-resilient pearl millet cultivars suitable for waterlogged agro-ecosystems.

**Keywords:** Antioxidant enzymes, hypoxic conditions, osmolytes, oxidative stress, waterlogging

**Abstract No: B–II-005**

**Registration No:1021**

**Water Use Efficiency and Productivity of Wheat Intercrops under Poplar-  
Based Agroforestry**

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A field trial was executed during 2024-25 to investigate the study the soil water dynamics and wheat yield under different spacings, i.e. 3×3m, 5×3m, and 7×3m of seven-year poplar-based agroforestry system in the field of forestry department CCS HAU, Hisar. Moisture content

increased with depth in all spacing at 0.5m and mid of the tree spacing. The moisture content at depth 45-60cm in spacing 3×3m before sowing was 16.66% and before the first irrigation 15.99%, indicating higher moisture content than the surface 0-15 cm which was before sowing 14.85% and before the first the first irrigation 13.01%, respectively. A similar pattern was shown in all irrigations. In contrast to 3×3m and 5×3m, the mid of tree spacing of 7×3m layout has significantly higher moisture content than the 0.5 m area at all depths. The result revealed that the effect of poplar tree spacing (3×3m, 5×3m, and 7×3m) on crop yields were significantly different from the control (10.77 t/ha). Among the poplar spacing treatments, the 7m x 3m spacing produced the highest yield at 3.58 t/ha, followed by 5×3m at 3.00 t/ha, and 3m x 3m at 1.45 t/ha. The wider poplar spacing (7×3m and 5×3m) in an agroforestry system leads to significantly higher field water use efficiency compared to denser spacing (3×3m). The 7×3m spacing had the highest water use efficiency (0.534 kg/m<sup>3</sup>), followed by 5×3m (0.463 kg/m<sup>3</sup>) and 3×3m (0.216 kg/m<sup>3</sup>) when compared with spacing, respectively. Overall higher field water use efficiency was observed in control (sole wheat) from all tree spacing (1.998 kg/m<sup>3</sup>).

**Keywords:** Water use efficiency, wheat yield, agroforestry

**Abstract No: B-II-006**

**Registration No:1036**

### **Building resilient and efficient farming systems for sustainability**

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Agriculture is increasingly challenged by climate variability, natural resource degradation, and rising food demand, necessitating a transition toward climate-resilient and resource-efficient farming systems for sustainable development. This study examines such systems as an integrated approach to enhance productivity while minimizing environmental impacts. Climate resilience refers to the capacity of farming systems to withstand and adapt to stresses such as droughts, floods, and temperature extremes, whereas resource efficiency emphasizes the optimal utilization of water, nutrients, energy, and land. The study synthesizes key approaches including conservation agriculture, precision farming, integrated farming systems, and agroforestry. Practices such as zero tillage, crop diversification, micro-irrigation, and integrated nutrient and pest management are evaluated for their role in improving yield stability, soil health, water conservation, and reducing greenhouse gas emissions. Additionally, the study critically assesses the role of digital agriculture, weather-based advisories, and decision-support systems in strengthening farmers' adaptive capacity. A key contribution of this research lies in its integrated framework that simultaneously examines climate resilience and resource-use efficiency, addressing a critical gap where these dimensions are often studied independently. By incorporating recent advancements in climate-smart and digital technologies, the study provides a holistic and field-oriented perspective, particularly relevant for smallholder farming systems. Despite the benefits, challenges such as limited awareness, high initial investment, and inadequate institutional support hinder adoption. The study concludes that targeted policy interventions, strengthened extension services, and capacity-building initiatives are essential to promote widespread adoption, thereby ensuring long-term agricultural sustainability and resilience.

**Keywords:** Climate variability, Resilient, conservation agriculture, capacity building, sustainability

## Impact of Lignin/ZnO Nanocomposite Priming on Wheat Seed Germination and Seedling Development under abiotic stress

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Recent advances in nanobiotechnology have highlighted its potential as an effective strategy to mitigate the adverse effects of abiotic stresses in crop plants. Zinc is an essential micronutrient that plays a critical role in the synthesis of various macromolecules and physiological processes in plants. Wheat (*Triticum aestivum* L.), the second most important staple food crop globally, must achieve approximately a 60% increase in productivity by 2050 to meet the growing nutritional demands of the increasing population. However, wheat productivity is severely constrained by several biotic and abiotic stresses, among which salinity and drought are the most prominent limiting factors. Therefore, the present investigation was undertaken to evaluate the potential role of Lignin/ZnO Nanocomposite in mitigating the adverse effects of salinity and drought stress in wheat. Two wheat variety HD 2009 and KRL 210 seeds were primed with 500 ppm Lignin/ZnO Nanocomposite solution for 12 hours and then hydroponically grown in saline, PEG, and a mixture of the two solutions for 20 days. Different morphological, biochemical, and proteomic traits and responses were studied, and Lignin/ZnO Nanocomposite was found effective in both varieties (HD 2009 and KRL210), but the trait response was different. The response of HD 2009 was better for traits such as shoot length, shoot fresh weight, root dry weight, shoot dry weight, RWC, total chlorophyll content, proline content, FRSA, and KRL 210 responded better for germination percentage, root length, root fresh weight, MSI and MDA content and H<sub>2</sub>O<sub>2</sub> content. Protein profiling analysis of seedlings grown under salinity (6 dSm<sup>-1</sup> and 10 dSm<sup>-1</sup>) with and without ZnO NP revealed that 90 proteins were differentially expressed under 6 dSm<sup>-1</sup>, and under salinity (10 dSm<sup>-1</sup>) 45 proteins were differentially expressed. The mitigating effect of zinc oxide nanoparticles at the seedling stage could be due to the expression of proteins related to the antioxidant defence system (peroxidase and superoxidase dismutase), amino acid metabolism, ribosomal proteins, photosynthesis, carbohydrate metabolism, ubiquitination, glycolysis, and tricarboxylic acid cycle revealed in a proteomics study. Based on the above experiment, it is concluded that 500 ppm of zinc oxide nanoparticles for 12 hours of priming is effective in mitigating salinity and drought. Traits like germination percentage, seedling growth parameters, and seedling vigour index-primary deterrents of growth under stress conditions get positively affected by nanoparticles of zinc oxide.

**Abstract No: B–II-008**

**Registration No:1051**

**Influence of nipping and growth regulators on the performance of chickpea  
(*Cicer arietinum* L.)**

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Chickpea (*Cicer arietinum* L.) is one of the important pulse crops having high nutritional value. There are many factors responsible for low productivity of chickpea in India. Through some agronomic management like nipping and use of plant growth regulators, we can improve the productivity of chickpea. Therefore, this experiment was carried out to find out the effect of nipping and growth regulators on the productivity of chickpea under Hisar conditions. The present investigation was carried out during the *Rabi* seasons of 2022-23 and 2023-24 at Research farm, Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar. The soil of the experimental site was sandy loam in texture. The experiment was laid out in randomized block design consisting of 11 treatments (T<sub>1</sub>: Control, T<sub>2</sub>: Nipping at 30 DAS, T<sub>3</sub>: Nipping at 30 DAS+ GA<sub>3</sub> @ 50 ppm, T<sub>4</sub>: Nipping at 30 DAS+ GA<sub>3</sub> @ 75 ppm, T<sub>5</sub>: Nipping at 30 DAS+ NAA @ 50 ppm, T<sub>6</sub>: Nipping at 30 DAS+ NAA @ 75 ppm, T<sub>7</sub>: Nipping at 40 DAS, T<sub>8</sub>: Nipping at 40 DAS+ GA<sub>3</sub> @ 50 ppm, T<sub>9</sub>: Nipping at 40 DAS+ GA<sub>3</sub> @ 75 ppm, T<sub>10</sub>: Nipping at 40 DAS+ NAA @ 50 ppm, T<sub>11</sub>: Nipping at 40 DAS+ NAA @ 75 ppm) with three replications. During both the years of study, it was found that nipping of chickpea at 30 DAS was found better than at 40 DAS. Nipping of chickpea at 30 DAS + spray of growth regulator NAA @ 50 ppm was found to increase the seed yield of chickpea crop (2658 kg/ha) as compared to control (2140 kg/ha). However, there was only a slight edge in the benefit-cost ratio of this treatment (2.37) over control (2.32).

**Key words:** Chickpea, NAA, GA<sub>3</sub>, seed yield

**Abstract No: B–II-009**

**Registration No:1055**

**Vermicomposting of equine dung: A sustainable solution for organic waste  
management**

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The rapid increase in organic waste due to industrialization, intensive agriculture, and livestock husbandry poses serious environmental and public health challenges. Improper disposal of equine dung (ED), underutilized animal bio-waste-leads to nutrient runoff, methane emissions, and land degradation. This study investigates vermicomposting as a sustainable, low-cost technology for managing equine dung using earthworms (*Eisenia foetida*). The vermicomposting process was carried out under controlled conditions (humidity: 50–60%, temperature: 25–30°C). The resulting equine dung vermicompost (EDV) was analyzed for physicochemical and nutrient parameters. EDV exhibited a pH of 8.0 and electrical

conductivity of 1.60 dS/cm. Nutrient analysis revealed high levels of organic carbon (19.70%), nitrogen (0.72%), phosphorus (0.61%), and potassium (1.07%), along with essential micronutrients: iron (992 ppm), zinc (675 ppm), manganese (258 ppm), and copper (235 ppm). The nutrient-rich EDV is suitable for agricultural, horticultural, and kitchen gardening applications. Beyond waste management, this eco-friendly technology enhances soil health, supports circular bio-economy principles, and offers income-generating opportunities for equine-owning families and rural women. This study provides a scientific framework for converting equine dung into a valuable resource, contributing to sustainable agriculture and environmental conservation.

**Keywords:** Vermicomposting, equine dung, *Eisenia foetida*, waste valorization, soil health, circular economy

**Abstract No: B-II-010**

**Registration No:1063**

### **Pathogenesis related enzymes as indicators of blast resistance in Pearl millet**

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Pearl millet [*Pennisetum glaucum* (L.) R. Br.] belonging to the family Gramineae is an important cereal and forage crop in the arid and semi-arid regions of India (Kumar & Manga, 2011). India contributes 26.6% of the total pearl millet produced in the world (Kumar *et al.*, 2022). Its productivity has been hindered due to several constraints (Chelpuri *et al.*, 2019). Blast, also known as leaf spot caused by *Pyricularia grisea* Sacc. has emerged as a serious threat in major pearl millet growing areas in India. The present study aimed to evaluate sixty pearl millet genotypes for blast resistance, followed by hybridization of selected resistant lines with elite lines, and subsequent screening of the developed hybrids through artificial spray inoculation with *P. grisea*. Among the 60 pearl millet genotypes, 12 were highly resistant, 18 resistant and 13 moderately resistant and out of the 39 crosses initiated, 34 F<sub>1</sub> hybrids were successfully developed, of which 8 were highly resistant, 18 resistant and 10 moderately resistant. The activity of pathogenesis related enzymes *viz.* phenylalanine ammonia lyase (PAL), peroxidase (POX) and lipoxygenase (LOX) was estimated in F<sub>1</sub> hybrids at 1-, 3- and 7-days post inoculation. All the enzyme activities were found higher in the resistant inoculated plants as compared to the susceptible and control. The susceptible inoculated hybrids also exhibited higher activity than controls. A significant increase in enzyme activity was observed with successive sampling days following inoculation. The enzyme activities exhibited strong correlation with the blast disease reaction, thus indicating their possible role in conferring resistance to blast disease in pearl millet.

**Keywords:** Pearl millet, Peroxidase, Lipoxygenase, Blast scoring

**Spin to win: Centrifugal spin drying revolutionizes hydropriming in palak****Ravichandran Gomathi<sup>1,2</sup>, K. Malarkodi<sup>2</sup>, T. Eevera<sup>2</sup>, Pon Sathya Moorthy<sup>3</sup>  
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Palak (*Spinacea* sp.) is a nutritionally rich green leafy vegetable widely cultivated across India, yet its seed quality and germination performance remain inconsistent due to inadequate presowing treatments and poor post priming moisture management. Excess surface moisture retained after conventional priming often accelerates seed deterioration during storage, undermining the benefits gained through priming. The present study was undertaken to develop and standardize an innovative automated seed priming system integrating controlled hydropriming with centrifugal spin drying specifically for Palak. The system incorporates a perforated rotating drum operating at 600 rpm, enabling precise, uniform and gentle moisture removal without compromising seed integrity, representing a significant advancement in post-priming seed handling technology. The optimal protocol for Palak was standardized as 2 hours hydropriming followed by 4 minutes of centrifugal spin drying. This treatment resulted in a remarkable improvement in speed of emergence (12.31), germination percentage (94% vs. 70% in unprimed control), root length (9.8 cm), shoot length (5.9 cm) and vigour index I (1476) over the control. Significant enhancement in key enzymatic activities was also observed, including  $\alpha$ -amylase (2.938 mg/min/mL), dehydrogenase (1.561 OD), catalase (2.532  $\mu\text{mol H}_2\text{O}_2 \text{ min}^{-1} \text{ g}^{-1}$ ) and peroxidase (1.223  $\text{mg}^{-1} \text{ protein min}^{-1}$ ), indicating superior metabolic activation and improved energy mobilization during germination. The centrifugal spin drying system demonstrated several practical advantages including reduced energy consumption, controlled moisture removal, prevention of seed damage from excessive drying and maintenance of priming-induced benefits while ensuring optimal seed storability and increasing the yield potential. These findings establish centrifugal spin drying integrated with hydropriming as an effective, energy-efficient and scalable presowing technology for enhancing seed quality and seedling establishment in Palak.

**Keywords:** Palak, Spinach, Hydropriming, Centrifugal spin drying, Seed vigour, Germination, Enzymatic activity, Presowing treatment

**Abstract No: B–II-012**

**Registration No:1081**

**Carboxymethyl cellulose-based composite hydrogel alleviates drought stress in *Brassica juncea*: A Label-Free Quantitative Proteomics Perspective**

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Drought stress severely impairs growth, productivity, and metabolic homeostasis in *Brassica juncea* by disrupting water dynamics, oxidative balance, and fundamental metabolic processes. Simultaneously, excessive use of conventional fertilizers such as diammonium phosphate (DAP) accelerates soil degradation and nutrient leaching, necessitating innovative strategies that address both water scarcity and fertilizer use efficiency. This study evaluates the efficacy of CMC-g-P(AA-AAm)/diatomite/DAP composite hydrogel as a dual-function soil amendment integrating water retention with controlled slow-release nutrient delivery to alleviate drought-induced damage in *Brassica juncea*. Under water-deficit conditions, plants showed marked reductions in root and shoot length, biomass, chlorophyll content, and relative leaf water content, alongside elevated electrolyte leakage, lipid peroxidation, reactive oxygen species accumulation, and antioxidant enzyme activity. Hydrogel application substantially mitigated these effects by improving soil moisture retention and delivering nitrogen and phosphorus in a controlled manner to the rhizosphere, thereby reducing fertilizer input while enhancing growth and physiological resilience. To elucidate the underlying molecular mechanisms, label-free quantification (LFQ)-based quantitative proteomics was performed. Of 1810 identified proteins, 523 were differentially expressed under drought stress, and hydrogel amendment restored 478 of these proteins, demonstrating significant proteome remodelling. Functional annotation revealed drought-triggered alterations in proteins associated with photosynthesis, carbohydrate metabolism, defence responses, and redox homeostasis. These findings establish CMC-g-P(AA-AAm)/diatomite/DAP composite hydrogel as a sustainable agronomic strategy for enhancing drought tolerance and oilseed crop productivity under water-deficit conditions.

**Keywords:** metabolic homeostasis, slow-release fertilizer, water use efficiency, label-free quantification, quantitative proteomics, proteome remodeling

**Abstract No: B–II-013**

**Registration No:1088**

**Enhancing mustard productivity through nutrient management**

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Nutrient management and conservation agriculture play a vital role in enhancing the productivity and sustainability of mustard cultivation. Mustard is a major oilseed crop that requires minimum nutrition, particularly nitrogen, phosphorus, potassium, and sulphur, for optimum growth, yield, and oil quality. Soil health is a key determinant of mustard

productivity, as it influences nutrient availability, root development, and moisture retention. Practices such as the application of FYM, green manuring, and crop residue incorporation increases organic carbon, improve soil structure, and increases beneficial microbial activity. These factors contribute to better nutrient cycling and increased resilience of mustard crops under stress conditions. To study this further, a field experiment was conducted during the 2024–25 season at the Dryland Research Farm, Department of Agronomy, CCS Haryana Agricultural University (CCS HAU), Hisar. The experiment used a split-plot design with three treatments in the main plots and four treatments in the subplots, each repeated three times. The results revealed that growth parameters of mustard were significantly influenced by different levels of recommended N & P application, while foliar application of nano-fertilizers alone did not exhibit significant effects.

**Key words:** Fertilizer, Mustard, Nutrient

**Abstract No: B–II-014**

**Registration No:1092**

### **Study the growth of tulsi plant in small pot by the application of ice**

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In every household soil is available either in pot or in open garden, Tulsi (*Ocimum tenuiflorum*) was planted in our house during the year 2020 in Sector 15 Hisar and we visited 40-50 house for this study and found that house having Tulsi plant is wilted due to every day given water. Because by giving water everyday there is formation of hard crust and oxygen supply is stopped and ultimately plant die. To solve this problem, we conducted a study on Tulsi plant in potted soil with the application of Ice to see the effect of ice technology for the growth of Tulsi plant at the kitchen garden in Sector 15 Hisar Haryana 125001. This study was based on the theory of absorption of water which indicates that plant can take up only capillary water from micro pores which is present in the soil near the root zone of the plant. During the experiment, we took two pots of same size The plant of Tulsi was planted on 03<sup>th</sup> June 2020 in two pots with Ice application which showed very good growth it emerges in 05 months with full bloom i.e. days on 27<sup>th</sup> October 2020. This study implies that normally Tulsi plant planted before the monsoon season takes 15-20 days for the initial growth after that there is no water required for Tulsi plant. Tulsi plant being a religious plant for each family of our Indian tradition and also used in every house hold in local medicinal purposes. To protect the Tulsi plant from wilting it is advised to each household do not use the water in Tulsi plant, by the application of Ice cubes we can plant more plants of Tulsi plant in every house.

**Keywords-** Tulsi plant, Capillary water, Ice, Wilt

**Abstract No: B-II-015**

**Registration No:1103**

## **Enhancing Soil Health and Carbon Sequestration through Biochar in Climate-Resilient Agriculture**

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Declining soil organic carbon (SOC) and land degradation threaten Indian agriculture. Biochar, a carbon-rich material produced via pyrolysis of agricultural residues, is emerging as a climate-smart solution. This synthesis of research across Indian agro-ecological regions evaluates biochar's potential for enhancing soil health and carbon sequestration. Field studies indicate that applying 2-10 t ha<sup>-1</sup> of biochar significantly improves soil properties, including a 10-35% increase in SOC, higher cation exchange capacity and 15-25% greater water retention in degraded soils. In the Indo-Gangetic Plains and semi-arid regions, integrating biochar with balanced fertilization increased rice, wheat, and maize yields by 8-20%. Furthermore, biochar improves nutrient use efficiency and reduces nitrogen losses, decreasing input dependency. India generates 500-550 million tonnes of crop residues annually, often burned, causing severe pollution. Converting this waste into biochar offers a sustainable management pathway, sequestering 0.3-1.0 t C ha<sup>-1</sup> yr<sup>-1</sup> with a residence time spanning centuries. Despite these benefits, large-scale adoption is hindered by economic challenges, lack of standardization and limited awareness. Nonetheless, integrating biochar into farming systems remains a promising strategy to enhance soil resilience, boost productivity, and mitigate climate change in Indian agriculture.

**Keywords:** Biochar, Soil Organic Carbon, Carbon Sequestration, Soil Health, Climate-Resilient Agriculture, India

**Abstract No: B-II-016**

**Registration No:1108**

## **Sowing time: A key climate resilient strategy in wheat**

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Wheat is a major staple crop, and its productivity is strongly influenced by climate variability, especially temperature fluctuations and moisture conditions. The experiment was conducted during the *rabi* season of 2023-24 at Research Farm, Department of Climate Change and Agricultural Meteorology, Punjab Agricultural University, Ludhiana to study the effect of sowing time on wheat yield. The experiment was planned with three sowing dates (20<sup>th</sup> October, 5<sup>th</sup> November and 20<sup>th</sup> November) and three wheat varieties (PBW 826, HD 3086 and PBW 677), to assess the influence of sowing dates on wheat yield. Yield and yield attributing

characteristics in different treatments were recorded at the harvesting time. Yield attributing characteristics showed better performance in first date of sowing followed by second and third date of sowing. The grain yield, biomass yield and straw yields were 54.55, 132.89 and 77.33 q/ha in 20<sup>th</sup> October sown wheat, respectively. Whereas, in 5<sup>th</sup> November and 20<sup>th</sup> November sowing, grain yield was 53.30 q/ha and 50.10 q/ha, respectively. Among different varieties, yield and yield attributing characteristics were recorded higher in variety PBW 826, followed by HD 3086 and PBW 677. PBW 826 gave highest grain yield, biomass yield and straw yield (54.37 q/ha, 131.45 q/ha, 77.08 q/ha), followed by HD 3086 (50.23 q/ha, 123.44 q/ha, 73.20 q/ha) and PBW 677 (48.47 q/ha, 119.42 q/ha, 70.95 q/ha). The findings of this experiment indicate that date of sowing has a significant effect on wheat yield, with early sowing resulting in higher yield due to better utilization of favourable temperature and moisture conditions. As sowing was delayed, the crop was exposed to high temperature and reduced growth duration leading to a gradual decline in yield. Therefore, timely or early sowing is simple but powerful climate resilient agronomic strategy for achieving maximum and stable wheat production under changing climatic conditions.

**Key Words:** Wheat, Climate resilient strategy, Date of Sowing, Varieties, Yield

**Abstract No: B-II-017**

**Registration No:1109**

### **Evaluating thermal regime effects on wheat phenology and yield under different sown environments**

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A field experiment was conducted at Research Farm of Dept. of Ag. Meteorology, CCSHAU, Hisar, Haryana to evaluate the role of sowing time in mitigating terminal heat stress and its impact on agro-meteorological indices, phenology, and yield of wheat (*Triticum aestivum* L.). Four wheat varieties were grown under three sowing environments, namely early (D1), timely (D2), and late (D3) conditions. Agro-meteorological indices such as Growing Degree Days (GDD), Photothermal Units (PTU), and Heliothermal Units (HTU) were computed across major phenophases to assess thermal accumulation and stress exposure. Results indicated that late sowing (D3) exposed the crop to higher terminal heat stress during reproductive and grain filling stages, leading to reduced thermal accumulation (1350°C days at maturity) compared to early sowing (1643°C days). Similar declining trends were observed for PTU and HTU under delayed sowing. Phenological observations revealed a significant reduction in crop duration under late sowing (118.75 days) as compared to early sowing (143.67 days), indicating forced maturity due to elevated temperatures. This shortening of growth duration adversely affected yield, with D3 recording significantly lower grain yield (48.83 q ha<sup>-1</sup>) compared to D1 (58.42 q ha<sup>-1</sup>). Among varieties, V3 and V1 exhibited relatively better tolerance by maintaining higher thermal accumulation and yield. The study demonstrates that optimum (early) sowing helps in escaping terminal heat stress by ensuring favorable thermal regimes during critical growth stages. These findings highlight the importance of sowing time adjustment as a practical strategy for sustaining wheat productivity under warming climatic conditions.

**Keywords:** Wheat, Terminal heat stress, GDD, PTU, HTU, Sowing time, Phenology, Yield

**Abstract No: B-II-018**

**Registration No:1114**

**Soil health cards: a smart pathway to climate-resilient and resource-efficient farming**

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Soil health is fundamental to agricultural productivity, environmental sustainability and long-term food security. However, unsustainable practices such as excessive use of chemical fertilizers, imbalanced nutrient application and declining organic matter have led to soil degradation and increased vulnerability of farming systems to climate variability. In this context, the Soil Health Card (SHC) Scheme, launched by the Government of India in 2015, emerges as a key intervention to promote climate-resilient and resource-efficient agriculture. With over 24.74 crore Soil Health Cards distributed, the scheme provides farmers with soil-specific information on nutrient status and crop-wise recommendations for balanced fertilization. The SHC scheme enhances resource-use efficiency by encouraging precise and need-based application of inputs, thereby reducing input costs and minimizing environmental risks. It promotes sustainable practices such as integrated nutrient management, use of organic manures, green manuring and bio-fertilizers, which improve soil structure and increase soil organic carbon. These improvements enhance water retention, reduce soil erosion and strengthen the resilience of farming systems against climate stresses such as drought and erratic rainfall. Furthermore, optimized fertilizer use contributes to lower greenhouse gas emissions, supporting climate mitigation efforts. Evidence from various regions indicates improved crop productivity, reduced fertilizer consumption and enhanced soil fertility following SHC adoption. Overall, the SHC Scheme plays a crucial role in advancing climate-resilient, resource-efficient and sustainable agricultural systems.

**Keywords:** Soil Health Card, Climate Resilience, Resource Efficiency, Sustainable Agriculture, Soil Fertility

**Abstract No: B-II-019**

**Registration No:1116**

**Evaluation of physio-biochemical and anatomical changes in Linseed genotypes under salinity stress**

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Salinity is one of the abiotic stresses that restricts plant growth in many regions of the world. In order to assess how salt stress effects growth and some physiological, biochemical and anatomical characteristics of linseed. Total five genotypes and five salinity levels (control, 6 dS<sub>m</sub><sup>-1</sup>, 8 dS<sub>m</sub><sup>-1</sup> and 10 dS<sub>m</sub><sup>-1</sup>) have taken for study. The results showed that with increasing salinity, germination percentage, plant height, leaf area index, plant fresh and dry weight decreased as compared to control. Similarly, the relative water content of leaves decreased with

increasing salinity level from control to 10 dS m<sup>-1</sup>. Total chlorophyll content, and total carotenoid content of leaves also decreased from control to 10 dS m<sup>-1</sup> salinity level. Salinity stress significantly affected the number, opening and closing of stomata. A marked increase in lipid peroxidation (MDA) was noticed in sensitive genotypes. Enzymatic activity of antioxidative enzymes increased under salinity (10 dS m<sup>-1</sup>) stress. Yield and yield attributes decreased significantly with rise in salinity levels. The above observations suggest that salinity had a negative effect on morpho-physiological and biochemical parameters, ultimately resulting in a decrease in the growth of plants. Over all it is concluded that accession no. IC0356271 is most sensitive and EC0541199 is moderate sensitive. IC0096480 and IC0510947 performed better under salinity stress so, these accessions may be considered as relatively tolerant and can be used for breeding.

**Keywords:** Salinity, linseed (*Linum usitatissimum* L.), Physiological, biochemical, anatomical, antioxidants.

**Abstract No: B-II-020**

**Registration No:1118**

### **Temporal Variation in Spectral Reflectance of *Pennisetum glaucum* under Different Row Orientations**

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A field experiment was conducted during the *kharif* season of 2022 at Hisar to study the pattern of spectral reflectance of pearl millet (*Pennisetum glaucum*) at different growth stages under varying row orientations. The experiment comprised three cultivars, HHB 299, HC 20 Composite and HHB 67 Improved, grown under two row orientations, viz., North–South (NS) and East–West (EW). The treatments were arranged in a Factorial Randomized Block Design with four replications and a plot size of 4.5 m × 4.5 m. Spectral reflectance observations were recorded at different growth stages of the crop using a field spectroradiometer across visible and near-infrared wavelength regions. The results indicated distinct variations in spectral reflectance pattern with advancement of crop growth stages. Reflectance in the visible region, particularly in the red wavelengths, decreased during the vegetative phase due to increased chlorophyll absorption, whereas near-infrared (NIR) reflectance increased with canopy development and leaf area expansion. At later growth stages, an increase in red reflectance and decline in NIR reflectance were observed due to senescence and reduction in chlorophyll content. Among row orientations, the North–South (NS) orientation exhibited higher reflectance compared to the East–West (EW) orientation at all growth stages, likely due to improved canopy development and better radiation interception.

**Abstract No: B-II-021**

**Registration No:1129**

**IMPACT OF WEATHER VARIABLES ON THE INCIDENCE AND  
POPULATION DYNAMICS OF INSECT PESTS IN PIGEONPEA  
(CAJANUS CAJAN L.)**

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Pigeonpea (*Cajanus cajan* L.) is a key pulse crop in India contributing substantially to food and nutritional security. However, its productivity is often constrained by insect pest infestations which are strongly influenced by prevailing weather conditions. To investigate these interactions a study was conducted at the AICRP on Pigeonpea GKVK Bengaluru, utilizing five years of data (2020-2024) on insect-pest incidence and meteorological parameters. Major pests considered were *Helicoverpa armigera* and *Maruca vitrata*, while minor pests included leaf webber and thrips (*Scirtothrips dorsalis*). Correlation analysis, stepwise regression and Principal Component Analysis (PCA) were employed to assess the influence of maximum and minimum temperature, relative humidity (RH I and RH II), rainfall and bright sunshine hours on insect-pest dynamics. The results indicated that *H. armigera* incidence was positively associated with maximum temperature but negatively with minimum temperature. Thrips showed a strong relationship with maximum temperature and RH II, while leaf webber was mainly influenced by minimum temperature and humidity. Rainfall exhibited a positive correlation with *M. vitrata* incidence. PCA explained 24.3-45.2% of the total variance, underscoring temperature and humidity as dominant climatic factors governing insect-pest populations. These findings highlight the critical role of weather-based pest monitoring and forecasting in strengthening integrated pest management strategies. By linking pest dynamics with meteorological variables, the study provides a scientific basis for climate-responsive pest management there by supporting sustainable pigeonpea production.

**Key words:** Pigeonpea, Stepwise regression, Correlation, Principal component analysis, Pest dynamics.

**Abstract No: B-II-022**

**Registration No:1133**

**Interactive effect of sulphur and manganese on yield of Groundnut  
(Arachis hypogaea L.)**

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An experiment entitled “Interactive effect of sulphur and manganese on yield of Groundnut (*Arachis hypogaea* L.)” was conducted at Screenhouse of Department of Soil Science, CCS Haryana Agricultural University, Hisar during 2023-24. This experiment comprised of twenty

treatments of different levels of sulphur and manganese. It was designed in Completely Randomized Design with three replications. To study the interactive effect of sulphur and manganese on yield of groundnut. Treatments included sulphur up to level 60 (S<sub>60</sub>) and manganese up to level 45 (Mn<sub>45</sub>), alone and in combination, and were compared with an unfertilized control. The results revealed a significant improvement in growth and yield attributes of groundnut with the combined application of sulphur and manganese. Among the treatments, the application of sulphur at 60 kg ha<sup>-1</sup> along with manganese at 30 mg kg<sup>-1</sup> (S<sub>60</sub>Mn<sub>30</sub>) was found to be the most effective in enhancing overall crop performance. This treatment recorded the maximum plant height (18.14 cm and 17.20 cm), number of nodules per plant (68.73 and 67.13), number of pods per plant (5.48 and 5.29), and number of kernels per plant (9.19 and 8.90), indicating improved vegetative growth and nodulation. Yield parameters were also significantly influenced by the treatments. The highest seed yield (11.17 g pot<sup>-1</sup> and 9.80 g pot<sup>-1</sup>), straw yield (39.17 g pot<sup>-1</sup> and 35.53 g pot<sup>-1</sup>), and biological yield (49.83 g pot<sup>-1</sup> and 45.47 g pot<sup>-1</sup>) were recorded under the S<sub>60</sub>Mn<sub>30</sub> treatment. The synergistic effect of sulphur and manganese may be attributed to their roles in protein synthesis, enzyme activation, chlorophyll formation, and improved nutrient uptake, which collectively enhanced crop productivity. In conclusion, the combined application of sulphur and manganese, particularly at S<sub>60</sub>Mn<sub>30</sub> level, proved to be an effective nutrient management strategy for improving growth, nodulation, and yield of groundnut under controlled conditions. These findings highlight the importance of balanced micronutrient management in achieving sustainable and resource-efficient agricultural production.

**Keywords:** Groundnut, Sulphur, Manganese, Nutrient Interaction, Yield, Soil Fertility

**Abstract No: B-II-023**

**Registration No:1135**

### **Temporal and spatial variation in rainfall pattern and drought frequency measure in Gurugram and Sonipat districts of Haryana, India**

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#### **ABSTRACT**

Climate variability is drastically impact on agriculture and food production. The main objectives of study to analyze the temporal and spatial variation in rainfall and drought frequency pattern in Gurugram and Sonipat during the period 1990-2022. The result showed that percentage departure of rainfall from normal is highly variable in last three decades. In Gurugram, it was observed that rainfall anomaly i.e. normal rainfall, above normal and below normal in January (above normal-8, below normal-25), February (7, 26), March (5,28), April (6,27), May (8, 25), June (11, 22), July (11, 22), August (14, 19), September (13, 20), October (7, 26), November (6, 27) and December (8,25). In Sonipat district, rainfall anomaly observed in January (12, 11), February (9, 24), March (8, 25), April (5, 28), May (12, 21), June (13, 20), July (13, 20), August (11, 22), September (15, 18), October (5, 28), November (5, 28) and

December (8, 25). Temporal and spatial variability of drought is calculated by Standardized Precipitation Index (SPI) for various time scales (3, 6, and 9 months) for 04 weather stations over the 1990–2022 period. SPI showed that in Gurugram SPI calculated drought frequency 3.81 % (moderate drought) and 1.2% (Extreme drought), in Sonipat 3.55 % (moderate drought), 2.03 % (Extreme drought) in time scale 3. In time scale 6, SPI showed drought frequency in Gurugram 5.37 % (moderate drought) and 2.30 % (Extreme drought), and in Sonipat 5.62 % (moderate drought), 0.76 % (Extreme drought). In time scale 9, SPI showed drought frequency in Gurugram 3.09 % (moderate drought) and 3.09 % (Extreme drought) and in Sonipat 5.92 % (moderate drought), 0.25 % (Severe drought) and 1.28 % (Extreme drought). The time scales reflect the impact of drought on the availability of the different water resources, moisture and precipitation pattern over a time scale.

**Keywords:** Rainfall pattern, Standardized Precipitation Index, Drought frequency

**Abstract No: B-II-024**

**Registration No:1137**

## **Integrating Carbon Credit Mechanisms with Agroforestry for Sustainable Rural Development in Vikshit Bharat**

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The vision of Vikshit Bharat emphasizes sustainable development, climate resilience, and enhanced rural livelihoods. In this context, integrating carbon credit mechanisms with agroforestry presents a promising pathway for achieving sustainable rural development. Agroforestry systems, which combine trees with crops and/or livestock, have significant potential for carbon sequestration both above and below ground. By capturing atmospheric carbon dioxide and storing it in biomass and soil, these systems contribute to climate change mitigation while improving soil fertility, biodiversity, and overall farm productivity.

The inclusion of carbon credit mechanisms allows farmers to monetize the environmental services provided by agroforestry practices. Through participation in carbon markets, farmers can generate additional income by selling carbon credits, thereby enhancing their economic stability. This integration not only incentivizes the adoption of sustainable land-use practices but also aligns agricultural activities with global climate goals.

However, the effective implementation of carbon credit systems in agroforestry requires supportive policies, awareness among farmers, reliable measurement and verification systems, and institutional frameworks. Addressing these challenges can unlock significant opportunities for rural communities, contributing to income diversification, ecological sustainability, and long-term resilience. Thus, the integration of carbon credit mechanisms with agroforestry can serve as a strategic approach to achieving the objectives of Vikshit Bharat by promoting sustainable agriculture, improving rural livelihoods, and supporting climate change mitigation efforts.

**Keywords:** Agroforestry, Carbon Sequestration, Carbon Credits, Sustainable Agriculture, Rural Development, Climate Change, Vikshit Bharat

**Abstract No: B-II-025**

**Registration No:1138**

**SOIL CHEMICAL HEALTH UNDER CONTRASTING LAND USE SYSTEMS IN DIFFERENTLY TEXTURED INCEPTISOLS: IMPLICATIONS FOR SUSTAINABLE AGRICULTURE AND CLIMATE RESILIENCE**

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Soil chemical properties are critical indicators of soil health and fertility. So, the present study evaluated the effect of three contrasting land use systems- Long-Term Fertilizer Experiment (LTFE), agroforestry system (poplar and shisham) and horticultural system (mango and guava) - on key soil chemical properties across two differently textured Inceptisols (sandy loam, Hisar; clay loam, Kaithal and Kurukshetra) at four depths (0–15, 15–30, 30–60 and 60–90 cm). Parameters assessed included soil pH, electrical conductivity (EC), available nitrogen (AN), available phosphorus (AP), available potassium (AK) and mineralizable soil organic carbon (MnSOC). Results revealed that soil pH increased with depth across all LUS, with sandy loam soils (8.18) being more alkaline than clay loam soils (7.96). EC was highest under poplar (0.31 dS m<sup>-1</sup>) and lowest under LTFE (0.23 dS m<sup>-1</sup>), declining with depth. LTFE consistently recorded the highest mean AN (126.3 kg ha<sup>-1</sup>), AP (15.3 kg ha<sup>-1</sup>) and MnSOC (0.56%), while shisham showed the highest mean AK (200.4 kg ha<sup>-1</sup>). Clay loam soils outperformed sandy loam soils in nutrient retention across all parameters. The three-way interaction (LUS × texture × depth) revealed peak values under LTFE in clay loam soils at 0–15 cm for AN (198.3 kg ha<sup>-1</sup>), AP (23.7 kg ha<sup>-1</sup>), AK (288.5 kg ha<sup>-1</sup>) and MnSOC (1.24%). These findings emphasize the role of integrated land management and soil texture in enhancing soil chemical fertility and promoting sustainable agriculture in the Indo-Gangetic Plains.

**Keywords:** Land use systems, Inceptisols, soil texture, available nutrients, mineralizable organic carbon, sustainable agriculture, Indo-Gangetic Plains

**Abstract No: B-II-026**

**Registration No:1140**

**Standardization of Potassium Fertilization for Yield Maximization and Quality Improvement in Fenugreek”**

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A field experiment was conducted during Rabi 2023 at ICAR-Krishi Vigyan Kendra, Hadonahalli, Bangalore Rural district, University of Agricultural Sciences, Bengaluru, to Standardization of Potassium Fertilization for Yield Maximization and Quality Improvement of Fenugreek (*Trigonella foenum-graecum* L.). The experiment was laid out in a randomized complete block design (RCBD) with 10 treatments and 4 replications, comprising graded levels of potassium (0-45 kg K<sub>2</sub>O ha<sup>-1</sup>) along with recommended doses of nitrogen and phosphorus (10:50:0 kg ha<sup>-1</sup>), farmyard manure (12.5 t ha<sup>-1</sup>) and rhizobium seed inoculation. Soil samples

were collected before sowing and after harvest to evaluate changes in physicochemical properties. Results indicated that integrated application of potassium with RDF and FYM significantly improved soil fertility as reflected by increased available nitrogen, phosphorus, potassium and O.C. content. The highest values of available N (270.68 kg ha<sup>-1</sup>), P<sub>2</sub>O<sub>5</sub> (43.99 kg ha<sup>-1</sup>) and K<sub>2</sub>O (260.23 kg ha<sup>-1</sup>) were recorded in T<sub>10</sub>. Yield and quality parameters were also markedly enhanced with increasing potassium levels. Maximum seed yield (1745.75 kg ha<sup>-1</sup>), green leaf yield (6.72 t ha<sup>-1</sup>) and crude protein content (18.40%) were observed in T<sub>10</sub>, which remained statistically at par with T<sub>8</sub> and T<sub>9</sub>. The study highlights the critical role of balanced nutrient management involving organic and inorganic sources in improving fenugreek productivity and soil health. Application of potassium at 40-45 kg ha<sup>-1</sup> along with RDF, FYM and rhizobium inoculation is recommended for achieving higher yield, better quality and sustained soil fertility under similar agro-climatic conditions.

**Abstract No: B-II-027**

**Registration No:1141**

## **EFFICACY OF PRE- AND POST-EMERGENCE HERBICIDES IN MANAGING WEEDS IN WHEAT (*TRITICUM AESTIVUM* L.)**

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Wheat (*Triticum aestivum* L.) is the second most important staple crop in India after rice, and India ranks as the second-largest wheat producer globally, after China. A variety of factors contribute to the decline in wheat productivity, among which weeds constitute one of the major constraints. Weeds compete with the crop for essential resources such as nutrients, light, moisture, and space. In addition to causing substantial yield losses, weeds increase the cost of cultivation, reduce input-use efficiency, and hinder agricultural operations. A field experiment was conducted during the *Rabi* seasons of 2018-19 and 2019-20 to manage weed infestation using a randomized block design with sixteen treatments and three replications. The treatments included pendimethalin (1500 g/ha), aclonifen + diflufenican (RM) (1000 + 200 g/ha), pyroxasulfone + pendimethalin (TM) (127.5 + 1500 g/ha), mesosulfuron + iodosulfuron (RM) (14.4 g/ha), sulfosulfuron + metsulfuron (RM) (32 g/ha), pinoxaden + metsulfuron (TM) (64 g/ha), and clodinafop + metribuzin (60 + 175 g/ha), applied either as mixtures or in sequences. Pre-emergence herbicides were applied immediately after sowing, while post-emergence herbicides were applied at 30–35 days after sowing. The pre-emergence application of pyroxasulfone + pendimethalin (127.5 + 1500 g/ha), followed by sequential application of pinoxaden + metsulfuron (64 g/ha) and post-emergence application of mesosulfuron + iodosulfuron (14.4 g/ha), proved to be the most effective weed management strategy, providing ≥79 per cent control of total weeds. This treatment also resulted in significantly higher grain yield (5452–5605 kg/ha), representing an increase of 44.4–54.4 per cent over the weedy check.

**Keywords:** Herbicide mixtures, Pyroxasulfone, Sequential application, Weed management

**Abstract No: B-II-028**

**Registration No:1146**

**STUDY OF WHITEFLY POPULATION BUILD UP UNDER VARIOUS MICROCLIMATIC CONDITIONS IN COTTON CROP**

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Cotton (*Gossypium spp.*), widely known as “White Gold,” is a crucial cash and fiber crop, with India playing a major role in global production. Whitefly (*Bemisia tabaci*) infestation has become a significant constraint, strongly influenced by microclimatic conditions. To examine this relationship, a field experiment was conducted during the *kharif* 2024 season at CCS HAU, Hisar. Two irrigation regimes: Recommended irrigation (I<sub>1</sub>) and low irrigation (I<sub>2</sub>) were tested across five cultivars (ACH-177-2, Ankur-555, Tata Diggaj, RCH-773, and MRC-7365). Weekly monitoring of adult whiteflies on tagged plants enabled correlation analyses with meteorological parameters. Infestation was consistently higher under low irrigation, indicating that water stress favors pest survival and reproduction. Cultivar ACH-177-2 recorded the highest peak population (20.3 adults/plant under I<sub>2</sub>), while Tata Diggaj showed the lowest (8.2 adults/plant). Correlation analysis revealed negative associations of whitefly population with maximum temperature, rainfall, evening relative humidity and wind speed, whereas positive correlations were observed with minimum temperature, morning relative humidity, and bright sunshine hours. These results suggest that warm, humid nights promote whitefly buildup, while daytime heat and rainfall suppress it. The findings support earlier reports that drought stress exacerbates insect pest pressure by weakening plant defenses and that seasonal weather factors strongly influence pest dynamics. This study highlights the importance of integrating microclimatic monitoring into Cotton pest management. By identifying cultivar-specific responses and critical weather parameters, the research provides valuable insights for developing climate-resilient strategies to safeguard Cotton productivity under increasing climatic variability.

**Keywords:** Cotton, White fly, Microclimate, Correlation, Climate-resilient

**Abstract No: B-II-029**

**Registration No:1162**

**Integrated weed management approaches for sustainable wheat production**

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Wheat's status as a staple crop makes effective weed control critical for food security. Conventional practices- heavy herbicide use, frequent plowing- control weeds but can harm soil,

water and foster herbicide resistance (McCauley et al., 2022; Sharma et al., 2025). Sustainable weed management therefore emphasizes a diversity of tactics. Cultural controls like crop rotation, cover crops and stale seedbeds reduce weed seed banks (Sharma et al., 2021); mechanical weeding and conservation tillage preserve soil health; and precision herbicide use or new non-chemical tools (robotic removal, thermal weeders) target weeds with minimal collateral damage (McCauley et al., 2022; Das et al., 2025). Breeding or selecting wheat varieties that emerge early, establish a dense canopy, or have allelopathic traits can suppress weeds biologically (Lebreton et al., 2025). Climate change and evolving weed floras add urgency: warmer conditions and altered rainfall may shift weed pressure, so flexible, site-specific IWM (integrated weed management) strategies are essential. Recent advances in sensors, AI and robotics offer “smart” weeding (e.g. camera guided robots) that could slash chemical use in future (Das et al., 2025). Yet trade-offs exist: non-chemical methods may demand more labor or new investments, and long-term economics must be assessed. Large knowledge gaps include how to breed truly weed-competitive wheat at scale, how climate variability will alter weed dynamics, and how to make advanced tech affordable in developing regions. Overall, moving beyond sole reliance on chemicals toward agroecological, precision and integrated strategies offer a path to sustainable wheat production (McCauley et al., 2022; Sharma et al., 2021; Lebreton et al., 2025). Effective policy and extension can accelerate adoption by training farmers in IWM, subsidizing conservation practices, and supporting development of green weeding technologies (Sharma et al., 2025; Das et al., 2025).

**Key words:** Sustainability, wheat, weed, integrated weed management.

**Abstract No: B-II-030**

**Registration No:1165**

### **Physiological optimization of late sown Indian mustard with the application of biostimulants**

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Climate change has emerged as a critical challenge on agricultural productivity and threatens the food and nutritional security of the country. Delayed sowing of Indian mustard exposes the crop to high temperature at critical developmental stages, which is the primary imperative at germination as well as at grain filling stage due to vulnerability during pollen germination, grain development leading to decrease in crop yield because of reduced photosynthetic efficiency and forced maturity. Biostimulants improves physio-biochemical metabolism, improving growth, development and aiding stress mitigation through antioxidant system enhancement. The experiment observed the effects of nitrophenolates and triacontanol biostimulants application on physio-biochemical responses of late sown Indian mustard variety RH 1424 during rabi season of 2023-24. Biostimulants treatment significantly enhanced transpiration rate and decreased canopy temperature by 27.8% and 0.9% respectively, with treatment triacontanol 1ml/L. Improved plant water status is correlated positively with the transpiration rate demonstrating thermal regulation and a negative correlation with canopy temperature showing evaporative cooling under high temperature stress, resulting in better photosynthetic efficiency and metabolic activity. The results demonstarted that the foliar

applied biostimulants, especially at lower concentrations, performed better over control morpho-physiological, and yield components of Indian mustard under late sown conditions.

Keywords: Biostimulants, canopy temperature, evaporative cooling, transpiration.

**Abstract No: B-II-031**

**Registration No:1174**

### **Effect of probiotics on haematological parameters of common carp in biofloc system**

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Study of haematological parameters can be used as an important index to observe the physiological and pathological alterations in fish to detect the fish health. In this study, the erythrocyte count, leucocytes (WBC), haemoglobin, packed cell volume was significantly different between the probiotic's treatment and control group. A higher number of red blood cells (RBC) in probiotic-fed fish results in an increased concentration of haemoglobin, which ultimately enhances the fish oxygen-carrying capacity. The mean total erythrocyte count in the present study was found significantly increased in probiotic treated fish ( $1.79 \times 10^6$  cells/mm<sup>-3</sup>) as compared to control ( $1.67 \times 10^6$  cells/mm<sup>-3</sup>) group. In the present study, the total WBC count showed a significantly higher value in treatment when compared with the control. Likewise, in the present study haemoglobin content and packed cell volume of probiotic treatment (22.70%) also significantly differed from the control group (20.67%), respectively.

**Keywords:** Probiotic, biofloc, haematology, fish health.

**Abstract No: B-II-032**

**Registration No:1176**

### **FUNCTIONAL CHARACTERIZATION OF RHIZOSPHERIC BACTERIA FROM GRAFTED AND NON-GRAFTED CUCUMBER**

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Cucumber (*Cucumis sativus* L.) is an economically important vegetable crop widely cultivated under protected environments for higher yield and quality. However, intensive cultivation practices and the continuous use of chemical fertilisers may have adverse effects on soil health and nutrient balance. In this context, rhizospheric bacteria play a crucial role in enhancing nutrient availability, promoting plant vigour, and contributing to sustainable crop production. The present study was undertaken to investigate rhizospheric bacteria associated with grafted and non-grafted cucumbers grown under polyhouse conditions. Rhizospheric soil samples were collected from grafted as well as non-grafted cucumber and bacterial isolation was done using respective media for phosphate-solubilising bacteria, nitrogen-fixing bacteria, and other PGPR.

The isolates were characterised using standard biochemical and functional assays. Comparative evaluation revealed variability among isolates for agriculturally important traits. Phosphate-solubilising isolates obtained from grafted cucumber rhizosphere exhibited relatively higher solubilization efficiency than those from non-grafted cucumber, indicating a possible influence of grafting on functional rhizospheric microflora. Bacteriocin activity was evaluated by agar well diffusion assay, in which isolates G-19, G-38, NG-33, NG-28, G-58, and G-57 exhibited higher antagonistic activity, whereas isolates G-49, G-50, NG-51, and NG-52 showed no inhibition. Preliminary molecular identification based on 16S rRNA analysis revealed the presence of bacterial taxa affiliated with *Azotobacter chroococcum*, *Azospirillum brasilense*, *Bacillus megaterium*, and *Pseudomonas fluorescens*. The study provides a useful basis for further selection and evaluation of promising bacterial isolates for improving cucumber productivity under polyhouse conditions.

**Keywords:** Cucumber, Grafting, Phosphate solubilization, PGPR and Sequencing.

**Abstract No: B-II-033**

**Registration No:1184**

## **AGRI-NANOTECHNOLOGIES: AN EMERGING SOLUTION FOR IMPROVING CROP PERFORMANCE UNDER ABIOTIC STRESS**

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Abiotic stress, such as drought, salinity, and high temperature, has significantly reduced the global crop productivity. Nano fertilizers and carbon-based nanomaterials are some of the recent agri-nanotechnologies that enable plants to survive under global climate change. These technologies improve plant resilience by improving nutrient-use efficiency, regulating stress-responsive genes, and promoting growth and yield under adverse conditions. Recent studies highlight the potential of agri-nanotechnologies as an ideal candidate for sustainable agriculture by increasing the efficiency of inputs and reducing input losses. Integrating nanotechnology with agriculture helps to mitigate oxidative damage, maintain ion homeostasis, and strengthen plant defense mechanisms. Agri-nanotechnologies are efficient tools to improve crop productivity by improving crop growth, yield, and quality. Agri-nanotechnologies, compared to their conventional methods, not only maximize crop adaptation to changing climatic conditions but also reduce GHG emissions from the agriculture sector, offering ecological and environmental sustainability. Overall, this helps to understand the role of nanofertilizers and carbon-based nanomaterials as a promising strategy in improving abiotic stress tolerance and ensuring food requirements for the global population.

**Keywords:** Nanofertilizers, carbon-based nanomaterials, sustainable agriculture, crop productivity

**Abstract No: B-II-034**

**Registration No:1185**

**Integrated application of bio-fertilizers and nano-fertilizers in summer greengram**

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An experiment was carried out at the Agronomy Research Farm, Department of Agronomy, CCSHAU, Hisar, to evaluate the effect of bio-fertilizers and nano-fertilizers on the seed yield and economics of greengram during the summer of 2024. The crop variety MH 1762 was grown using a factorial randomized block design. The study comprised three experimental factors: (i) fertilizer doses, including 75% and 100% of the recommended dose of fertilizers (RDF); (ii) seed treatments, namely Rhizobium alone, Rhizobium combined with Biophos (5 ml kg<sup>-1</sup> seed) + Biozinc (5 ml kg<sup>-1</sup> seed), and NPKZn microbial consortia (50 g kg<sup>-1</sup> seed); and (iii) foliar applications involving NPK (19:19:19), Nano DAP and Nano urea applied at pre-flowering and pod initiation stages. The results revealed that the integration of 75% RDF with seed inoculation of Rhizobium @ 50 g + Biophos @ 5 ml + Biozinc @ 5 ml per kg seed, along with foliar application of Nano DAP @ 0.4% at pre-flowering and pod initiation stages, proved to be the most effective and economically beneficial treatment. This combination resulted in a grain yield of 1012 kg ha<sup>-1</sup>, the highest net return of ₹49,332 per hectare, and a maximum benefit–cost ratio of 2.28, while also reducing overall fertilizer costs. The study concludes that integrating nano scale nutrient delivery with microbial bio-inoculants offers a transformative pathway for sustainable pulse production. This integrated approach optimizes resource use efficiency through technology driven, climate resilient agriculture.

**Keywords:** *Biofertilizers, Nanofertilizers and Resource use efficiency*

**Abstract No: B-II-035**

**Registration No:1192**

**Screening of linseed genotypes for salinity tolerance based on biochemical traits**

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Salinity is one of the most severe abiotic stresses limiting crop productivity by inducing osmotic and oxidative damage in plants. Linseed (*Linum usitatissimum* L.) belongs to the family Linaceae. It is an important rabi oilseed crop, particularly sensitive to salinity during early growth stages. The present study was undertaken to evaluate the biochemical responses of linseed genotypes under salinity stress and to identify tolerant and susceptible groups. Initially, fifty genotypes were screened under three salinity levels (0, 8 and 10 dS m<sup>-1</sup>). Based on their overall performance, four genotypes were categorized as most salt tolerant and four as most

susceptible, which were further studied along with a check variety. Salinity stress resulted in a significant increase in proline accumulation, indicating its role in osmotic adjustment and stress tolerance. A marked rise in hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and malondialdehyde (MDA) content was observed in both shoots and roots with increasing salinity, reflecting enhanced oxidative stress and membrane lipid peroxidation, especially in susceptible genotypes. To counteract this oxidative damage, the activities of antioxidant enzymes including superoxide dismutase (SOD), catalase (CAT), peroxidase (POX), ascorbate peroxidase (APX) and glutathione reductase (GR) increased significantly at 10 dS m<sup>-1</sup>. Tolerant genotypes showed a stronger induction of these enzymes compared to susceptible ones, indicating a more efficient antioxidant defense system. In contrast, non-enzymatic antioxidants such as ascorbate (AsA) and glutathione (GSH) declined under severe salinity, suggesting their utilization in scavenging reactive oxygen species. Overall, tolerant genotypes maintained lower MDA levels, higher proline content and stronger antioxidant activity than susceptible genotypes. Among them, accessions IC0268344 and IC0499192 performed better under salinity stress and may be considered relatively salt tolerant for future studies.

**Keywords:** Linseed, salinity stress, proline, antioxidant enzymes, oxidative damage

**Abstract No: B-II-036**

**Registration No:1194**

## **CLIMATE-SMART AND RESOURCE-EFFICIENT FARMING SYSTEMS: A PATHWAY TO SUSTAINABLE AGRICULTURE**

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Climate change poses significant challenges to global agriculture, threatening food security, natural resource sustainability and farmer livelihoods. The need for climate-resilient and resource-efficient farming systems has become increasingly critical to ensure sustainable agricultural production. This study explores the integration of traditional ecological knowledge with modern scientific approaches to develop sustainable and climate-smart farming systems. Emphasis is placed on efficient water and nutrient management, conservation agriculture practices, soil health improvement and the adoption of smart resource-use technologies. The paper highlights how blending indigenous farming practices with advanced innovations such as nano-fertilizers, precision agriculture and integrated farming systems can enhance resource use efficiency while reducing environmental degradation. Efficient management of water, energy and nutrients not only improves productivity but also minimizes losses through leaching, volatilization and runoff. Additionally, diversified farming systems, including crop-livestock-fish integration are discussed as viable strategies for increasing resilience against climatic variability. The findings suggest that adopting a holistic approach that combines ecological principles with technological advancements can significantly improve sustainability, profitability, and resilience of farming systems. Policy support, farmer awareness, and capacity building are essential for large-scale adoption of these practices. This study contributes to the ongoing discourse on sustainable agriculture by providing insights into scalable and adaptable strategies for climate-resilient farming.

**Keywords:** Climate resilience, resource-use efficiency, sustainable agriculture, conservation agriculture, integrated farming systems, nano-fertilizers, soil health

**Abstract No: B-II-037**

**Registration No:1196**

## **Comparative Assessment of Wastewater and Tubewell Water Quality for Agricultural Use in South Haryana**

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The present study was conducted to evaluate the chemical and biological composition of Gurgaon canal wastewater and compare it with tubewell water across six blocks—Sohna, Nuh, Punhana, Ferozpur Jhirka, Hathin, and Hodal—of Gurugram, Mewat, and Palwal districts. The analysis revealed that wastewater exhibited comparatively higher values of pH (7.46–8.84), electrical conductivity (1.22–3.12 dS m<sup>-1</sup>), total dissolved solids (840–1850 mg L<sup>-1</sup>), biological oxygen demand (28–47 mg L<sup>-1</sup>), and chemical oxygen demand (83–109 mg L<sup>-1</sup>) than tubewell water. Similarly, concentrations of major cations (Na<sup>+</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup>, K<sup>+</sup>) and anions (HCO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup>) were significantly higher in wastewater, indicating its enriched nutrient status. Furthermore, wastewater contained elevated levels of micronutrients (Zn, Cu, Fe, Mn), suggesting its potential use in agriculture as a nutrient source. However, higher concentrations of heavy metals such as Cd, Cr, Pb, and Ni in wastewater raise concerns regarding long-term soil health and food safety. In contrast, tubewell water exhibited relatively lower ionic and metal concentrations, making it safer for irrigation. Overall, the study highlights the dual role of wastewater as both a nutrient-rich resource and a potential environmental risk, emphasizing the need for proper monitoring and management before its agricultural utilization.

**Keywords:** Wastewater irrigation; Water quality assessment; Nutrient enrichment; Irrigation suitability.

**Abstract No: B-II-038**

**Registration No:1200**

## **Evaluation of weed management practices in finger millet (*Eleusine coracana* (L.) Gaertn)**

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A field experiment was conducted during the *Kharif* season of 2024-25 to study the effects of herbicides, cultural practices and mustard residue mulch on the growth and yield of finger millet (ragi) through weed suppression at Research farm of Department of Agronomy, CCS Haryana Agricultural University, (Haryana). The experiment was laid out in Randomized Block Design with thirteen treatments replicated thrice. Observations were taken on weeds, crop growth, yield attributes, yield and economic parameters. The experimental field was characterized by a heterogeneous weed flora comprising grassy (45%), broad-leaved weeds (40%) and sedges (15%). Treatments with two hand weedings (HW), oxyfluorfen @ 0.12 kg a.i. ha<sup>-1</sup> pre-emergence (PE) followed by one hand weeding, and isoproturon @ 0.5 kg a.i. ha<sup>-1</sup>

PE followed by one hand weeding provided effective control of mixed weed flora comprising grasses, broad-leaved weeds, and sedges. However, despite their effectiveness, these treatments were less economical due to higher labour costs. The highest grain yield of 19.46 quintals per hectare was recorded in the treatment with two hand weedings. The highest B:C ratio (2.10) was recorded under oxyfluorfen @ 0.12 kg a.i ha<sup>-1</sup> PE fb 2,4-D Na salt @ 0.75 kg a.i ha<sup>-1</sup> post emergence (PoE), indicating economically better among all treatments.

**Keywords:** Weeds, Finger millet, Herbicide, Yield, Oxyfluorfen

**Abstract No: B-II-039**

**Registration No:1213**

### **Comparative study of swelling kinetics of a peanut shell-derived hydrogel in distilled and tap water**

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A sustainable peanut shell-derived hydrogel was synthesized via graft polymerization of acrylic acid onto lignocellulosic biomass, followed by chemical crosslinking to develop a three-dimensional hydrophilic network. The swelling behaviour of the prepared hydrogel was evaluated in distilled water and tap water to assess the influence of ionic strength and dissolved solutes on its performance. The equilibrium swelling ratio of the hydrogel in distilled water was found to be (420 ± 15 g/g), whereas a significantly lower value of (285 ± 12 g/g) was observed in tap water. The reduction in swelling capacity (~32%) is attributed to the presence of dissolved electrolytes (e.g., Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>) in tap water, which decrease the osmotic pressure gradient and induce charge screening of ionizable functional groups (COOH, -OH) within the polymer network. Furthermore, multivalent cations contribute to additional ionic crosslinking, restricting network expansion. The developed hydrogel exhibits promising potential for applications in water retention, soil conditioning, and controlled release systems, particularly in environments with varying water quality.

**Keywords:** Peanut shell hydrogel, Lignocellulosic biomass, Graft polymerization, Swelling behaviour, Equilibrium swelling ratio, Ionic strength, Distilled water, Tap water, Charge screening effect, Sustainable materials, Water retention

**Abstract No: B-II-040**

**Registration No:1216**

### **Nature-derived solutions: Biosurfactants for sustainable and climate-resilient agriculture**

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The term “surfactant” derived from “surface active agents”, which are molecules that adsorb on the water–surface interface and lower the surface tension of water to improve the cleaning of surfaces. Synthetically produced chemical surfactants are toxic and nonbiodegradable,

which causes severe problems with their disposal, whereas biosurfactants which are produced by bacteria, yeasts and fungi that are distinguished on the basis of their amphiphilicity, environmental compatibility and capacity to work in adverse environmental conditions. Biosurfactant are the green alternative of chemical surfactants which are synthesized from renewable sources, less toxic, biodegradable and can possibly a good as well as ecofriendly alternative to chemical pesticides and other agrochemicals. Chemical insecticides, fungicides, fertilizers, and high-breeding crop varieties are commonly used to increase crop yield. However, excessive chemical use and their persistence in the environment for long time have negative impacts on soil, water and air which disrupting the food chain and ecosystem. On the other hand, biosurfactant can be used as biopesticides to control pests, diseases, phytopathogenic fungi, and weeds. They also boost plant immunity and are used for soil hydrophilization, which ensures adequate moisture levels and consistent fertilizer distribution. Application of biosurfactant (with 0.5% and 1% concentrations) improved seed germination percentage, plant growth parameters and Stay-Green traits of wheat crop in abiotic stress conditions significantly. Conclusively, the use of biosurfactants as compare to chemical surfactant is a novel, sustainable and biologically coordinated technique for improving plant tolerance capacity towards abiotic stress conditions while also contributing to the restoration of degraded ecosystems due to excess use of chemicals in the form of fertilizer, pesticides and other yield enhancement supplements.

**Keywords:** Biosurfactant, Biodegradable, Abiotic stress, Ecofriendly, Sustainable, Restoration

**Abstract No: B-II-041**

**Registration No:1221**

### **Assessing regional variability in training needs for drone-based technology adoption through PCA and hierarchical clustering**

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The study analyzed the training needs related to drone-based technologies (DBT) among progressive farmers in Haryana and Tamil Nadu, with a total sample of 120 respondents. A comparative analytical approach was employed using the Mann–Whitney U test to assess differences in training demand, while Principal Component Analysis (PCA) and hierarchical clustering (dual dendrogram analysis) were used to examine the structural dimensions of training needs. The Mann–Whitney U test revealed a highly significant difference between the two states ( $U = 556.5$ ,  $Z = -6.910$ ,  $p < 0.001$ ), indicating substantial regional variation in training requirements. PCA identified distinct factor structures: five components in Haryana explaining 88.27% of the total variance, and four components in Tamil Nadu explaining 82.36% of the variance. Thematic analysis indicated that core operations and benefits, support and training, precision applications, and safety protocols were consistently important across both states. However, regulatory and legal aspects emerged as a significant component in Haryana (factor loading = 0.65) but were absent in Tamil Nadu. Dual dendrogram analysis further supported these findings, with Haryana showing well-defined hierarchical clusters, while Tamil Nadu exhibited a more consolidated structure. The study highlights significant regional differences in both the magnitude and structure of training needs. The findings provide

an empirical basis for designing context-specific, tiered training interventions to enhance effective adoption of drone-based technologies in agriculture.

**Keywords:** Comparative analysis, Drone technology adoption, Dual-dendrogram, PCA, Training needs

**Abstract No: B-II-042**

**Registration No:1223**

**Exploring host plant resistance in desi cotton genotypes to *Meloidogyne incognita***

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Screening of desi cotton genotypes for resistance to root-knot nematode (*Meloidogyne incognita*) was conducted to identify potential sources of resistance for breeding programs. A total of 100 genotypes were evaluated under controlled conditions. One week after germination, each plant was inoculated with 1000 freshly hatched second-stage juveniles (J2) of *M. incognita*. The inoculum was carefully applied to exposed roots to ensure uniform infection, followed by soil covering and light irrigation to maintain optimal moisture. The response of genotypes was assessed based on the Root-Knot Index (RKI) using a 1–5 scale, where 1 indicates highly resistant and 5 indicates highly susceptible reaction. The results revealed considerable variability among genotypes. Eight genotypes, namely 0479, G 23, Garovilli, H 1, H 52-519, HD 379, N-W-1, and RA 1, exhibited resistant (R) reactions. Twenty-seven genotypes showed moderate resistance (MR), indicating partial tolerance to nematode infection. However, a majority of the genotypes (48) were classified as susceptible (S), while 17 genotypes were found to be highly susceptible (HS), showing severe galling and nematode infestation. The predominance of susceptible genotypes highlights the vulnerability of desi cotton germplasm to *M. incognita*. Nevertheless, the identified resistant and moderately resistant genotypes can serve as valuable genetic resources for developing nematode-resistant cultivars. These findings emphasize the importance of incorporating host plant resistance as a sustainable and eco-friendly strategy for managing root-knot nematode in cotton.

**Keywords:** *Meloidogyne incognita*; resistance; Garovilli; Desi Cotton

**Abstract No: B-II-043**

**Registration No:1225**

### **Unveiling and prioritizing crop and dairy constraints faced by scheduled caste households**

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Agriculture and dairy farming are the primary livelihood sources for rural households in arid regions of India, particularly among marginalized communities. However, these sectors are constrained by multiple production, institutional, and market-related challenges. The present study aimed to identify and prioritize key constraints affecting crop and dairy enterprises among Scheduled Caste households in arid districts of Rajasthan. An ex-post facto research design was adopted, and data were collected from 240 respondents using a structured interview schedule. The Analytical Hierarchy Process (AHP) was applied to rank constraints based on their relative importance. The findings revealed that crop production is mainly constrained by environmental and input-related factors, with rainfall variability and high irrigation costs being the most critical. Marketing issues such as delayed payments and price instability, along with limited access to credit and extension services, further aggravate the situation. In dairy farming, breeding-related challenges, particularly poor heat detection and limited artificial insemination services, emerged as the most severe constraints. Feeding issues, including high feed costs and fodder scarcity, ranked next, followed by inadequate veterinary services and weak market linkages. The study concludes that addressing these interconnected constraints through climate-resilient technologies, improved extension services, accessible credit, and efficient market systems is essential for enhancing productivity and livelihood security in arid regions.

**Keywords:** Analytical Hierarchy Process (AHP), Crop and Dairy constraints, Scheduled Caste farmers, Arid region, Livelihood security

**Abstract No: B-II-044**

**Registration No:1226**

### **Empowering climate-resilient farming through AI and IT innovations**

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The integration of Information Technology (IT) and Artificial Intelligence (AI) in agriculture has emerged as a transformative approach for achieving climate-resilient and sustainable food production. Recent studies emphasize how AI-driven data analytics, machine learning, Internet of Things (IoT), and remote sensing technologies are revolutionizing precision agriculture by enabling real-time monitoring and adaptive decision-making. Climate variability and resource constraints have accelerated the adoption of intelligent systems for soil health assessment, crop growth modeling, pest and disease prediction, and smart irrigation management. IT-enabled platforms enhance data collection and interpretation from sensors, drones, and satellites, facilitating region-specific climate adaptation strategies and efficient resource utilization. This review compiles and synthesizes pre-published research highlighting the potential of AI and IT

tools to minimize yield gaps, optimize input use, and improve resilience against droughts, floods, and other climate-induced stresses. The paper also discusses challenges such as data interoperability, model accuracy under variable conditions, and the need for farmer-centric digital infrastructures. Overall, the integration of AI and IT forms the cornerstone of climate-resilient precision agriculture, driving innovation toward sustainable and intelligent agri-management systems for the future.

**Keywords:** Artificial Intelligence (AI), Precision Agriculture, Climate Resilience, Internet of Things (IoT), Sustainable Agriculture

**Abstract No: B-II-045**

**Registration No:1234**

### **Effect of vermicompost and fertilizer levels on economics of barley under alternate furrow irrigation method**

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A field experiment was conducted to study effect of vermicompost, fertilizer levels on economics of barley (*Hordeum vulgare* (L.)) under furrow irrigation method at Research farm of Department of Agronomy, CCS Haryana Agricultural University, (Haryana) during winter season, 2021-22. The experiment was laid out in split plot design with three replications. The findings revealed that increasing vermicompost levels increased gross returns, net returns and B: C ratio progressively. Among different vermicompost levels, maximum gross returns (₹148582), net returns (₹78274) and B:C ratio (2.11) was recorded with application of vermicompost @ 3.0 t ha<sup>-1</sup>, which was 9.33, 10.93, 12.41 and 1.44 per cent higher, respectively over vermicompost @ 1.5 t ha<sup>-1</sup>. Among different treatments, maximum gross returns (₹129376), net returns (₹63068) and B:C ratio (1.95) recorded with every furrow irrigation, which was 15.52, 25.66 and 12.95 per cent higher, respectively over alternate furrow irrigation method. Among different fertilizer levels, maximum gross returns (₹148566), net returns (₹80418) and B:C ratio (2.18) recorded with application of fertilizer at N<sub>40</sub>P<sub>20</sub> level, which was 13.72, 24.49 and 10.10 per cent higher, respectively over fertilizer at N<sub>40</sub>P<sub>20</sub>.

**Abstract No: B-II-046**

**Registration No:1237**

### **Role of different organic composites on the soil properties and growth of Zea maize**

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Soil is termed as the mother of the Earth because it nourishes the whole world in different ways. Day by day, excessive use of soil for human requirements and the application of chemical fertilizers reduce soil fertility. That's not only reduces crop productivity but also enhances hazardous and inorganic components in our food chain through root absorption. The present

investigation was planned to study the traditional methods employed in ancient India to conserve soil, as well as to find out the role of different soil composites. Four maize genotypes (HM-10, HQPM-5, HM-4, and J-1006) were evaluated with Completely Randomized Design (CRD) and three replications in the herbal garden of Baba Mastnath University, Rohtak (28.87° N, 76.66° E). Seven treatments viz., T0 (Control), T1 (Compost), T2 (Vermicompost), T3 (Biochar), T4 (Green Manure), T5 (Bio-fertilizer), and T6 (Combined treatment: Compost + Vermicompost + Biochar + Green Manure + Bio-fertilizer) and soil parameters such as soil pH, electrical conductivity, water holding capacity, total organic carbon, available nitrogen, phosphorus, potassium, plant height, cob length, number of cobs per plant, total number of seeds per cob and grain yield were evaluated under both drought and control conditions. Initial soil properties were uniform (pH-7.8, EC-0.42dS/m, WHC-38.5%, TOC-0.48%, N-210kg/ha, P-18.5kg/ha, K-185kg/ha). After harvesting, the combined treatment (T6) significantly improved soil health with pH (7.3<sup>a</sup>), WHC (47.5<sup>a</sup>%), TOC (0.80<sup>a</sup>%), and available N (265<sup>a</sup> kg/ha), P (27.5<sup>a</sup> kg/ha), and K (235<sup>a</sup> kg/ha), compared to control (T0). Among genotypes, HQPM-5 exhibited the highest growth and yield performance, followed by HM-10, J-1006 and HM-4. The maximum plant height was (210<sup>a</sup>cm), cob length (22.0<sup>a</sup>cm), cobs per plant (2.3<sup>a</sup>), seeds per cob (470<sup>a</sup>), and grain yield (165<sup>a</sup> g/plant) were recorded in HQPM-5 under Combined treatment: Compost + Vermicompost + Biochar + Green Manure + Bio-fertilizer (T6). T6 identifying it as the best genotype treatment combination. Generally, this study deeply rooted with the Indian sculpture of agriculture system and it offers a sustainable approach to restoring soil health and enhancing crop productivity under stress conditions.

**Keywords:** IKS, Soil Health, Maize, Organic Composites and Sustainable Crop Protection

**Abstract No: B-II-047**

**Registration No:1243**

### **Reducing water footprint in cotton for sustainable production through precision irrigation under semi-arid condition**

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Water scarcity and declining groundwater levels pose significant challenges to sustainable agriculture, particularly in semi-arid regions like Punjab, India, where irrigation accounts for a major share of water use. This study evaluates the impact of different irrigation methods on seed cotton yield and water footprint (WF) in Faridkot district during 2014–2022. Field experiments were conducted at Punjab Agricultural University, Regional Research Station, comparing surface flood irrigation with precision irrigation techniques, including surface drip (SD), subsurface drip (SSD), and subsurface drip fertigation (SSDF) under varying crop evapotranspiration (ET<sub>c</sub>) levels. The results revealed substantial differences in water use efficiency and productivity among irrigation methods. Surface flood irrigation recorded the lowest seed cotton yield (2458 kg ha<sup>-1</sup>) and the highest WF (4.41 m<sup>3</sup> kg<sup>-1</sup>), indicating inefficient water use. Surface drip irrigation showed moderate improvement, with yield increasing to 2553

kg ha<sup>-1</sup> and WF reducing to 2.80 m<sup>3</sup> kg<sup>-1</sup>. A significant enhancement was observed under subsurface drip systems, where yield reached 3201 kg ha<sup>-1</sup> with the lowest WF (2.45 m<sup>3</sup> kg<sup>-1</sup>). The highest yield (3598 kg ha<sup>-1</sup>) was achieved under SSDF with 25 cm lateral depth and 30 cm emitter spacing, accompanied by a low WF (2.56 m<sup>3</sup> kg<sup>-1</sup>). However, increasing lateral depth (30 cm) or emitter spacing (40 cm) reduced yield and increased WF, highlighting the importance of optimal system design. Overall, the study demonstrates that precision irrigation, particularly optimized subsurface drip fertigation, significantly enhances water productivity and crop yield, offering a sustainable solution for water conservation in cotton-based systems.

**Abstract No: B-II-048**

**Registration No:1244**

### **Detection and Degradation of Broflanilide via MIPs**

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Broflanilide, a new meta-diamide insecticide, is being used more and more in modern farming because it works so well against pests that are hard to kill. However, it is necessary to create sensitive detection methods and fully understand how it breaks down in agro-ecosystems because it lasts a long time and could harm the environment. This work presents the production and application of molecularly imprinted polymers (MIPs) as selective recognition elements for the detection of broflanilide in soil matrices and cabbage, along with an analysis of its degradation dynamics. Molecular imprinting is a technique which creates stable synthetic polymers possessing tailor-made selective recognition sites, obtained using high amount of cross linker in the presence of template molecule. Once polymerization is over, removal of template from polymer leaves specific cavities which can rebind template selectively on the basis of shape, size and functionality. The advantages of molecular imprinting polymer are the stability at extreme of pH and temperature, ease of preparation, low cost and reusability. The combination of MIP-based detection and degradation analysis gives a complete way to keep track of broflanilide residues in farming systems. This plan has a lot of potential to make sure that food is safe and the environment is protected. The results support long-term methods for controlling pests and help to improve selective sensing technology.

**Keywords:** Molecular Imprinted Polymers, Broflanilide, Modern farming, Insecticide, Soil matrices, Agro- ecosystems

**Abstract No: B–II-049**

**Registration No:1250**

**High-resolution digital mapping of soil fertility dynamics in perennial fruit systems**

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A geospatial soil fertility assessment integrating Geographic Information System (GIS) tools and multi-depth laboratory analyses was conducted within an experimental orchard across two phases (2023–2025). The study digitized spatial datasets to develop high-resolution thematic maps, characterizing the nutrient dynamics of prolonged fruit-crop systems. The pedospheric environment was predominantly alkaline (pH 7.8-8.5) and non-saline, though localized salinity was identified in specific aonla-cultivated zones. Geostatistical analysis revealed significant variability in soil organic carbon (up to 0.90%), with 52% of the study area categorized as low. Macronutrient profiling exposed a critical, uniform deficiency in available nitrogen (104-198 kg ha<sup>-1</sup>) across 100% of the samples. In contrast, available phosphorus showed moderate sufficiency (61% medium), and potassium reserves were robust, with 96% of the area testing high (220-540 kg ha<sup>-1</sup>). Micronutrient mapping identified significant deficiency hotspots for iron and zinc, with 77% and 44% of samples falling below critical thresholds, respectively. Conversely, manganese and copper levels remained largely sufficient for perennial growth. The integration of GIS-based digital classification facilitated a precise diagnostic interpretation of the orchard's nutritional status. These findings underscore the efficacy of digital soil mapping as a robust decision-support framework. By transitioning from conventional blanket applications to site-specific nutrient management (SSNM), this research provides a data-driven baseline essential for precision horticulture and the advancement of sustainable productivity in managed orchard ecosystems.

**Keywords:** GIS mapping, orchard soils, nutrient status

**Abstract No: B–II-050**

**Registration No:1263**

**Efficacy of microbial and non-microbial biostimulants in mitigating thermally induced physiological disruptions in chickpea (*Cicer arietinum* L.)**

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Chickpea (*Cicer arietinum* L.) is a cornerstone of global food security, providing vital protein and micronutrients; however, its productivity in regions like Haryana is increasingly threatened by high-temperature stress (>30°C), which causes irreversible damage to thylakoid membrane, induces pollen sterility and disrupts cellular homeostasis. This study investigates the potential of chickpea genotypes with microbial biostimulants, specifically plant growth promoting rhizobacteria (PGPR)-Rhizotica (1ml/100 gm seeds) and *Trichoderma asperellum* (1ml/100

gm seeds) alongside non-microbial agents such as melatonin (50  $\mu\text{m}$  and 100  $\mu\text{m}$ ), to bolster crop resilience. Three genotypes named as H13-36, H20-58 and H21-75 performed best in combination with treatment (melatonin-50  $\mu\text{m}$  + *T. asperellum* + PGPR-R) including percent germination, vigor indices and growth attributes such as seedling height and biomass. Biostimulants enhanced stomatal conductance, chlorophyll synthesis and antioxidant enzymatic activities by maintaining leaf water potential. Conclusively, the findings provides an eco-friendly alternative for mitigating climate-induced yield losses, supporting the development of sustainable agricultural practices that align with the national vision of a *Viksit Bharat* through technological innovation in the agrarian sector.

**Keywords:** *Cicer arietinum*, biostimulants, heat stress, photosynthetic efficiency, climate resilience

**Abstract No: B-II-051**

**Registration No:1264**

**Responses of exogenous application of  $\alpha$ -tocopherol on physiological and yield parameters in wheat genotypes under rainfed and late sown conditions**

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Abiotic stresses such as drought and heat severely constrain wheat productivity. This study aims to assess the physio-biochemical and yield responses of selected wheat genotypes to exogenous application of  $\alpha$ -tocopherol under stress conditions. Four contrasting genotypes (drought tolerant, heat tolerant, drought sensitive, and heat sensitive) were evaluated during the rabi season 2024–25 under irrigated, rainfed, and late-sown environments using a Randomized Block Design.  $\alpha$ -tocopherol were applied as a foliar spray at concentrations of 0, 0.005, 0.05, and 0.1 mM at the heading stage. The crop has been grown at a spacing of 20  $\times$  5 cm with a plot size of three rows of 1.5 m length. Physiological traits (SPAD, NDVI) has been recorded at 90 days after sowing, along with yield parameters. It has been found genotypes PBW826© and GW543 performed best at 0.05 mM dose in all the three environments based on physiological and yield parameters.

**Keywords:** Wheat, rainfed, late-sown,  $\alpha$ -tocopherol

**Abstract No: B-II-052**

**Registration No:1267**

**Sustainable management practices for climate-smart cotton (*Gossypium herbaceum*) production: A comprehensive review**

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The growth and yield of cotton (*Gossypium herbaceum* L.) are significantly impacted by local weather variations. Although cotton plants show some resilience to heat and drought, prolonged exposure to adverse weather conditions can negatively affect their productivity. In India, Gujarat is typically the leading cotton-producing state, followed by Maharashtra, Telangana, Rajasthan, Karnataka, and Andhra Pradesh, which together contribute to over 65% of the nation's cotton production. In Punjab, the ideal sowing period for cotton falls between April 1st and May 15th. Sowing outside of this window, whether too early or too late, tends to disrupt crop establishment and reduce yields. Temperature is a critical factor in the development of cotton, with specific thresholds guiding different growth phases. Germination requires a minimum temperature of 16°C, while vegetative growth thrives within a range of 21-27°C. For reproductive growth, temperatures between 27-32°C are optimal. Root development benefits from diurnal temperatures of 30°C/22°C to 35°C/27°C. High temperatures, such as 40°C during the day and 32°C at night, can cause shallow root systems, even with sufficient water and nutrients. To mitigate the impact of climate change on cotton yields, strategies like timely sowing, proper plant spacing, favorable row alignment, efficient irrigation, and mulching can be employed. Additionally, the use of crop simulation models and access to accurate weather forecasts and agro-advisories provide valuable support for decision-making in cotton cultivation.

**Key words:** Climate Change, Drought, Resilience, Crop Simulation Models.

**Abstract No: B-II-053**

**Registration No:1277**

**Evaluating the effect of plant growth regulators on flowering attributes of gladiolus (*Gladiolus grandiflorus* L.) var. Pusa Shanti under semi arid conditions**

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An experimental research was carried out during rabi season of 2024-2025 at Horticulture Farm of CCS, HAU, Hisar to evaluate the effect of plant growth regulators on flowering attributes of gladiolus (*Gladiolus grandiflorus* L.) var. Pusa Shanti under semi arid conditions using different amount of concentrations of growth regulators like GA<sub>3</sub>, NAA, IBA and CCC. The results showed that flowering attributes such as rachis length (66.77cm), internodal length of florets (6.03cm), minimum days for first floret opening (99.89), days to 50% floret opening (103.35) and floret diameter (9.63cm) were found better under treatment T<sub>3</sub>(GA<sub>3</sub>@150ppm)

which were attributed to enhanced cell elongation, assimilate partitioning and accelerated floral transition mediated by gibberellin activity which enhances the quality and display life of the spike fetching more price for farmers.

**Keywords:** Gladiolus, GA3, IBA, NAA, CCC and flowering attributes

**Abstract No: B-II-054**

**Registration No:1279**

## **Harnessing the soil microbiome for resilient and sustainable agronomic systems**

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Ensuring global food security while maintaining soil health is a central challenge for modern agriculture. The soil microbiome, comprising diverse communities of bacteria, fungi, archaea, and other microorganisms, plays a pivotal role in sustaining soil fertility and crop productivity. These microorganisms regulate essential biogeochemical processes such as biological nitrogen fixation, phosphorus solubilization, organic matter decomposition, and nutrient mineralization. For example, symbiotic nitrogen fixation in leguminous cropping systems can supply 50–200 kg N ha<sup>-1</sup> year<sup>-1</sup>. Likewise, phosphate-solubilizing microorganisms can mobilize phosphorus in soils where up to 70–90% of applied phosphorus becomes fixed and unavailable to plants. Beneficial microbial groups, including PGPR and arbuscular mycorrhizal fungi, enhance plant growth by stimulating phytohormone production, improving root architecture, and increasing plant tolerance to abiotic stresses such as drought, salinity, and nutrient deficiency. Approaches such as crop diversification, conservation tillage, INM and the application of organic amendments have been shown to increase microbial biomass by 20–40%, enhance soil enzymatic activity, and improve soil carbon sequestration. Integrating soil microbiome management with sustainable agronomic practices can reduce dependence on chemical inputs, enhance ecosystem resilience. Therefore, harnessing the functional potential of the soil microbiome represents a key pathway toward sustainable and resilient agricultural systems.

**Keywords:** Soil microbiome, sustainable agronomy, nutrient cycling, PGPR, soil health, climate-smart agriculture.

**Abstract No: B–II-055**

**Registration No:1280**

**Biostimulant mediated growth, physiology and yield modulation in tomato  
(*Solanum lycopersicum* L.)**

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Biostimulants are increasingly recognized as sustainable inputs for enhancing crop productivity, physiological efficiency, and stress tolerance. This review synthesizes recent advances on the role of humic acid, fulvic acid, salicylic acid, and seaweed extract in modulating growth, physiology, and yield of tomato. Previous studies indicate that humic substances can enhance root growth and nutrient uptake by 20–40%, thereby improving biomass accumulation. Fulvic acid facilitates nutrient transport and metabolic activity, leading to 15–25% improvement in plant growth. Salicylic acid acts as a signaling molecule that enhances antioxidant enzyme activity and stress tolerance, resulting in 10–20% yield improvement under adverse conditions. Seaweed extracts, rich in natural phytohormones and bioactive compounds, have been reported to increase chlorophyll content, flowering, and fruit yield by 15–30% in tomato. These biostimulants operate through multiple mechanisms, including enhanced nutrient acquisition, improved photosynthetic efficiency, and activation of defense pathways. Humic and fulvic acids improve soil health and nutrient dynamics, while salicylic acid regulates stress-responsive signaling. Seaweed extract promotes vegetative and reproductive growth through hormonal stimulation. Their combined application often results in synergistic effects, improving fruit quality traits such as total soluble solids and nutrient content. Despite promising outcomes, challenges remain regarding standardization and field validation. Overall, biostimulants offer an eco-friendly strategy for improving tomato productivity and sustainability.

**Keywords:** Biostimulants, tomato, humic acid, fulvic acid, salicylic acid, seaweed extract, growth, physiology and yield.

**Abstract No: B–II-056**

**Registration No:1282**

**Genomic Architecture of cereal cyst nematode antagonist *Bacillus subtilis*  
BREB 03 unravelled inherent biocontrol and plant growth promotion traits**

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Comprehensive genomic analysis of the cereal cyst nematode antagonist *Bacillus subtilis* BREB 03 elucidated its inherent potential for biocontrol and plant growth promotion. Genome-

based taxonomic assessment using TYGS and Genome BLAST Distance Phylogeny (GBDP) robustly positioned BREB 03 within the *Bacillus subtilis* clade, closely related to type strains ATCC 6051 and NCIB 3610. High digital DNA–DNA hybridization (dDDH) values (>90%) further confirmed its species identity. Genome annotation identified 5,909 genes, including 5,806 coding sequences, along with essential rRNA and tRNA components, indicating a functionally diverse genome. Functional categorization revealed a wide array of plant growth–promoting genes, including those involved in phosphate uptake (pst operon), nitrogen assimilation (nifS and nas cluster), siderophore-mediated iron acquisition (fhuD and related transporters), and indole-3-acetic acid biosynthesis via the tryptophan pathway. Genes encoding hydrolytic enzymes and chitinases suggest strong antagonistic activity against phytopathogens. Additionally, the presence of biofilm-associated genes (tasA, bslA) and 2,3-butanediol biosynthesis pathways highlights its role in effective root colonization and induction of systemic resistance. Notably, bioinformatic analysis identified 33 proteases associated with nematode virulence, including ATP-dependent proteases (Clp complex, Lon, FtsH), serine proteases, and zinc metalloproteases. These enzymes are likely involved in degrading nematode structural components and overcoming host defenses. The coexistence of intracellular regulatory and extracellular degradative proteases indicates a multifaceted mechanism of nematode suppression. Overall, the genomic features of BREB 03 underscore its potential as an efficient plant growth–promoting rhizobacterium and a sustainable biocontrol agent against cereal cyst nematodes.

**Keywords:** *Bacillus subtilis*, chitinases, siderophore, indole-3-acetic acid

**Abstract No: B–II-057**

**Registration No:1291**

### **Impact of nano urea on growth parameters of mungbean under Western agroclimatic region of Haryana**

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India is one of the largest producers and consumers of pulses in the world. Mungbean, *Vigna radiata* L. Wilczek, also known as green gram, is the third most important pulse crop after chickpea and pigeonpea growing in the arid and semi-arid regions of the country. A field experiment was carried out during *Kharif* season of 2022 and 2023 at research farm of Pulses Section, CCS HAU, Hisar to assess the effect of seed treatment with bio-formulations (*Rhizobium*, PSB and *Beejamrit*) and nano urea on growth parameters of mungbean. The field trial was laid out in factorial randomized block design with the following treatments; seed treatment comprising nano urea, *Rhizobium* + PSB and *Beejamrit* and nitrogen management including 100 % RDN through conventional fertilizer, soil application of nano urea @ 500 ml ha<sup>-1</sup>, nano urea at 35 DAS @ 250 ml ha<sup>-1</sup>, 50 % RDN + nano urea at 35 DAS @ 250 ml ha<sup>-1</sup> and urea @ 2 % at 35 DAS. It was evident that 50 % RDN + nano urea @ 250 ml/ha at 35 DAS reported CGR of 10.55 and 10.52 g m<sup>-2</sup> day<sup>-1</sup> in 2022 and 2023, respectively at the flowering stage of mungbean which was statistically at par with 100 % RDN (11.04 and 11.10 g m<sup>-2</sup> day<sup>-1</sup>).

<sup>1</sup>, respectively) and can be adopted as one of the best alternatives of nitrogen management. It will eventually reduce the demand for conventional fertilizers without compromising production potential and also help in enhancing nutrient-use efficiency.

**Keywords:** nano urea, seed treatment, *Rhizobium*, CGR

**Abstract No: B–II-058**

**Registration No:1294**

## **Green Synthesis of Magnesium Nanoparticles for Mitigation of Heat Stress in Crops**

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Heat stress is a major abiotic factor limiting crop productivity under current climate change scenarios, disrupting key physiological and biochemical processes such as photosynthesis, nutrient assimilation, and membrane stability. These disruptions lead to excessive accumulation of reactive oxygen species (ROS), chlorophyll degradation, enzyme inactivation, and yield losses. Although plants activate antioxidant defense systems and heat-responsive regulatory pathways, these mechanisms are often insufficient under prolonged thermal stress. In recent years, nanotechnology has emerged as a promising approach to enhance plant stress tolerance. Among various nanomaterials, magnesium nanoparticles (MgNPs) have gained attention due to the essential role of magnesium in chlorophyll structure, photosynthetic efficiency, and enzymatic regulation. This study highlights the potential of green-synthesized MgNPs, produced using plant-derived biomolecules, as an eco-friendly and sustainable strategy for mitigating heat stress in crops. Recent findings indicate that MgNPs enhance antioxidant enzyme activities, including superoxide dismutase, catalase, and peroxidase, thereby reducing oxidative damage and maintaining membrane integrity. Additionally, MgNPs help preserve chlorophyll content, stabilize thylakoid membranes, and improve photosynthetic performance under elevated temperatures. They also influence the expression of heat-responsive genes, contributing to improved thermotolerance. Despite these advances, the precise molecular mechanisms and optimal application strategies, remain poorly understood. This study synthesizes current knowledge and identifies critical research gaps, providing a foundation for developing sustainable nano-enabled approaches to improve crop resilience under heat stress conditions.

**Keywords:** Green synthesis, Magnesium nanoparticles, Heat stress, thermotolerance, Antioxidant defense, Sustainable agriculture

**Abstract No: B-II-059**

**Registration No:1334**

**Climate change and emerging plant diseases: A growing threat to agricultural sustainability**

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Climate change is fundamentally reshaping the epidemiology of plant diseases, posing unprecedented challenges to global and Indian agriculture. Rising temperatures, erratic precipitation patterns, elevated atmospheric CO<sub>2</sub>, and shifting humidity regimes are altering the geographic distribution, virulence, and seasonal dynamics of major plant pathogens. Fungal, bacterial, viral, and oomycete pathogens are expanding into previously non-endemic regions, while the overwintering survival of inoculum is increasingly favored by milder winters. Haryana and the broader Indo-Gangetic Plain, being a critical food-producing belt of India, face heightened vulnerability as thermophilic pathogens such as *Fusarium* spp., *Alternaria* spp., wheat rust races, and emerging viral complexes are reported with increasing frequency and intensity. Furthermore, climate-driven stress weakens host plant immunity, creating a conducive environment for opportunistic pathogens. This review synthesizes current literature on the mechanisms by which climate variables influence host-pathogen interactions, disease forecasting models and the emergence of new pathogenic strains. It also examines the relevance of integrating traditional ecological knowledge with modern surveillance technologies, including remote sensing and AI-based early warning systems, for sustainable crop protection. Strengthening climate-resilient disease management strategies through interdisciplinary research is imperative for achieving the vision of Viksit Bharat@2047.

**Keywords:** Climate change, plant pathogens, emerging diseases, disease epidemiology, crop protection, Viksit Bharat

**Abstract No: B-II-060**

**Registration No:1337**

**Climate-smart agriculture adoption by farmers: barriers, enablers and the role of agricultural extension — A REVIEW**

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Climate-smart agriculture (CSA) has emerged as a critical framework for simultaneously addressing food security, climate adaptation, and mitigation goals in the context of rapidly changing agro-climatic conditions. Despite growing policy emphasis on CSA under India's national agricultural programmes, the rate of adoption among smallholder farmers remains alarmingly low, particularly in states like Haryana where conventional farming practices are deeply entrenched. This review synthesizes existing literature on the socio-economic,

institutional, and behavioural determinants influencing CSA adoption, with a focus on the role of agricultural extension systems as critical intermediaries between technology generation and farmer-level application. Key barriers identified include limited awareness, inadequate access to credit and inputs, poor extension reach, and low perceived relative advantage of CSA practices over traditional methods. Enabling factors such as participatory extension approaches, farmer field schools, peer learning networks, digital extension tools, and gender-inclusive outreach programmes are discussed in relation to their effectiveness in promoting CSA uptake. The review further highlights the potential of integrating Indian Knowledge Systems (IKS) with modern CSA technologies to enhance contextual relevance and farmer acceptability. Strengthening extension education through trained human resources, evidence-based communication strategies, and community-driven approaches is identified as indispensable for scaling CSA adoption and contributing to the vision of Viksit Bharat @2047.

**Keywords:** Climate-smart agriculture, agricultural extension, technology adoption, smallholder farmers, IKS, Viksit Bharat

**Abstract No: B-II-61**

**Registration No:1367**

### **Impact of Edible Coatings on Shelf Life and Storage Quality of Ber**

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The present experiment was conducted to evaluate the impact of edible coatings on the shelf life and storage quality of ber (*Ziziphus mauritiana* L.) cv. Apple ber at the PG Laboratory, Department of Horticulture, CCS Haryana Agricultural University, Hisar. Uniform and disease-free fruits were harvested in February from the university orchard. The fruits were subjected to different edible coating treatments, namely turmeric extract (10% and 20%), chitosan (1.5% and 2.0%), guar gum (1% and 2%), aloe vera extract (100%) and lemongrass oil (0.1% and 0.2%), along with an untreated control. After applying treatments, the fruits were packed in corrugated fiber box (CFB) and stored under ambient conditions ( $25 \pm 2^\circ\text{C}$ ). Observations were recorded at 3-day intervals for physiological loss in weight (PLW), decay loss (%), total soluble solids (TSS), ascorbic acid content and sugar content. The results revealed that Aloe vera extract (100%) was most effective in maintaining fruit quality, recording the lowest physiological weight loss (19.6%), decay loss (11.4%), TSS (13.1%), ascorbic acid degradation (53.4 mg/100 g), and sugar loss (8.9%) followed by chitosan (2%) and guar gum (2%). In contrast, untreated fruits exhibited the highest deterioration. Therefore, aloe vera-based coating proved to be the most promising treatment for extending shelf life and preserving quality of ber fruits under ambient storage conditions.

**Abstract No: B-II-062**

**Registration No:1372**

## **Effectiveness of Policies and Environmental Consequences for Sustainable Crop Residue Management in India**

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In India the problem of crop residue is significant concern in recent years. The sustainable practice for the crop residue has given a new share to the residues which were harmful to the environment. This critical issue is particularly in Punjab and Haryana, because the residue is generated in large quantity annually. The practice of the crop residue burning majorly contributed in the air pollution, soil degradation, and other adverse health effects, hence creating the serious environmental and environmental challenges. As the government of India has introduces the various policy initiatives that includes the National Policy for Management of Crop Residues (NPMCR) that look forward for the promoting sustainable residues management practices among the framers.

This study analyses the effectiveness of the policy interventions in the adoption of the eco-friendly methods to be encouraged among the farmers for the management of the crop residues. This paper focuses on the perception, awareness and adoption behaviour of farmers related to sustainable alternatives to residue burning. It also analyses the economics and environmental implications of various practices in the context of India's broader goal of achieving sustainable agricultural development and the vision of a Viksit Bharat.

Moreover, the study explains the importance of government support in the forms of subsidies, awareness programs and technologies assistance to facilitate the adoption of sustainable practices such as mulching, composting and the ways to use the crop residue for the generation for the bioenergy generation. The study incorporates both primary and secondary data sources, such as government reports, farmer surveys, and interviews, to explain the impact of policy measures and to determine the major obstacles that farmers face when implementing different alternative practices.

The findings highlight how important it is to promote sustainable farming practices through financial incentives, technology access, policy support, and awareness campaigns. The study concludes that effective crop residue management policies can significantly improve India's long-term economic growth, agricultural productivity, and environmental sustainability.

**Abstract No: B-II-063**

**Registration No:1387**

## **Food waste valorization of jamun: A review on anthocyanin quality and product development**

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Jamun (*Syzygium cumini*) is widely recognized for its rich anthocyanin content and associated antioxidant, anti-inflammatory, and therapeutic properties. Despite its nutritional significance,

a considerable proportion of harvested fruits are discarded as culled produce due to physical imperfections, contributing to post-harvest losses. This review critically examines the existing literature on anthocyanin composition, stability, and bioavailability in jamun fruits, with a particular focus on culled fractions. The review synthesizes findings on factors affecting anthocyanin quality, including maturity stage, processing conditions, and storage parameters. It further explores the potential of utilizing culled jamun fruits in the development of value-added products such as juices, jams, squashes, wines, and nutraceutical powders. Emphasis is placed on processing techniques that enhance anthocyanin retention and product quality. Available studies indicate that culled jamun fruits retain significant levels of anthocyanins and can serve as a cost-effective raw material for functional food development. The integration of these underutilized fruits into value-added processing streams presents a sustainable strategy for waste reduction and value enhancement. This review highlights current research gaps and suggests future directions for improving anthocyanin stability and commercialization potential of jamun-based products.

**Abstract No: B-II-064**

**Registration No:1388**

### **Strengthening farmers' income in india through the integration of solar energy and farming**

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Agrovoltaics (AV) is a combination of agriculture and solar energy production that offers a progressive opportunity to make better off and promote sustainable farming practices. The present study analysed how AV systems can help increase farmers' income and reduce carbon emissions by using precision farming techniques. In India, there is significant pressure on land resources (decreasing by 0.1% annually) and a growing demand for energy (expected to rise by 15% in 2030). AV offers a viable solution to address these challenges effectively by combining agriculture with solar power which can not only boost farmers' income but also reduce the need for chemical fertilizers and pesticides leads to environmentally friendly farming. Additionally, by using agricultural waste in biogas plants along with thermal solar panels and bio-hydrogen production can further enhance sustainability and reduce reliance on fossil fuels leads to a more circular agricultural economy. Several successful case studies from India showed that how AV can be a win-win situation. For instance, the installation of solar panels above vegetable farms in Gujarat has resulted in increased income (34.9 %) for farmers while generating clean energy. This paper also discusses the legal and policy challenges associated with adopting AV technology and suggests ways to overcome these barriers including incentives for farmers and partnerships between the public and private sectors. Ultimately, AV has the potential to transform farming practices and making agriculture more sustainable along with profitable offering long-term assistance to food security in India as well as globally.

**Keywords:** Agrovoltaics, sustainable farming, solar energy, precision agriculture and India.

**Abstract No: B-II-065**

**Registration No:1405**

**Isolation and functional characterization of plant growth promoting rhizobacteria from sunflower rhizosphere for sustainable agriculture**

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The excessive and indiscriminate use of chemical fertilizers has led to declining soil fertility, environmental pollution and reduced microbial diversity, necessitating the development of sustainable alternatives for crop production. Plant Growth Promoting Rhizobacteria (PGPR) play a pivotal role in enhancing plant growth and soil health through multiple mechanisms, including nutrient mobilization, phytohormone production and biological control of pathogens. The present study was undertaken to isolate and functionally characterize efficient PGPR from the rhizosphere of sunflower (*Helianthus annuus L.*) cultivated in different locations of Cuddalore district, Tamil Nadu. Rhizosphere soil samples were collected and processed for the isolation of beneficial microorganisms, including *Azospirillum*, *Pseudomonas* and *Trichoderma*. The isolates were identified based on morphological and biochemical characteristics. Further, the isolates were screened for key plant growth-promoting traits such as nitrogen fixation, phosphate solubilization and indole acetic acid (IAA) production. In addition, their antagonistic activity against soil-borne pathogens was evaluated. The results revealed significant variability among the isolates, with selected strains exhibiting superior functional traits like efficient nutrient mobilization and antagonistic potential. These findings indicate that the sunflower rhizosphere harbors diverse and efficient native PGPR strains with significant potential for application as bioinoculants. The study highlights the role of PGPR as eco-friendly and sustainable alternatives to chemical fertilizers, contributing to improved soil health, enhanced crop productivity and long-term agricultural sustainability.

**Keywords:** PGPR, Rhizosphere, *Azospirillum*, *Pseudomonas*, *Trichoderma*, Sustainable Agriculture

**Abstract No: B-II-066**

**Registration No:1407**

**Impact of Biochar Application on Soil Properties and Productivity of Rice-Wheat Cropping System under Varying Water Regimes**

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The sustainability of the rice-wheat cropping system is increasingly challenged by soil degradation, declining productivity, and inefficient water use. Biochar, a carbon-rich product derived from biomass pyrolysis, has emerged as a promising soil amendment for improving soil health and crop performance. This study evaluates the impact of biochar application on soil physicochemical properties and productivity of the rice-wheat system under different water regimes. Field experiments were conducted with varying irrigation levels, comparing

control plots with biochar-amended soils. Results indicated that biochar significantly improved soil structure, increased soil organic carbon, enhanced water retention capacity, and reduced bulk density. These improvements were more pronounced under water-limited conditions, where biochar helped maintain soil moisture and supported better root growth. Nutrient availability, particularly nitrogen and phosphorus, was also enhanced, contributing to increased crop yields. Rice and wheat productivity showed notable improvement in biochar-treated plots, with yield gains being higher under moderate and deficit irrigation compared to conventional practices. Additionally, biochar application contributed to improved water use efficiency and reduced irrigation requirements without compromising yield. The findings suggest that integrating biochar into rice–wheat systems can enhance soil resilience, optimize water use, and sustain crop productivity under varying water regimes. This approach holds significant potential for climate-smart agriculture and long-term soil fertility management.

**Keywords:** Biochar, rice–wheat system, soil properties, water regimes, crop productivity

**Abstract No: B-II-067**

**Registration No:1434**

**Synergistic role of biofertilizers, cover cropping, and nano biofertilizers in sustainable agriculture**

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Sustainable agriculture requires innovative strategies to enhance crop productivity while reducing reliance on chemical inputs. This study synthesizes recent advances in biofertilizers, cover cropping, and nanobiofertilizer technologies to evaluate their combined effects on crop performance and soil health. The integration of cover crops with biofertilizers significantly improves plant growth, biomass, yield, and grain quality by enhancing nutrient availability and stimulating beneficial soil microbial communities. Biofertilizers, including nitrogen-fixing, phosphate-solubilizing, and potassium-solubilizing microorganisms, play a crucial role in improving nutrient cycling, plant resilience, and soil fertility, particularly within agroecological systems such as push–pull cropping. Recent developments in nano-biofertilizers, which combine plant growth-promoting bacteria with nanoparticles, further enhance nutrient use efficiency, soil enzymatic activity, and plant growth traits, particularly in wheat system. These approaches collectively promote sustainable nutrient management, improve soil microbial diversity, and reduce environmental impacts associated with synthetic fertilizers. However, challenges such as inconsistent field performance and complex plant–microbe interactions must be addressed. Overall, integrating biofertilizers, cover crops, and nanotechnology offers a promising pathway toward resilient and sustainable agricultural systems.

**Keywords:** INM, Bio-fertilizer, FYM, Sustainable

# **Sub Theme III**

**Sustainable Crop Protection, Food Safety  
and Agri-Economic**

**Abstract No: B-III-001**

**Registration No: 1005**

**Host plant resistance: an environmental friendly approach for managing root knot nematode (*Meloidogyne incognita*) in *Solanum* spp.**

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Vegetables are regarded as protective foods due to their rich content of vitamins, minerals, carbohydrates, dietary fibre and a wide range of beneficial phytochemicals. Among solanaceous crops, tomato, eggplant and potato are widely cultivated across the world because of their extensive use in diets, industrial applications and their high nutritional value. Plant-parasitic nematodes, known for their broad host range, represent a serious constraint to agricultural productivity and food security. Their damaging effects are likely to increase under changing climatic conditions, as elevated soil temperatures and shifts in host plant physiology favour faster nematode growth, reproduction and infestation levels. Wild *Solanum* species constitute an important genetic resource, offering valuable traits such as resistance to pests and diseases, thereby highlighting the importance of conserving these species through both in situ and ex situ strategies. Among these pests, the root-knot nematode (*Meloidogyne incognita*) is one of the most destructive, causing considerable yield losses in crops like tomato and eggplant. In sustainable agriculture, the use of host plant resistance is considered an eco-friendly and efficient approach for managing root-knot nematodes. Due to the environmental hazards and health concerns linked with chemical nematicides, breeding for resistance has gained prominence as a reliable and sustainable management strategy.

**Keywords:** Genetic resource, host plant physiology, nutritional value and phytochemicals

**Abstract No: B-III-002**

**Registration No: 1009**

**Modulation of Moringa Leaf Extract under Salinity Stress on Pearl Millet (*Pennisetum glaucum* L.)**

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Salinity stress is a major abiotic constraint that adversely affects crop productivity by disturbing physiological and biochemical processes in plants, particularly in arid and semi-arid regions. Pearl millet, a climate-resilient cereal crop, is moderately tolerant to harsh environments; however, elevated salinity levels significantly impair its growth, photosynthesis, and yield. In recent years, the use of natural plant-based biostimulants has emerged as a sustainable strategy to mitigate salinity-induced damage. *Moringa oleifera* leaf extract is a rich source of antioxidants, essential nutrients, and plant growth regulators such as cytokinins (zeatin), which play a crucial role in enhancing plant stress tolerance. The application of moringa leaf extract

under saline conditions has shown promising results in improving the physiological performance of pearl millet. Physiologically, moringa leaf extract enhances chlorophyll content and photosynthetic efficiency, leading to improved biomass accumulation. It promotes osmotic adjustment by increasing the accumulation of compatible solutes such as proline and soluble sugars, thereby maintaining cellular water balance. Additionally, it strengthens the antioxidant defense system by activating enzymes like superoxide dismutase, catalase, and peroxidase, which help in scavenging reactive oxygen species and reducing oxidative damage. The extract also contributes to better ion homeostasis by decreasing sodium ( $\text{Na}^+$ ) toxicity and maintaining a favorable potassium to sodium ( $\text{K}^+/\text{Na}^+$ ) ratio. Furthermore, it improves membrane stability and water use efficiency, ensuring better plant survival under stress conditions. In conclusion, the application of moringa leaf extract represents an eco-friendly, cost-effective, and sustainable approach to enhance salinity tolerance in pearl millet by regulating key physiological processes. This strategy holds significant potential for improving crop productivity in salt-affected soils and ensuring food security under changing climatic conditions.

**Keywords:** Abiotic stress tolerance, antioxidant enzyme, bio stimulant, osmolyte accumulation, salinity stress

**Abstract No: B-III-003**

**Registration No: 1020**

**Impact of chemical and biological insecticides on predator–prey interactions: Evaluation of *Chrysoperla carnea* predation on *corcyra cephalonica* under laboratory conditions**

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The compatibility of chemical and biological insecticides with natural enemies is a key consideration in sustainable pest management. The present study evaluated the effects of Malathion and three biological treatments *Beauveria bassiana*, *Metarhizium anisopliae*, and *Trichoderma viride* on the predation efficiency of *Chrysoperla carnea* larvae against eggs of *Corcyra cephalonica* under laboratory conditions. Second instar larvae of *C. carnea* were exposed to treated surfaces and provided with a fixed number of *C. cephalonica* eggs. Predation was recorded at 24, 48, and 72 hours after treatment exposure. Results indicated that insecticidal treatments significantly influenced predation efficiency of the predator. Larvae exposed to malathion exhibited a marked reduction in egg consumption compared with the untreated control, suggesting adverse effects on predator activity and feeding behavior. In contrast, the biological treatments showed comparatively lower negative effects on predation efficiency, with *Beauveria bassiana* and *Metarhizium anisopliae* maintaining higher predation rates relative to the chemical treatment. *Trichoderma viride* showed minimal interference with predator feeding behavior. The findings indicate that microbial bioinsecticides are comparatively safer for beneficial predators than chemical insecticides and may be integrated with biological control agents in sustainable pest management programs. These results highlight the importance of evaluating insecticide selectivity to conserve natural enemies in agroecosystems.

**Keywords:** *Beauveria bassiana*, *Chrysoperla carnea*, *Corcyra cephalonica*, *Metarhizium anisopliae*, *Malathion*

**Abstract No: B-III-004**

**Registration No: 1027**

## **Microbial biofertilizers and biopesticide sustainable alternative for Indian agriculture**

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Microbial biofertilizers and biopesticides are gaining importance as sustainable alternatives to chemical inputs in Indian agriculture. Biofertilizers such as plant growth-promoting rhizobacteria enhance nutrient availability through nitrogen fixation, phosphate solubilization, and phytohormone production, improving soil fertility and crop productivity. Recent studies highlight innovations like microbial consortia and nano-biofertilizers that increase nutrient-use efficiency and reduce reliance on synthetic fertilizers. Microbial biopesticides, including *Bacillus*, *Trichoderma*, and entomopathogenic fungi, provide eco-friendly pest and disease control while minimizing environmental and health risks. They play a key role in integrated pest management and help reduce pesticide resistance. In India, where excessive agrochemical use has degraded soil health, these biological inputs offer a viable solution for sustainable intensification. Despite challenges such as limited shelf life and inconsistent performance, their adoption can significantly reduce chemical dependency and promote environmentally resilient farming systems.

**Keywords:** Agrochemical reduction, biocontrol agents, microbial consortia, plant growth-promoting rhizobacteria, soil health sustainability

**Abstract No: B-III-005**

**Registration No: 1028**

## **DESIGN AND OPTIMIZATION OF PYROLYSIS SYSTEM FOR BIOCHAR PRODUCTION FROM AGRICULTURAL WASTE**

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The increasing generation of agricultural residues and the need for sustainable waste management have driven interest in biochar production through pyrolysis. This study focuses on the design and optimization of a pyrolysis system for efficient conversion of agricultural waste into high-quality biochar. Key process parameters, including temperature, heating rate, residence time, and feedstock type, are systematically evaluated to enhance yield and physicochemical properties of the produced biochar. The proposed system integrates energy-efficient reactor design with controlled thermal conditions to maximize carbon retention while minimizing emissions. Optimization techniques are applied to identify ideal operating conditions that improve biochar stability, surface area, and nutrient content, making it suitable for soil amendment and carbon sequestration applications. The study also emphasizes scalability and economic feasibility, ensuring adaptability for rural and industrial settings. Overall, the optimized pyrolysis system provides a sustainable approach to agricultural waste valorization, contributing to circular economy practices and environmental conservation.

**Keywords:** Agricultural waste valorization, biochar production, pyrolysis optimization, reactor design, sustainable waste management

**Abstract No: B-III-006**

**Registration No: 1031**

**Bioplastic film incorporated with leaf extract for active packaging: A sustainable approach**

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**Abstract:** Petroleum-based plastics are linked to numerous environmental issues throughout their lifespan, such as pollution, persistence in marine and terrestrial environments, and greenhouse gas emissions. Bioplastic is an effective replacement for these synthetic polymers. Bioplastics and active packaging techniques are combined to produce food packaging materials that meet consumer requirements while minimizing environmental impact. The bioplastic films were synthesized by solvent casting technique with incorporation of *Mesua ferrea* leaf extract into a cellulose-based matrix. For evaluation of the plasticizing effect of *Mesua ferrea* leaf extract different characterizations were performed i.e., FT-IR, FE-SEM, TGA, opacity, water solubility, moisture content, antioxidant, antimicrobial and biodegradation. The prepared bioplastic films incorporated with *Mesua ferrea* leaf extract showed O-H stretching vibration bands in the range of 3300  $\text{cm}^{-1}$  to 3370  $\text{cm}^{-1}$ , and the elongation at break was increased to 11.11 % from 4.83 %. *Mesua ferrea* extract incorporated films inhibited the growth of certain types of microorganisms like *E. coli* and *Bacillus pumilus* and showed 70.07% increased antioxidant activity. The biodegradability test showed  $71.59 \pm 1.28\%$  within 35 days of degradation under composting and laboratory conditions, respectively. Therefore, bioplastic film containing leaf extract can be suitable alternative to petroleum-based plastics and is consistent with the objectives of environmentally responsible agricultural practices and secure food systems.

**Keywords:** Bioplastic film, Biodegradation, Antioxidant, *Mesua ferrea*, Antimicrobial

**Abstract No: B-III-007**

**Registration No: 1041**

**Evaluation of the dissipation behavior and risk assessment of fungicide mixture in tomatoes**

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To check the dissipation pattern of the premix formulation of fluopyram + tebuconazole, 200 g L<sup>-1</sup> SC, each in/on the tomato crop. A field trial was conducted in the research farms of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The premix formulation of the fungicide was applied thrice at the rate of 500 (X dose) and 625mL ha<sup>-1</sup> (1.25Xdose) at an interval of ten days. Samples were collected at definite time intervals: 0 (2 h), 1, 3, 5, 7, 10, 15, 20, 25, and 30 days post-treatment. A swift and responsive method was validated on GC-

tandem mass spectrometry for quantifying the residues of fluopyram and tebuconazole in tomato, using acetonitrile for extraction. Detection and quantification limits were determined to be 0.005 and 0.01 mg kg<sup>-1</sup>, respectively. Half-life of the applied fungicide at different doses ranged from 2.52 to 2.55 days for fluopyram and from 2.15 to 3.01 days for tebuconazole. Fluopyram and tebuconazole residues were found to dissipate below their detection limits after 10 days post-treatment at a dose of 1.25X. Residues of both the fungicides were below the detection limit in soil samples collected 30 days after treatment. Health hazards are also associated with consuming contaminated tomatoes; therefore, the dietary risk quotient was calculated. It was observed that the dietary risk quotient for humans was less than 1 (RQ < 1) for both the fungicides at both doses for all periods. Therefore, it has been determined to have a low risk of acute toxicity when used to manage tomato pests.

**Abstract No: B-III-008**

**Registration No: 1043**

**Sustainable Livelihood Development and Capacity Building for Rural Women: A Study in Hisar District, Haryana**

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Sustainable livelihood development is essential for improving the socio-economic conditions of rural women, who play a significant role in agriculture and allied activities. The present study assessed the Livelihood Status Index (LSI) and examined its relationship with selected socio-economic variables among rural women in Hisar district, Haryana. The study was conducted in two randomly selected villages, Kaimri and Salemgihar, with a total sample of 60 respondents (30 from each village). Data were collected using a structured and pre-tested interview schedule, and statistical tools such as percentage analysis and Pearson's correlation coefficient were employed for analysis. The findings revealed that 51.67% of respondents belonged to the medium livelihood status category, followed by 28.33% in the low and 20.00% in the high category. Significant positive correlations were observed between monthly income, annual family income, family type, and mass media exposure with various livelihood capitals, particularly human, physical, financial, and social capital. Age showed a negative correlation with human capital. No significant association was observed between selected independent variables and natural capital. Further, a skill-based tailoring training intervention (N=15) demonstrated substantial improvement in knowledge levels across technical components, indicating the effectiveness of capacity-building initiatives in enhancing livelihood capabilities. The study underscores the importance of income enhancement, media exposure, and structured skill development programs in strengthening sustainable livelihoods among rural women. Targeted interventions can significantly improve economic resilience and overall well-being in rural communities.

**Keyword:** assets, capacity building, livelihood index, rural women, sustainable

**Abstract No: B-III-009**

**Registration No:1060**

**Integrated management of cereal cyst nematode, *Heterodera avenae* in wheat through bio-agents and vermicompost**

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Cereal cyst nematode (CCN, *Heterodera avenae*) is known to incite significant yield losses in *Rabi* cereals in North Indian states having light sandy soil. Above ground symptoms of CCN in cereals are quite normal deficiency symptoms and misleading while below ground symptoms like bushy appearance of roots with slight swelling at the site of nematode infection and presence of white glistening female on roots is the confirmatory sign. For managing this nematode in wheat (var. WH-1105), an experiment was conducted in screen house during *Rabi* 2023-24 and 2024-25, in earthen pots of 2 kg capacity using the bioagents alone and in combination with vermicompost. Bioagents including one bacterium (*Pseudomonas fluorescens*) and two fungi (*Purpureocillium lilacinum*, *Trichoderma harzianum*) were applied at two different dose alone @ 2.5 kg/ha and @ 3.5 kg/ha and in combination with 500 kg vermicompost. Observations on final number of cysts/plant and plant growth parameters was recorded after 110-120 days of sowing. The minimum population of cysts (8 cysts/plant) was observed in the treatment where *T. harzianum* @ 3.5 kg /ha + 500 kg Vermicompost/ha, was applied. All the treatments increased the growth parameters of wheat and reduced the nematode population whereas maximum number of nematodes (51 cyst/plant) and minimum plant growth were recorded in untreated check.

**Keywords:** Agriculture, bio-control agents, management, nematodes, wheat

**Abstract No: B-III-010**

**Registration No: 1077**

**Degradation behaviour of Broflanilide in chili**

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The use of pesticides remains essential for ensuring food security; however, pesticide residues in food commodities pose significant risks to human health and food safety. The present study aims to evaluate the dissipation dynamics of broflanilide and its metabolite (DM-8007) in chili (*Capsicum annuum* L.) under field conditions. Broflanilide (20% SC) was applied as a foliar spray at the recommended (25 g a.i. ha<sup>-1</sup>) and double the recommended dose (50 g a.i. ha<sup>-1</sup>) at the fruit setting stage. Green chili fruit and soil samples were collected at 0 (2 h), 1, 3, 7, 14, and 21 days after application. Samples were processed using the QuEChERS method, and

residue analysis was carried out using liquid chromatography–tandem mass spectrometry (LC–MS/MS) with a limit of quantification (LOQ) of 0.01 mg kg<sup>-1</sup>. The limit of detection (LOD) was found to be 0.005 mg kg<sup>-1</sup>. The initial deposits of broflanilide were 0.261 mg kg<sup>-1</sup> and 0.434 mg kg<sup>-1</sup> at 2 hours after spray for the recommended and double-recommended doses, respectively. The residues declined progressively over time and dissipated below the LOQ by 14 and 21 days for the respective treatments. The dissipation followed first-order kinetics, with calculated half-life (T<sub>1/2</sub>) values of 3.09 days for the recommended dose and 4.31 days for the higher dose, indicating relatively faster degradation at the lower application rate. The metabolite (DM-8007) residues were below LOQ at both doses at 0 days after application.

**Abstract No: B-III-011**

**Registration No: 1104**

## **Molecular Screening of Rice genotypes for Biotic Stress Resistance**

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Rice (*Oryza sativa* L.) serves as a staple food for more than half of the global population, yet its productivity is severely constrained by major biotic stresses such as bacterial leaf blight, brown planthopper, blast, false smut, sheath blight and gall midge. The present study aimed to characterize 50 rice genotypes based on key biochemical traits, physiological parameters and functional molecular markers associated with stress tolerance. Biochemical profiling included total reducing and non-reducing sugars, total phenolics, flavonoids, and the activities of phenylalanine ammonia lyase (PAL) and tyrosine ammonia lyase (TAL). Physiological parameters such as chlorophyll stability index (CSI) and cell membrane stability (CMS) were also assessed. Total phenolic content ranged from 0.89–1.72 mg/g, while total flavonoids varied from 0.67–2.96 mg/g. PAL and TAL activities ranged between 1.11–3.32  $\mu\text{mol/h/g}$  and 1.21–3.42  $\mu\text{mol/h/g}$ , respectively. CSI values ranged from 70.46–89.84% and CMS from 69.51–86.84%. Among all genotypes, Noori-Basmati and HKR-120 exhibited the highest antioxidant levels and enzyme activities, indicating superior physiological resilience under stress. For molecular analysis, 40 trait-specific functional markers were employed, of which 28 were polymorphic. Genotypes Noori-Basmati and HKR-120 showed the maximum number of resistant alleles with markers such as RM7376 (195 bp), RM586 (276 bp), RM6869 (126 bp), RM206 (140 bp), RM8225 (221 bp), RM22555 (240 bp), RM224 (120 bp), RM1090 (176 bp) and RM202 (189 bp). The combined biochemical, physiological and molecular insights suggest that these genotypes hold strong potential for combating biotic stresses and can serve as valuable donors in future gene-pyramiding and resistance-breeding programs.

**Keywords:** Rice, biotic stress, biochemical, physiological, functional marker

**Abstract No: B-III-012**

**Registration No:1110**

**Evaluation of *in-vitro* nematocidal potential and cytotoxicity of *Semecarpus anacardium* for sustainable management**

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Plant-parasitic nematodes, particularly root-knot nematodes (genus *Meloidogyne*) rank among the most harmful agricultural pests worldwide, causing \$157 billion annual losses to a variety of economically significant crops like okra, tomatoes, cucumber, brinjal, rice, sweet potato etc. and resulting in considerable yield declines. The present study investigates the dual profile of *Semecarpus anacardium* extract as a potential bio-nematicide and its safety on mammalian systems. In the first study; the effects of *S. anacardium* ethanolic extract (1%, 5%, 10%, 15%, 20% concentrations) on egg masses and second stage juveniles (J<sub>2</sub>s) of the *M. incognita* were evaluated under laboratory conditions (*in vitro* tests). The ethanolic extract of *S. anacardium* exhibited the greatest egg hatching inhibition recording 42.3, 54.79, 63.1 and 72.2% and percent mortality of 28.33, 55, 88.33, 98.67 % after 24, 48, 72, 96 h of observation at 20% concentration. *In-vitro* cytotoxicity of *S. anacardium* extract was determined using the MTT assay on Vero Cell lines (African Green Monkey Kidney Cells) across a broad concentration gradient (0.16 µg/mL to 100 µg/mL). Vero cells serve as a standard model for assessing the potential toxic effects of agricultural chemicals on mammalian health. Cell viability remained above 90% at concentrations that were effective for nematode control, indicating a high Selectivity Index. The results showed that while the extract was lethal to nematodes, it exhibited remarkably low cytotoxicity toward Vero cells. This clear margin between efficacy and safety suggests that the botanical extract can target soil pests without posing a risk to non-target organisms.

**Keywords:** Nematicidal Activity, Cytotoxicity, Sustainable Crop Protection, Biopesticides

**Abstract No: B-III-013**

**Registration No:1115**

**PestiCheck kit: A Rapid Strip-Based Point-of-Care Kit for On-Site Detection of Pesticide Residues in Green Tea Leaves.**

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Pesticide contamination in food and agricultural products poses significant public health risks, including chronic toxicity, neurological disorders, and endocrine disruption. Conventional methods such as gas or liquid chromatography (LC/GC-MS) are sensitive but require specialized equipment and trained personnel, limiting rapid on-field screening. We present PestiCheck, a portable, low-cost, strip-based assay for rapid on-site detection of 26 pesticides

across organophosphates, carbamates, acaricides, and neonicotinoids. Samples are mixed with a proprietary buffer, applied to immobilized biosensor of strip. Pesticides inhibit enzymatic activity, preventing color development, while their absence produces a distinct blue signal, enabling qualitative to semi-quantitative interpretation within minutes without specialized tools.

Validation showed high sensitivity its LOD range 0.01–20 ppm, excellent accuracy (92.86% initial agreement with LC-MS/MS, improving to 99.9% after confirmation), specificity, selectivity, and repeatability. Ruggedness tests across four tea estates (26–32 °C, >85% humidity) confirmed operational stability. Inter-Laboratory Comparison (ILC) studies demonstrated reproducibility across laboratories, and field trials strongly correlated with LC-MS/MS results.

The PestiCheck technology is patented and transferred to Tata Consumer Products Limited (TCPL) for commercial-scale production and deployment. This kit offers a robust, user-friendly, and cost-effective solution for preliminary pesticide screening in green tea, supporting public health, agricultural safety, and regulatory surveillance.

**Keywords:** Early screening using rapid diagnostics can reduce pesticide exposure risks and support community-level preventive healthcare monitoring.

**Abstract No: B-III-014**

**Registration No : 1123**

### **Parameter Optimization for the Surface Modification of *Sansevieria trifasciata* Cellulosic Fibers**

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This study explores the optimization of alkali and enzymatic treatments to enhance the physical, mechanical and surface characteristics of water-retted *Sansevieria trifasciata* cellulosic fibers for sustainable material applications. A systematic experimental methodology was employed to investigate the influence of key processing parameters on fiber quality and performance. Alkali treatment was conducted using sodium hydroxide (NaOH) at concentrations of 2.5, 5.0 and 7.5 g/L, with material-to-liquor ratios ranging from 1:10 to 1:30, temperatures between 80°C and 100°C and treatment durations of 60-120 minutes within a controlled pH range of 6-8. Enzymatic treatment was performed using enzyme concentrations of 0.5%, 1.0% and 1.5% at temperatures ranging from 60°C to 80°C, maintaining similar time, pH and liquor ratio conditions. Fiber samples (10 g) were immersed in distilled water and treated at predetermined temperatures. Post-treatment neutralization was carried out using 10% acetic acid for alkali-treated fibers and 10% hydrochloric acid for enzymatically treated fibers, followed by repeated rinsing and oven drying to achieve stable conditions. The comparative evaluation of both treatments highlights the effectiveness of controlled parameter optimization in improving fiber surface roughness, interfacial bonding potential, tensile strength and overall durability. The results demonstrate that optimized surface modification significantly enhances the compatibility of *S. trifasciata* fibers with polymer matrices, thereby improving their performance in composite materials. These findings support the potential of such treated fibers as sustainable alternatives to synthetic reinforcements in various industrial applications. Key

application areas include biodegradable composites, eco-friendly textiles, geo-textiles, packaging materials, automotive interior components, building and insulation materials, paper and pulp products and reinforcement in bio-based plastics. Furthermore, the integration of enzymatic treatments offers an environmentally sustainable alternative to conventional chemical processes, reducing chemical consumption and environmental impact. The study contributes to advancing sustainable material development by promoting the utilization of renewable plant-based fibers and optimizing treatment processes to achieve superior performance characteristics suitable for large-scale industrial adoption.

**Keywords:** *Sansevieria trifasciata*, Natural fibers, Alkali treatment, Enzymatic treatment, Surface modification, Sustainable materials

**Abstract No: B-III-015**

**Registration No: 1134**

**AGRO-TOURISM AND INDIGENOUS KNOWLEDGE SYSTEMS:  
PATHWAYS TO SUSTAINABLE RURAL DEVELOPMENT IN VIKSIT  
BHARAT**

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Agro-tourism has gained prominence as an innovative approach to promote sustainable rural development by integrating agricultural activities with tourism-based income generation. At the same time, Indigenous Knowledge Systems (IKS) represent a valuable repository of location-specific, time-tested practices that contribute to ecological sustainability, biodiversity conservation, and climate resilience. This review paper explores the potential of integrating agro-tourism with indigenous knowledge systems as a strategic pathway towards achieving the vision of Viksit Bharat. Based on an analysis of secondary literature, policy documents, and empirical studies, the paper highlights that agro-tourism provides opportunities for income diversification, employment generation, and rural entrepreneurship. The incorporation of indigenous technical knowledge such as traditional farming methods, local food systems, and ethno-ecological practices enhances the authenticity and sustainability of agro-tourism experiences. This integration not only strengthens rural livelihoods but also supports the preservation and transmission of indigenous knowledge across generations. The review further identifies key challenges, including inadequate infrastructure, limited awareness, policy gaps, and insufficient documentation of indigenous practices. However, emerging policy support and technological interventions, particularly digital platforms for knowledge sharing and rural marketing, offer significant opportunities for scaling agro-tourism initiatives. The study concludes that a synergistic approach combining agro-tourism and indigenous knowledge systems can foster inclusive growth, cultural preservation, and environmental sustainability, thereby contributing to the realization of a self-reliant and developed India.

**Keywords:** Agro-tourism, Indigenous Knowledge Systems, Sustainable Development, Rural Livelihoods, Viksit Bharat, India

**Abstract No: B-III-016**

**Registration No:1143**

**Antifungal Efficacy of *Cinnamomum camphora* Leaf Against *Fusarium oxysporum* f. sp. *vasinfectum***

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Fungal pathogens cause a major threat to global food security, specifically impacting significant crops like cotton, wheat, rice, and maize. In India, these infections result in an annual yield loss of approximately 5 million tons, while global economic damages reach an estimated \$60 billion each year. Traditional reliance on synthetic fungicides has become problematic due to rising environmental concerns, toxicity to non-target species, and the development of fungal resistance. As a result, eco-friendly, sustainable alternatives are becoming increasingly crucial. For the fungal disease *Fusarium oxysporum* f.sp. *vasinfectum*, *Cinnamomum camphora* can be considered but more work is in need to validate. Present research examines the *in vitro* antifungal efficacy of *Cinnamomum camphora* leaves extract. Aqueous and ethanolic extracts of *Cinnamomum camphora* leaves were evaluated for antifungal activity against *F. oxysporum* f. sp. *Vasinfectum*. The aqueous extract of *Cinnamomum camphora* exhibited 64% mycelial growth inhibition at 400 ppm concentration and ethanolic extract exhibited 65.59% mycelial growth inhibition at 200 ppm concentration.

This study demonstrates promising *in vitro* antifungal efficacy of *Cinnamomum camphora*. The results exhibited a robust dose-dependent antifungal response.

**Keywords:** *Cinnamomum camphora*, Antifungal efficacy, *Fusarium oxysporum*

**Abstract No: B-III-017**

**Registration No:1173**

**Growth, Seasonality and Price Forecasting of Potato in Regulated Markets of Haryana: An ARIMA-Based Analysis**

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Potato (*Solanum tuberosum*) is an important vegetable crop that helps boost farmer income and market stability because it stores better than other perishable goods. This study examines potato growth, trends, seasonal behaviour and price forecasting in selected regulated markets of Haryana: Pehowa, Shahbad, Jagadhari and Sadhuara. It uses monthly secondary data on arrivals and prices from 2014 to 2023, compiled from AGMARKNET records. The study applies Compound Annual Growth Rate (CAGR), linear trend analysis, seasonal indices, Augmented Dickey-Fuller (ADF) tests and ARIMA models to forecast prices. The results in Pehowa (CAGR: 17.04%) and Sadhuara (-4.58%) display opposite price-arrival trends, while Jagadhari shows a connection in both. In Pehowa, arrivals increased in January (20.96%) and September (8.38%) while prices fell by -3.25 per cent and -2.80 per cent. Sadhuara had lower arrivals in January (-6.12%) and December (-11.60%), which raised prices by 4.43 per cent and

3.70 per cent. Jagadhari recorded increases in both arrivals and prices (January: 6.28%, 2.84%; February: 7.25%, 2.63%), while Shahbad showed mixed trends (May: -15.19%, 5.95%; January: 9.42%, 7.30%). Seasonal peaks from January to March lower prices, while lean months from July to November raise them, and Jagadhari remains relatively stable (index >0.80). ADF results confirm stationarity after first differencing, making ARIMA suitable for this analysis. Among the models, Pehowa shows the best forecasting accuracy (RMSE: 180.07; MAPE: 16.29%), while Jagadhari has higher volatility but a better model fit (lowest AIC: 1520.69). Forecasts for 2024 to 2026 suggest stable to declining prices in Pehowa, steady increases in Shahbad, and noticeable cyclical fluctuations in Jagadhari. Forecast accuracy is highest in Pehowa (76.43%) and Jagadhari (77.18). Market-specific improvements in storage, marketing, and information systems are essential to stabilize prices and raise farmer incomes in Haryana's potato markets.

**Keywords:** Potato, Price dynamics, Seasonality, ARIMA, Market integration, Haryana

**Abstract No: B-III-018**

**Registration No:1197**

## **SOLAR IRRIGATION ADOPTION IN HARYANA: AN ASSESSMENT OF WATER USE EFFICIENCY, FARMER INCOME AND CO<sub>2</sub> REDUCTION**

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Agriculture in Haryana has faced a difficult choice for a long time. Nearly 95.5% of the state's sown land is watered, which results in significant groundwater depletion, expensive diesel pumps, and an inconsistent electricity supply. Haryana is one of the Indian states most actively implementing solar-powered irrigation systems, which are becoming more and more popular as a workable alternative. This abstract review the current status and effects of solar irrigation in Haryana. As of October 2024, Haryana leads all Indian states in implementing PM-KUSUM, having installed 1,36,572 solar pumps out of a target of 1,97,655 achieving 69% of the goal. The economic benefits for farmers are clear. A survey of 150 farmers in Sirsa district found that those using solar pumps save up to ₹6,790 per acre each year for wheat and ₹8,076 per acre for cotton, mainly by reducing diesel consumption and maintenance costs. Environmentally, solar irrigation reduces approximately 127 kg CO<sub>2</sub> per acre for wheat and 165 kg CO<sub>2</sub> per acre for cotton.

However, challenges remain. High initial installation costs, lack of awareness among small farmers, and concerns that costless pumping may increase groundwater extraction rather than promote conservation. A 2023 report by the Central Ground Water Board classified over 1,000 blocks across India as "overexploited," with Haryana, Punjab, and Rajasthan among the most affected. This abstract argues that solar irrigation can reach its full potential only when integrated with micro-irrigation and better-designed subsidies combining modern technology with traditional community practices.

**Keywords:** Solar irrigation, PM-KUSUM, groundwater depletion, water-use efficiency, sustainable agriculture

**Abstract No: B-III-019**

**Registration No:1204**

**Morpho-physiological and Biochemical Responses of *Sorghum bicolor* L. under Salinity Stress**

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The present investigation was carried out to screen sorghum [*Sorghum bicolor* (L.) Moench] varieties for their tolerance to salinity stress under field conditions. Eight sorghum varieties (HC 136, HC 171, HC 260, HC 308, HJ 513, HJ 541, CSV 44F, and HJ 1513) were evaluated in the field, initial EC<sub>e</sub> ranging from 7–14 dS m<sup>-1</sup>, imposing moderate to severe salinity stress. Observations recorded at 50% flowering included growth, physiological, and biochemical parameters. Results revealed delayed flowering under salinity, with HC 136 flowering earliest (62 days) and HC 260 latest (99 days). Plant height, number of leaves, fresh and dry biomass, and leaf area were significantly reduced under salt stress. Among physiological traits, HC 308 maintained the highest relative water content (70.9%), while HJ 541 showed superior photosynthetic efficiency, supported by higher SPAD values and photochemical quantum yield. Antioxidative responses, measured through anthocyanin (0.95–1.30%) and flavonoid content (0.15–0.18%), indicated varietal differences in stress adaptation. At physiological maturity, HJ 541 and HJ 513 outperformed other genotypes with maximum biomass and seed yield, whereas HC 260 performed poorly. Soil analysis post-harvest showed a reduction in salinity (EC<sub>e</sub> 1.3–1.7 dS m<sup>-1</sup>) and stabilized pH (8.3–8.6), highlighting the phytoremediation potential of sorghum under saline conditions. Overall, varieties HJ 513, HJ 541, HC 308, and HJ 1513 exhibited better adaptability and performance under salinity, making them promising candidates for cultivation in salt-affected areas as well as for phytoremediation.

**Keywords:** Sorghum, Photosynthetic efficiency, Phytoremediation

**Abstract No: B-III-020**

**Registration No:1205**

**Evaluating the Socio-economic Impact of Pradhan Mantri Jan Dhan Yojana in Haryana**

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The Pradhan Mantri Jan Dhan Yojana (PMJDY) was launched on 28 August, 2014 to promote financial inclusion in India. The objective of present study is to analyze the socio-economic impact of the scheme in Haryana. Primary data were collected from 500 respondents across eight districts using a semi-structured questionnaire and secondary data were subsequently incorporated. It includes changes in areas like income levels, employment, education, health, living standards, social relationships, and access to resources. To capture this impact fully, a five-point likert scale was used. In this study, factor analysis was conducted on a set of

statements or items related to socio-economic impact. The highest loading was for the statement “People believe that PMJDY has reduced poverty and uplifted every household” (.775), indicating that the scheme is widely seen as a tool for poverty alleviation. The results also highlighted areas where further improvements might be needed for inclusive development and it was revealed that due to lack of respondent’s income, they were unable to operate their accounts. The study suggested the government needs to implement programs that encourage active usage and financial involvement among people.

**Keywords:** Socio-economic, Inclusive growth, PMJDY, Financial inclusion

**Abstract No: B- III-021**

**Registration No:1239**

### **Dissipation kinetics of fluopyram in soil under open and protected field conditions following soil drench application using GC-MS/MS**

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The use of pesticides for pest control often leads to the accumulation of residues in vegetables. Several studies have reported the presence of different pesticide residues in vegetables, sometimes exceeding the maximum residue levels (MRLs), which can pose risks to human health. In comparison, methods such as seed treatment and soil drenching are considered better alternatives, as compare to foliar application as they reduce direct contamination of the edible parts of the crops. Considering the point, a field trial was conducted to study the persistence with degradation dynamics of fluopyram its metabolite (32113) in soil and cucumber under open and protected field conditions. Fluopyram was applied twice as soil drench@ 250 g a.i./ha with first application at 3 days after sowing and second application at 21 days after the first application. Field experiment was performed in randomized block design (RBD) at dose of 625ml/ha. Quantification was done on GCMS/MS and detection and quantification limits were obtained as 0.005 and 0.01 mg kg<sup>-1</sup>, respectively. The dissipation of fluopyram, in soil followed first-order kinetics with half-life of 6.25 days. Cucumber samples does not contain any residues of fluopyram. In soil the residue persist up to 28 days and 45 days in open and protected field conditions.

**Keywords:** Fluopyram, Cucumber, GC-MS/MS, dissipation, Soil drench

**Abstract No: B-III-022**

**Registration No:1240**

**Bioagents and fungicides as complementary tools against *Colletotrichum spp.* In pomegranate: Implications for reduced chemical dependency**

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Pomegranate (*Punica granatum* L.) is an ancient crop; suffers from economically important and most common disease like anthracnose, caused by *Colletotrichum gloeosporioides* (Penz.) Penz. And Sacc., resulting in severe economic yield losses. An attempt was made to manage the disease under *in vitro* conditions with fungicides and biocontrol agents. During the experimentation; the bio-efficacy of systemic, non-systemic and bioagents were evaluated against *C. gloeosporioides*. The results revealed that; among the four non-systemic fungicides tested, chlorothalonil 75 WP recorded 86.76 per cent inhibition at all the concentrations (*i.e.*, 0.1, 0.2 and 0.3 ppm) with a mean inhibition, which was significantly superior over all the treatments. Among seven systemic fungicides tested, propiconazole showed 100 per cent inhibition at 500, 1000 and 1500 ppm, which was significantly superior over all the treatments, followed by difenoconazole 90.16 per cent. Whereas the bio-agents tested, *Trichoderma harzianum* was found more effective and statistically significant than other bio-control agents in inhibiting the mycelial growth of 85.96 per cent of *C. gloeosporioides* followed by *Stutzerimonas stutzeri* at 70.96 per cent and the rest of other treatments.

**Keywords:** Pomegranate, Anthracnose, *Colletotrichum gloeosporioides*, Fungicide formulations, Bioagents

**Abstract No: B-III-023**

**Registration No:1258**

**Physiological and biochemical responses of salinity stress in linseed genotypes**

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Salinity stress is a major constraint affecting productivity and physiological performance of linseed. The present study evaluated a set of 15 linseed genotypes under salinity stress. Observations were recorded for chlorophyll content (SPAD), NDVI, relative water content (RWC), membrane injury (%), malondialdehyde (MDA) content, free radical scavenging activity (FRSA), and yield parameters. Salinity stress resulted in decreasing NDVI, chlorophyll content, and RWC, along with an increase in membrane injury, MDA content, and antioxidant activity. However, tolerant genotypes exhibited comparatively lower reductions in physiological traits. Among the evaluated lines, Sal-396 showed the least reduction in NDVI (8.9%), followed by Sal-14 and Sal-323, performing at par with the tolerant check Shubhra. Similarly, Sal-396, Sal-14, and Sal-260 maintained higher RWC with minimal reduction (5.4–6.5%) compared to the tolerant check. Sal-396 exhibited the lowest increase in MDA (12.4%)

and highest FRSA (84.44%). Sal-14 recorded the highest number of capsules per plant with minimum reduction in seed yield followed by Sal-112, Sal-260, and Sal-396. Based on physiological, biochemical, and yield performance, genotypes Sal-14, Sal-112, Sal-260, and Sal-396 were identified as the most salinity-tolerant. These genotypes can serve as promising genetic resources for breeding programs aimed at improving salinity tolerance in linseed.

**Keywords:** *Linum usitatissimum*, salinity tolerance, physiological traits, biochemical responses, yield reduction, genetic variability.

**Abstract No: B-III-024**

**Registration No:1260**

### **Assessment of the effectiveness of the pulse seed hub project in enhancing quality seed production**

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Pulses are an important agricultural commodity with high nutritional value, serving as a rich source of protein in the human diet. Considering the gap between demand and supply of pulses and the need to enhance nutritional security, the Government of India initiated the Pulse Seed Hub Programme across the country. To ensure the availability of location-specific, high-yielding varieties and quality seeds, the programme was sanctioned to Krishi Vigyan Kendra (KVK), Lalitpur, under the administrative control of Banda University of Agriculture and Technology, Banda, Uttar Pradesh, during 2016–17. With the active participation of farmers through a buy-back policy, the KVK successfully procured 1120.8 quintals of field pea, 281.16 quintals of chickpea, 59.44 quintals of black gram, 51.34 quintals of green gram, and 19.4 quintals of lentil during the period from 2018–19 to 2021–22. This led to the production of 1532 quintals of quality seed, covering an area of 2083.5 hectares in the district. Buy-back agreements were executed between the KVK and participating farmers, who were also provided training on improved agronomic practices. Over a period of four years, the Seed Hub Programme generated a gross profit of ₹66,28,627.25 and a net profit of ₹36,14,893 for the KVK. The revenue generated from seed sales was reinvested to strengthen infrastructure and further enhance seed production activities.

## Stingless bees as efficient pollinators for muskmelon: A Strategy to enhance yield under protected cultivation

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Pollination studies were conducted during 2024-25 at the Research Farm, Department of Entomology, on muskmelon (*Cucumis melo* L.) variety 'Haramadhu' to evaluate pollinator diversity, foraging behaviour, floral biology, and the impact of different modes of pollination on yield and quality parameters. The experiment was laid out in a Randomized Block Design (RBD) with four pollination treatments, viz., open pollination (OP), stingless bee pollination (SBP), hand pollination (HP), and pollinator exclusion (PE), each replicated thrice in plots of 5 × 4 m. A total of 15 insect species belonging to 7 families across 3 orders were recorded visiting muskmelon flowers. Hymenopterans dominated the pollinator assemblage, particularly members of Apidae, including honey bees (*Apis mellifera*, *A. cerana*, *A. dorsata*, *A. florea*) and stingless bees (*Tetragonula ruficornis*). Dipteran flies and Lepidopteran butterflies were also observed in comparatively lower abundance. The abundance of honey bee species varied during the flowering period (April 16-25, 2025), with *A. mellifera* being the most dominant (7.33 bees m<sup>-2</sup> 5 min<sup>-1</sup>), followed by *A. cerana* (5.53) and *A. dorsata* (5.39). However, *A. dorsata* exhibited the highest foraging rate (8.70 flowers min<sup>-1</sup>), particularly during early morning hours (0600–1000 h), peaking at 14.5 flowers min<sup>-1</sup> at 0800 h. Foraging speed differed significantly among species, with *A. dorsata*, *A. cerana*, and *A. mellifera* spending the least time per flower (5.18–5.93 s), whereas *T. ruficornis* showed the slowest foraging (50.96 s flower<sup>-1</sup>). Floral biology studies indicated that staminate flowers initiated earlier (≈36 days) than pistillate flowers (≈41 days), although both opened synchronously between 0500 and 0630 h. Pollen dehiscence occurred about 25 minutes after anthesis, while stigma receptivity was observed approximately 13 hours post-anthesis. Flowers remained open for 29–31 hours, supporting effective pollinator activity. Among the different modes of pollination, stingless bee pollination (SBP), wherein one strong colony was maintained within a netted enclosure (10 × 10 × 7 ft), significantly enhanced yield and quality attributes. Maximum fruit length (121.80 mm), breadth (124.80 mm), weight (998.60 g), number of fruits per vine (8.00), and seeds per fruit (600.70) were recorded under SBP. This resulted in the highest yield (19.30 kg plot<sup>-1</sup>; 96.50 q ha<sup>-1</sup>), representing a 76.57% increase over pollinator exclusion (PE). Open pollination and hand pollination showed intermediate performance. The findings clearly demonstrate that managed stingless bee pollination is an efficient and sustainable approach for improving muskmelon productivity, particularly under protected cultivation conditions.

**Keywords:** Muskmelon, stingless bees, pollination, foraging behaviour, yield, protected cultivation

**Abstract No: B-III-026**

**Registration No:1266**

## **Sustainable Crop Residue Management: A Pathway to Enhanced Yield and Farm Profitability in Rice -Wheat Cropping System**

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The rice–wheat cropping system (RWCS) in the Indo-Gangetic Plains, spread over about 13.5 million hectares, plays a major role in food security, but faces serious issues due to poor residue management. Farmers often burn crop residues because of the short gap between rice harvesting and wheat sowing, which leads to pollution, nutrient loss and soil degradation, while better residue management improves soil health and productivity. An experiment conducted at CCS HAU Krishi Vigyan Kendra, Panipat evaluated different residue management practices and nitrogen levels for wheat. Treatments included residue removal ( $R_1$ ), burning ( $R_2$ ), incorporation using Super Seeder ( $R_3$ ) and retention with Happy Seeder ( $R_4$ ), along with nitrogen levels such as control, 100% RDN, 100% RDN + waste decomposer and 125% RDN. Results showed that residue incorporation and retention produced higher grain yields (51.0 and 49.1 q ha<sup>-1</sup>) and better harvest index (~40%) compared to removal and burning. Grain yield increased with fertilizer application, from 34.8 q ha<sup>-1</sup> in control to 53.4 q ha<sup>-1</sup> at 125% RDN, while 100% RDN and waste decomposer treatments performed similarly. The best performance observed under residue incorporation combined with 125% RDN, recording highest grain yield (59 q ha<sup>-1</sup>), biological yield (145 q ha<sup>-1</sup>), net returns (₹133287) and B:C ratio (3.62), which was almost similar to  $R_3F_3$ . In contrast, residue burning or removal without fertilizer gave the lowest yield and returns, overall showing that proper residue management with higher nitrogen improves productivity and profitability.

**Key words:** Rice-wheat, CRM, Sustainable, Productivity, Benefit-Cost ratio.

**Abstract No: B-III-027**

**Registration No:1268**

## **A trend analysis of the progress of the kisan credit card scheme in India**

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In 1998, the R.V. Gupta committee's proposals led to the formation of the Kisan Credit Card (KCC) scheme. The scheme represented as a landmark initiative for the farmer's by ensuring timely and adequate credit facilities. This study examines the KCC scheme's performance in India. The main aim was to assess the country's KCC progress by year, agency and region wise. Secondary data were used for the research. The study period ran from 1999 to 2024. The findings indicate that the KCC scheme has experienced substantial growth over the study period, with coverage expanding from 51.34 lakh cards in 1999 to more than 7.72 crore operative accounts by 2024. This remarkable progress highlights the increasing outreach of

institutional agricultural credit. However, the study revealed disparities in institutional agricultural credit access across India; the North-Eastern region has the lowest levels of both KCC coverage and amount sanctioned. The study suggests that strengthening of KCC scheme can make an important contribution towards improving the economic development of the country.

**Keywords:** Kisan Credit Card, Progress, KCCs, Credit

**Abstract No: B-III-028**

**Registration No:1274**

**Effect of Integrated Nutrient Management on Growth and Yield of Wheat  
(*Triticum aestivum* L.)**

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Wheat (*Triticum aestivum* L.) is an important cereal crop for food and nutritional security in India. In recent years, excessive use of chemical fertilizers has adversely affected soil health and crop productivity. Therefore, the present study was carried out during the winter (Rabi) season of 2024–2025 at the Center for Agriculture and Farmers Development, Bhagwanpur, Roorkee, Uttarakhand, to evaluate the effect of integrated nutrient management on growth and yield of wheat (variety HD-2851). The experiment was conducted in a Randomized Block Design with eight treatments and three replications. Different combinations of recommended dose of fertilizers (RDF), biofertilizer (PSB), and vermicompost were applied. The results showed that the combined application of inorganic fertilizers along with biofertilizer and vermicompost significantly improved plant growth, plant height, and yield attributes compared to control. Among all treatments, application of 100% RDF along with PSB and vermicompost (2 t/ha) recorded the best performance in terms of growth and yield. Overall, it can be concluded that integrated nutrient management is an effective and sustainable approach for improving wheat productivity while maintaining soil health.

**Keywords:** Wheat, Integrated Nutrient Management, RDF, Vermicompost, Biofertilizer, Yield

**Structural Changes in Indian Agriculture: Evidence from Horticultural Diversification****Amit Yadav, Neeraj Pawar, D.P. Malik and Janailin S. Papang**

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Crop diversification towards horticultural crops has increasingly been seen as an important and emerging pathway for enhancing farm income and supporting sustainable agricultural growth. In this context, the present study examines the changing pattern of horticultural diversification across nation and different regions over the period of 2004-05 to 2023-24, using secondary data. The extent of diversification has been assessed through the Herfindahl-Hirschman Index of Diversification (HHI) as well as other diversification measures while growth trends have been analysed using Compound Annual Growth Rate (CAGR). The findings indicate that overall diversification has slightly declined over time, as reflected in the rise in HHI from 0.2611 to 0.2708 and the corresponding decline in SID and CEI. At the same time, horticultural crops have shown uneven but noticeable growth across regions. Fruits recorded relatively higher growth in the northern region (4.40%), while vegetables expanded more rapidly in the eastern region (6.84%) and spices showed significant growth in the western region (5.82%). However, the declining share of fruits and the relatively stable share of other crop groups suggest that this shift is not broad-based and remains uneven across crop categories. The analysis of determinants, carried out using principal component analysis, further indicates that factors such as irrigation intensity, Road length, Urbanization and Per Capita Income levels play an important role in shaping diversification patterns. These trends appear to be closely linked with ongoing policy support through programmes such as the National Horticulture Mission, National Horticulture Board, MIDH, Operation Greens and export promotion initiatives under APEDA as well as the Foreign Trade Policy (2023), which aim to strengthen infrastructure for production, value chains, market linkages and trade. Overall, the study suggests that while Indian agriculture is gradually moving towards high-value crops, diversification remains regionally concentrated and structurally uneven, thereby requiring more focused and region-specific policy efforts to ensure balanced and sustainable agricultural development.

**Keywords:** Horticulture, Crop Diversification, CAGR, Agricultural Policy, India

**Abstract No: B-III-030**

**Registration No:1287**

**Efficacy of bio agents in the integrated management of root-knot nematode fusarium wilt disease complex in tomato**

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The Fusarium wilt disease complex is a highly destructive disease of tomato (*Solanum lycopersicum* L.) caused by the synergistic interaction between *Fusarium oxysporum* f. sp. *lycopersici* and *Meloidogyne incognita*. This interaction leads to severe yield losses and represents a major constraint to tomato cultivation. The present study aimed to develop an effective and eco-friendly management strategy that reduces dependence on chemical fungicides by employing various bioagents for integrated control of these pathogens in tomato cv. Hisar Arun. Significant variation among the bioagents was observed with respect to disease suppression, nematode management, physiological responses, and plant growth. Among all treatments, *Trichoderma harzianum* 1.0% WP (0.8%) consistently exhibited the highest efficacy. The study demonstrated that *M. incognita* infection predisposed tomato plants to increased severity of Fusarium wilt, highlighting the necessity of simultaneous management of both pathogens. *Trichoderma harzianum* 1.0% WP (0.8%) reduced disease severity, minimized infection rate, and exhibited the lowest Area Under the Disease Progress Curve (AUDPC) relative to the inoculated control. Physiologically, *T. harzianum* treated plants displayed higher total chlorophyll content and photosynthetic rate, indicating enhanced photosynthetic efficiency.

**Keywords:** Tomato, Fusarium wilt disease complex, bioagents, infection rate

**Abstract No: B-III-031**

**Registration No:1293**

**Comparative parasitization efficiency of different Trichogramma species for sustainable management of pink bollworm (*Pectinophora gossypiella*) in Cotton**

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The present investigation was carried out in the Biocontrol laboratory, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar, during the year 2024–25 to study how effective different species of *Trichogramma* are, as a Biocontrol agent against pink bollworm (*Pectinophora gossypiella*) in Cotton. We checked the parasitization efficiency of four different species of *Trichogramma* which included *Trichogramma bactrae*, *Trichogramma japonicum*, *Trichogramma embryophagum* and *Trichogramma chilonis* against pink bollworm. This method was opted to control the infestation of insect, instead of insecticides as it is not

only one of the most sustainable methods of control but it is also safe for the environment as well. For this purpose, four sets of pink bollworm eggs were created. Each set comprised of 50 eggs. On these 4 sets, 4 different species of *Trichogramma* were allowed to parasitize. Later on, number of parasitized eggs were counted for each species. This experiment was repeated thrice and then parasitization efficiency was calculated for each species. *Trichogramma bactrae* appeared to be the best biocontrol agent against pink bollworm with parasitization efficiency of 76.6%. *Trichogramma chilonis* showed parasitization efficiency of 70.60% and in case of *Trichogramma embryophagum*, it was found to be 54.66%. Lowest parasitization was found in *Trichogramma japonicum* that was 51.33%. As it was found that *Trichogramma bactrae* was the most effective among all 4 species so it was taken for the field trials as well and the results were astonishing. Compared to the plots where Insecticides were applied, less infestation was found in the plots where *Trichogramma bactrae* was released at regular intervals. Hence, it is evident that *Trichogramma* can be an effective tool to control pink bollworm infestation in cotton. By avoiding insecticidal application, we all can work for better health, better environment and better results.

**Keywords:** Pink bollworm, *Trichogramma*, Sustainable method, Biocontrol agent

**Abstract No: B-III-032**

**Registration No:1311**

### **Effect of UV-C irradiation on Shelf life of capsicum: A Review**

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Vegetables are high-value crops widely cultivated under protected conditions for improved productivity and quality. They are known for their attractive colours, nutritional value, and antioxidant properties. Cucumber is a refreshing vegetable with high water content that helps maintain hydration and supports healthy skin. Tomato is an excellent source of vitamin C, potassium, and lycopene, a powerful antioxidant that supports heart health and immunity. Capsicum fruits are low in calories yet highly nutritious, being rich in vitamins A and C, which help maintain health and immunity. Protected cultivation is a modern production technique used for the qualitative and quantitative improvement of horticultural crops. It has expanded rapidly across the world in recent decades. It is also known as Controlled Environment Agriculture, recognized for high productivity, efficient use of water and land resources, and eco-friendly nature. Studies on postharvest management have shown that optimized UV-C based treatments significantly improve storage life. Research revealed that UV-C irradiation, alone or combined with hydro-cooling and edible coatings, effectively reduced weight loss, maintained firmness, and preserved quality during storage. Higher UV-C doses were also found to enhance antioxidant activity and bioactive compounds in bell pepper fruits. The present study is planned to evaluate the effect of UV-C irradiation on the shelf life of capsicum (*Capsicum annum L.*) grown under protected conditions. The influence of postharvest UV-C irradiation on quality attributes of capsicum during refrigerated storage will be investigated. The overall objective is to standardize an effective UV-C treatment for extending postharvest shelf life under cold storage conditions.

**Keywords:** Vegetables, UV-C irradiation, postharvest storage, refrigerated conditions, shelf life

**Abstract No: B-III-033**

**Registration No:1312**

### **Importance of non- *Apis* bee pollinators in pollination**

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Insects constitute one of the most diverse and functionally significant groups of organisms on Earth, playing critical roles in the maintenance and stability of terrestrial ecosystems. Among insects, bees are particularly notable for their role as pollinators, providing essential ecosystem services that support both wild plant reproduction and agricultural productivity. Honey bees (*Apis* spp.) collect nectar and pollen from flowers, which serve as essential nutrients for colony growth and maintenance. Social bees, including honey bees, bumble bees (*Bombus* spp.) and stingless bees, exhibit division of labour and colony-based organization, which enhances their efficiency as pollinators. Bees that belong to genera other than *Apis* are collectively referred to as non-*Apis* bees. Research over recent decades has highlighted the ecological importance of non-*Apis* bees in pollination biology. These bees often exhibit specialized foraging behaviours, morphological adaptations, and high efficiency in pollen transfer, which in many contexts can make them more effective pollinators than honey bees for certain crops. Non-*Apis* bees also contribute to ecosystem resilience due to their diversity, temporal activity patterns and ability to pollinate flowers under environmental conditions that limit honey bee activity, such as cooler temperatures or dense floral architecture. Among non-*Apis* bees, the family Megachilidae, particularly the genus *Megachile*, plays a crucial role in pollinating wild plant species and maintaining ecosystem stability. One distinctive morphological adaptation of *Megachile* bees is the placement of the scopa (pollen-collecting hairs) on the ventral surface of the metasoma, in contrast to the hind-leg scopa found in most other bees. This adaptation facilitates efficient pollen collection and transport, enhancing their effectiveness as pollinators.

**Keywords:** Bumble bees, *Halictus* sp., Leaf cutter bees, Mason bees, *Megachile* sp., *Nomia* sp., non-*Apis* bees, *Osmia* sp., Pollination, Pollinators, *Xylocopa* sp.

**Abstract No: B-III-034**

**Registration No:1325**

### **Sustainable management of citrus psyllid (*Diaphorina citri*) through biorationals in Kinnow**

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The citrus psyllid (*Diaphorina citri*) is a serious pest of kinnow mandarin, primarily due to its role as the vector of Huanglongbing (citrus greening) disease. Both nymphs and adults damage plants by sucking sap, causing leaf curling, stunted growth, and significant yield loss in orchards. The field experiment was carried out at the Experimental Orchard, DDUCE-OF, CCS Haryana Agricultural University, Hisar, during the spring seasons of 2023–24 and 2024–25 to evaluate the efficacy of selected biorationals against citrus psylla (*Diaphorina citri*) in kinnow.

The trial was laid out in a Randomized Block Design (RBD) comprising eight treatments with three replications. Observations of psyllid populations were recorded 1 day prior to the first spray and subsequently at 5, 10, and 15 days after each spray application. Results on the basis of cumulative of both years (2023-24 & 2024-25) revealed that minimum population (5.95 psyllid/ twig) was recorded in treatment having two sprays of azadirachtin 1% @ 5ml/l of water with maximum reduction (78.10%) over control followed by treatment having two sprays of azadirachtin (0.15%) @ 5 ml/litre of water having 7.64 psyllid/ twig with 72.14 per cent reduction over control and both were found statistically at par with each other. Next best treatment was two sprays of 5% neem oil at 5 ml/liter of water, with 8.92 psyllids/and a 67.24 percent reduction over the control. The findings highlight the scope of integrating eco-friendly alternatives into citrus pest management programs, reducing reliance on chemical insecticides, and supporting sustainable kinnow production.

**Keywords:** azadirachtin, biorationals, citrus, entomopathogenic fungi, neem oil, psylla

**Abstract No: B-III-035**

**Registration No:1329**

**Role of Farmer Producer Organisations in Enhancing Farmers' Livelihoods: A Study of Kaithal District, Haryana**

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Farmer Producer Organisations (FPOs) have emerged as a vital institutional mechanism for improving the socio-economic conditions of farmers. The present study assesses the impact of FPO membership on farmers in Kaithal district of Haryana by comparing member and non-member farmers. A total of 160 respondents (80 members and 80 non-members) were selected, and primary data were collected through a structured schedule. Statistical tools such as the two-sample t-test, Chi-square test, and Wilcoxon-Mann-Whitney U test were employed for analysis. The results revealed that FPO membership has a significant positive impact on farm income, with member farmers earning considerably higher income than non-members. Socio-economic indicators, including food security, habitat security, educational security, health security, and social empowerment, were analysed using appropriate scales and scoring methods. The findings indicated significant differences between members and non-members in terms of food expenditure patterns, resilience to price fluctuations, possession of assets such as four-wheelers, access to improved healthcare services, and health insurance coverage.

Further, FPO members exhibited better educational outcomes, including higher enrolment in private schools, greater access to higher education, and lower dropout rates due to financial constraints. In terms of social empowerment, members showed significantly higher levels of awareness, leadership ability, participation in social activities, self-confidence, and entrepreneurial orientation. However, no significant differences were observed in certain basic amenities and demographic characteristics such as age and family size. Overall, the study concludes that FPOs play a significant role in enhancing income, improving livelihood security, and promoting social empowerment among farmers in Kaithal district. Strengthening FPO capacity, improving institutional support, and enhancing market linkages can further amplify their impact on rural development.

**Abstract No.: B-III-036**

**Registration No.: 1333**

**Fungicide resistance in *Macrophomina phaseolina* infecting cotton: Mechanisms, monitoring and management**

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Charcoal rot caused by *Macrophomina phaseolina* (Tassi) Goid. is a devastating soil-borne disease of cotton (*Gossypium hirsutum* L.) that causes severe economic losses in the semi-arid cotton-growing belts of India. Over the past decade, the repeated and indiscriminate use of chemical fungicides for the management of this pathogen has raised serious concerns regarding the development of fungicide resistance. The present review critically examines the current status of fungicide resistance in *M. phaseolina*, with special reference to benzimidazoles, triazoles, and carboxin-based fungicides commonly employed in cotton production systems. Key resistance mechanisms including target-site mutations, efflux pump overexpression, and metabolic detoxification pathways are discussed. Monitoring approaches such as discriminatory dose bioassays, molecular marker-based detection, and EC<sub>50</sub> profiling are reviewed for their utility in early detection of resistant populations in field conditions. The review further highlights the urgent need for fungicide resistance management (FRM) strategies encompassing rotation of fungicide groups, integration of biocontrol agents, and adoption of Indian Knowledge System (IKS)-based plant extracts with antifungal properties as complementary tools. Strengthening resistance monitoring networks and developing region-specific FRM guidelines are recommended to ensure sustainable and effective management of *M. phaseolina* in cotton, in alignment with the goals of Viksit Bharat @2047.

**Keywords:** Fungicide resistance, *Macrophomina phaseolina*, Cotton, Charcoal rot, Resistance management, Biocontrol

**Abstract No.: B-III-037**

**Registration No.: 1335**

**Efficacy of bio-ecological management strategies against lasora stone weevil under field conditions at Regional Research Station, Bawal**

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The present investigation was conducted during 2025 at Regional Research Station, Bawal to evaluate the bio-efficacy of selected bio-pesticides and insecticides against Lasora stone weevil, *Barioscopus cordiae*. The experiment was laid out in a Randomized Block Design (RBD) with three replications. Eight treatments comprising NSKE (5%), karanj seed extract

(5%), *Bacillus thuringiensis* var. kurstaki (0.1%), *Metarhizium anisopliae* (6 g/L), neem oil (0.1%), spinosad 45 SC (0.2 ml/L), *Beauveria bassiana* (6 g/L) and an untreated control were evaluated. The results revealed significant differences among treatments in reducing fruit infestation. Spinosad 45 SC recorded the lowest fruit infestation (27.80%) and proved to be the most effective treatment with 66.10 per cent reduction over control. This was followed by *Beauveria bassiana* (34.60%) and *Metarhizium anisopliae* (37.90%), showing 57.80 and 53.80 per cent reduction, respectively. Among botanical treatments, NSKE (41.90%) was found to be more effective compared to neem oil (45.10%) and karanj seed extract (48.20%). The highest infestation (82.00%) was observed in untreated control. The study concludes that spinosad is highly effective against *Lasora* weevil, while entomopathogenic fungi such as *Beauveria bassiana* and *Metarhizium anisopliae* offer promising eco-friendly alternatives for sustainable pest management strategies.

**Keywords:** *Lasora* weevil, *Barioscapus cordiae*, spinosad, bio-pesticides, NSKE, entomopathogenic fungi, IPM

**Abstract No.: B-III-038**

**Registration No.: 1339**

### **Macrophomina phaseolina in cotton: Biology, epidemiology and integrated disease management strategies**

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Cotton (*Gossypium hirsutum* L.) is one of the most economically important fiber crops in India, yet its productivity is severely threatened by soil-borne fungal pathogens, among which *Macrophomina phaseolina* (Tassi) Goid., the causal agent of charcoal rot and root rot, poses a significant challenge. This pathogen has an exceptionally wide host range, survives in soil as microsclerotia for extended periods, and thrives under conditions of high temperature and moisture stress, making it particularly devastating in semi-arid cotton-growing regions of Haryana and Rajasthan. The present review synthesizes current knowledge on the biology, infection mechanism, epidemiology, and yield losses caused by *M. phaseolina* in cotton. The pathogen's ability to produce cell-wall-degrading enzymes and exploit drought-stressed plants accelerates disease progression, often resulting in 20–40% yield losses under favorable conditions. Various management strategies including cultural practices, resistant varieties, chemical fungicides, and biological control agents such as *Trichoderma* spp., *Bacillus subtilis*, and *Pseudomonas fluorescens* have been evaluated. Emerging approaches integrating Indian Knowledge Systems with modern biotechnological tools, including genomics-assisted breeding and nano-fungicides, show considerable promise. A holistic integrated disease management (IDM) framework combining these strategies is advocated for sustainable cotton production aligned with the vision of Viksit Bharat @2047.

**Keywords:** Cotton, *Macrophomina phaseolina*, Charcoal rot, Biological control, Integrated Disease Management

**Abstract No.: B-III-039**

**Registration No.: 1340**

**Biological control of *colletotrichum gloeosporioides* causing anthracnose of guava: A review**

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Guava (*Psidium guajava* L.) is a nutritionally rich and economically significant tropical fruit crop widely cultivated across India. However, its production is severely constrained by anthracnose, caused by *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc., which causes extensive pre- and post-harvest losses often exceeding 30-40% under humid conditions. Increasing concerns over chemical fungicide residues, environmental hazards, and pathogen resistance have necessitated exploration of eco-friendly biological control approaches. The present review consolidates current knowledge on the biocontrol of *C. gloeosporioides* in guava, with emphasis on antagonistic microorganisms including *Trichoderma* spp., *Bacillus subtilis*, *Pseudomonas fluorescens*, and *Chaetomium globosum*. Mechanisms of biocontrol including mycoparasitism, antibiosis, competition for nutrients and space, and induction of systemic resistance are discussed. The role of plant-based botanicals and traditional Indian Knowledge Systems (IKS) such as neem-based formulations, turmeric, and garlic extracts as supplementary biocontrol tools is also highlighted. Integration of biocontrol agents with post-harvest management practices including hot water treatment, edible coatings, and modified atmosphere storage is emerging as a promising holistic strategy. Standardization of biocontrol formulations, shelf-life improvement, and field-level delivery mechanisms remain key challenges that warrant further research. Developing region-specific, integrated biocontrol modules aligned with sustainable agriculture and the vision of Viksit Bharat @2047 is strongly recommended.

**Keywords:** Guava, *Colletotrichum gloeosporioides*, Anthracnose, Biological control, Biocontrol agents, Post-harvest disease

**Abstract No.: B-III-040**

**Registration No.: 1368**

**Enhancing Food Safety and Nutrition through Sustainable Crop Protection**

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Sustainable crop protection is a key driver for ensuring food safety, nutrition security, and agri-economic transformation aligned with the vision of Viksit Bharat. It integrates ecological approaches with modern technologies to enhance crop resilience, productivity, and environmental sustainability. Strategies such as integrated pest management (IPM), biological control agents, and plant-based pesticides reduce dependence on synthetic chemicals while maintaining yield and quality. Precision agriculture tools further optimize resource use and improve efficiency. Emerging innovations, including nanotechnology, artificial intelligence-based pest monitoring, and climate-smart practices, are reshaping crop protection by

minimizing pesticide residues, preserving soil health, and enhancing the nutritional quality of food. These advancements also support compliance with global food safety standards. Sustainable crop protection contributes to improved farmer income, stronger value chains, and rural development. However, challenges such as high costs, limited accessibility, and scalability constraints remain. Addressing these requires innovation, policy support, and stakeholder collaboration. Overall, sustainable crop protection offers a pathway toward safe, nutritious food systems and inclusive agricultural growth.

**Keywords:** Sustainable Crop Protection, Food Safety, Nutrition Security, Integrated Pest Management (IPM), Precision Agriculture, Agri-Economic Transformation

**Abstract No.: B-III-041**

**Registration No.: 1390**

### **Mucilage in plant produce: structure, functional properties, and industrial applications**

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Mucilage is a naturally occurring, hydrophilic polysaccharide found in various plant tissues, including seeds, fruits, leaves, and roots. It plays a crucial role in plant physiology by aiding in water retention, seed germination, and protection against environmental stress. In plant produce such as okra, flaxseed, chia, taro, and cactus, mucilage is present in significant quantities and exhibits unique physicochemical and functional properties. Structurally, mucilage is composed of complex heteropolysaccharides, including arabinose, galactose, rhamnose, and uronic acids, which contribute to its high water-binding capacity, viscosity, and gel-forming ability. These properties make mucilage a valuable component in food, pharmaceutical, and biomedical applications. In the food industry, it functions as a natural thickener, stabilizer, emulsifier, and fat replacer, enhancing texture and shelf life of products. Additionally, mucilage possesses health-promoting properties such as dietary fiber effects, glycemic control, cholesterol reduction, and prebiotic activity. Recent research has focused on the extraction, characterization, and modification of mucilage from different plant sources to optimize its functionality. Sustainable extraction techniques and its potential as a biodegradable and eco-friendly biomaterial have further increased its industrial relevance. Despite its wide applications, variability in composition and functional properties across plant species remains a challenge for standardization. Overall, mucilage represents a promising natural biopolymer with multifunctional applications in plant-based food systems and beyond, thereby justifying further exploration in post-harvest technology and value-added product development.

**Comparative biology of *Helicoverpa armigera* (Hubner) on natural and artificial diets: Implications for sustainable crop protection****Geeta Devi, Pankaj Kumar, Lomash Kumar**

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*Helicoverpa armigera* (Hubner) is a major polyphagous pest responsible for severe yield losses in tomato. A detailed understanding of its biology is essential for designing effective and timely management strategies. The present study evaluated the comparative biology of *H. armigera* on natural diet (tomato fruits) and an artificial chickpea flour-based diet under laboratory conditions. The results indicated that larval development period was relatively shorter on tomato, whereas larvae reared on chickpea-based artificial diet showed higher survival, uniform growth, pupation, and adult emergence, confirming its suitability for mass rearing. However, fecundity and egg viability were comparatively higher in insects reared on natural tomato diet, indicating enhanced reproductive fitness on the host plant. The study highlights that knowledge of developmental duration, survival rate and reproductive potential of *H. armigera* plays a crucial role in its management. Understanding the life cycle helps in identifying the most vulnerable stages, particularly early instar larvae, for timely intervention. This biological information aids in optimizing the timing of control measures such as pheromone trap installation, release of biological control agents and precise application of insecticides, thereby improving their effectiveness. Furthermore, the findings contribute to broader agri-economic and policy dimensions by enabling cost-effective pest management, supporting integrated pest management (IPM) adoption, and enhancing farmer income through reduced input costs and improved produce quality. The use of artificial diet also facilitates large-scale rearing of insects for research, bioagent production, and innovation in pest management technologies. Thus, linking insect biology with sustainable practices, digital monitoring tools, and policy-driven extension systems can strengthen resilient agricultural systems and promote safe, high-quality tomato production in line with the vision of Viksit Bharat.

**Keywords:** *Helicoverpa armigera*, tomato, artificial diet, biology, integrated pest management (IPM),

**Abstract No.: B-III-043**

**Registration No.: 1424**

**Bio-assay based detection of petroleum hydrocarbons contamination in soil and their bioremediation using *Pseudomonas fluorescens* MTCC 103**

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Petroleum hydrocarbon (PHC) contamination severely deteriorates soil quality and its biological activity. This study investigated bio-assay based detection of petroleum hydrocarbons contamination in soil and their bioremediation using *Pseudomonas fluorescens* MTCC 103. Physicochemical and biological parameters of soil indicated severe PHC contamination, characterized by high total organic carbon (TOC; 19.62%) and total petroleum hydrocarbon (TPH; 14.72%), with reduced lipase activity ( $0.962 \mu\text{mol min}^{-1} \text{g}^{-1}$ ) and low bacterial ( $6.40 \times 10^4 \text{ CFU g}^{-1}$ ) and fungal ( $1.14 \times 10^1 \text{ CFU g}^{-1}$ ) count. Fluorescence based bio-assay response using *P. fluorescens* MTCC 103 provided a sensitive and reliable approach for detecting PHC contamination in soil, with variations in pigment intensity indicating low, moderate and high contamination levels. During bio-assay maximum pigment production was recorded in the presence of 1% PHC contaminated soil. However, pigment production was inhibited at higher concentrations (10%, 15% and 20%) of PHC contaminated soil. *Pseudomonas fluorescens* MTCC 103 along with biosurfactant BS103 also played key role in bioremediation of PHC contaminated soil under both liquid culture remediation and solid state conditions. After 60 days of bioremediation under liquid culture conditions, lipase activity in soil increased to a maxima of  $9.11 \mu\text{mol min}^{-1}$ , along with maximum TOC and TPH reduction of 44.7% and 55.7%, when treated with *P. fluorescens* MTCC 103 and its derivative biosurfactant (BS103). However, under state conditions, lipase activity of  $6.71 \mu\text{mol min}^{-1} \text{g}^{-1}$ , TOC and TPH reduction of 30.7% and 40.1%, respectively, were recorded in the same treatment. Overall, the study demonstrates that fluorescence-based bioassay using *P. fluorescens* MTCC 103 is an effective and sensitive approach for detecting PHC contamination in soil. Furthermore, bioremediation significantly enhanced hydrocarbon degradation, improved lipase activity, and reduced TOC and TPH levels. Comparative evaluation indicated that liquid culture remediation was more efficient than solid-state treatment in restoring soil biological activity and reducing contaminant load.

**Abstract No.: B-III-044**

**Registration No.: 1430**

**Screening of different varieties/lines against whitefly, *Bemisia tabaci* (G.) on mung bean under natural conditions**

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Field evaluation of sixty-three varieties/lines of mung bean (*Vigna radiata*) for their resistance against whitefly, *Bemisia tabaci* (G.) was carried out at Agricultural Research farm, Rani Lakshmi Bai Central Agricultural University, Jhansi on the basis of whitefly population during *Kharif* season-2022-23. Lines IPU-24-21, ML-2818 and KMG-479 showed minimum average whitefly population and Proved to be tolerant lines. Whereas, the maximum average whitefly populations were recorded on the line ML-2795 followed by IPU-2000-1 and LC (Local cultivar). From the above line ML-2795 remained highly infested with the whitefly in all observational period. An insect resistant/tolerant cultivar fits well in integrated pest management as it provides the farmers with ecologically sound, effective and economical option for pest management.

**Keywords:** Mung bean crop, *Bemisia tabaci* (Gennadius), Natural conditions, Screen, varieties/lines

**Abstract No.: B-III-045**

**Registration No.: 1451**

**Sub-lethal Effects of Dimethoate and Thiamethoxam on Returning Behaviour of *Apis mellifera***

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Honey bees (*Apis mellifera*) are vital pollinators that play a significant role in agricultural productivity and ecosystem stability. However, their exposure to insecticides through contaminated food sources can adversely affect their behaviour, particularly their homing ability. A field study was conducted at CCS Haryana Agricultural University, Hisar, to evaluate the sub-lethal effects of dimethoate 30% EC and thiamethoxam 25% WG, administered through sucrose solution, on the returning activity of marked worker bees at the hive entrance. Observations were recorded at three-time intervals (0900-1000 h, 1200-1300 h and 1500-1600 h) over five days during treatment. Pre-treatment observations indicated uniform returning activity across treatments. A significant decline in returning behaviour was observed following insecticide exposure, varying with concentration and type of insecticide. Lower concentrations,

particularly dimethoate @220 ppm, exhibited relatively higher returning activity (>6 bees/5 min), indicating reduced impact. In contrast, higher concentrations such as thiamethoxam @100 ppm and dimethoate @880 ppm caused a marked reduction, with values declining to around 3 bees/5 min. The maximum reduction in returning activity was recorded with thiamethoxam @100 ppm (46.53%), followed by dimethoate @880 ppm (43.09%), whereas lower doses showed comparatively lesser effects. The control maintained stable returning activity throughout the study. The study highlights the dose-dependent adverse effects of insecticide exposure on the homing behaviour of honey bees, emphasizing the need for judicious pesticide use.

**Keywords:** *Apis mellifera*, returning activity, dimethoate, thiamethoxam, pollinator health

# **Sub Theme IV**

**Any other work in Agricultural Science & Technology  
integrating Indian Knowledge Systems (IKS) into modern  
practices**

**Abstract No: B-IV-001**

**Registration No:1016**

**Assessment of Physiological Stress and Drudgery among Women Farmers during Harvesting**

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This study aims to assess the physiological workload experienced by women farmers during manual harvesting activities using different types of sickles. Agricultural operations, particularly harvesting, involve repetitive movements and prolonged physical effort, leading to increased drudgery and health risks among farm women. The study was conducted on selected women farmers with an average age of  $35.6 \pm 4.11$  years, body weight of  $58.60 \pm 5.80$  kg, and height of  $157.37 \pm 6.81$  cm. The mean Body Mass Index (BMI) of respondents was  $23.74 \pm 2.06$  kg/m<sup>2</sup>, indicating a normal and mesomorphic body type. Physiological parameters such as heart rate, oxygen consumption, and energy expenditure were measured at rest and during harvesting work. The results revealed a significant increase in physiological responses during work. The average heart rate increased from  $78.83 \pm 11.00$  beats/min at rest to  $95.36 \pm 8.56$  beats/min during work. Similarly, oxygen consumption increased from  $1.18 \pm 0.16$  l/min to  $1.45 \pm 0.13$  l/min, while energy expenditure rose from  $3.62 \pm 1.79$  kcal/min to  $6.44 \pm 1.35$  kcal/min. Statistical analysis indicated that these increases were significant ( $p < 0.05$ ), highlighting the high physiological workload involved in manual harvesting. The findings indicate that manual harvesting imposes considerable physiological stress on women farmers, leading to increased drudgery. The study emphasizes the need for ergonomic interventions and improved tool usage to reduce workload and enhance efficiency.

**Keywords:** Drudgery, ergonomics, manual harvesting, physiological workload, women farmers

**Abstract No: B-IV-002**

**Registration No:1034**

**Development of a scale on financial well-being of rural farm families**

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A scale was developed to assess the financial well-being of rural farm families in Hisar and Panipat districts. Two villages from each district were selected for data collection, comprising a total sample size of 120 respondents. The study specifically examined the human factor influencing the financial well-being of rural farm families through eight key sub-factors. The overall obtained score was 100.4 out of a maximum possible score of 180, resulting in a human factor index of 55.7 score, which indicates a moderate level of human capital development among the respondents. Among the sub-factors, work experience (H3) recorded the highest score (91.2), reflecting strong practical exposure and field-based knowledge. Entrepreneurial skills (H8) (72.5), awareness about risk management (H7) (67.08), and technical and digital

skills (H6) (66.7) also demonstrated relatively high performance, highlighting the increasing adaptability and skill orientation of respondents. Moderate scores were observed in awareness about farm practices (H5) (58.4) and family age distribution (H1) (56.52), suggesting average levels of knowledge and demographic support within households. However, training exposure (H4) (36.97) and diploma courses related to agriculture (H2) (21.7) showed comparatively low scores, indicating limited access to formal training and education. Overall, the findings emphasize the need to strengthen institutional training and educational opportunities.

**Keywords:** Entrepreneurial, exposure, scale, well-being

**Abstract No: B-IV-003**

**Registration No:1045**

**Survival studies on white tip nematode of rice, *Aphelenchoides besseyi* in exotic and indigenous rice germplasm**

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White tip nematode of rice, *Aphelenchoides besseyi* is major seed borne nematode and considered as a quarantine pest by several countries. *A. besseyi* survive in anhydrobiotic state for several years inside the seeds and spread with it. It is most frequently intercepted plant parasitic nematode in exotic as well as indigenous germplasm processed at Division of Plant Quarantine, ICAR-NBPGR. Studies were conducted to observe the survival of nematode in paddy seeds under exchange and seeds meant for pest free conservation in National Gene bank. Sixty diverse samples of paddy, both indigenous and exotic were observed for presence of *A. besseyi*. Seeds were soaked in water for 48 hours and observed under microscope. Out of sixty samples, thirteen were found infected with *A. besseyi*. Among the infected samples, 20 to 80 percent seeds were found with nematodes (dead and / live). Among inactive nematodes, few nematodes were revived within 24 h while most of the nematodes were unable to revive. In conclusion, large number of nematodes can survive inside the seeds and effective management strategy such as hot water treatment needed to prevent its spread.

**Keywords:** *Aphelenchoides besseyi*, rice, plant quarantine

**Salinity-Mediated Biochemical Modulation of *Azolla indicus* and Its Functional Implications on Growth Performance and Muscle Texture Quality of *Ctenopharyngodon idella*: Towards Sustainable Aquafeed Development**

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Salinity fluctuations, driven by climate variability and anthropogenic activities, pose a critical challenge to the stability of freshwater aquaculture systems by altering the nutritional dynamics of feed resources. This study investigates the salinity-induced biochemical modulation of *Azolla indicus* and its subsequent influence on the growth performance and flesh texture quality of grass carp (*Ctenopharyngodon idella*). As a fast-growing, protein-rich aquatic macrophyte, *Azolla indicus* represents a promising sustainable alternative to conventional feed ingredients; however, its functional efficacy under salinity stress remains inadequately understood. The present work systematically evaluates the effects of graded salinity regimes on biomass productivity, proximate composition and key bioactive compounds, including phenolics, flavonoids, tannins and carotenoids. Furthermore, salinity-conditioned azolla is incorporated into formulated diets to assess its impact on growth indices, feed conversion efficiency and muscle textural attributes of grass carp. By integrating plant biochemical responses with fish performance metrics, this study establishes a mechanistic linkage between environmental stress and feed functionality. The findings are expected to advance climate-resilient aquaculture strategies by optimizing the use of salinity-adapted azolla as a cost-effective and nutritionally efficient feed resource. This research contributes to sustainable aquaculture intensification, enhanced fish quality and the development of eco-friendly feeding systems aligned with global food security goals.

**Keywords:** *Azolla indicus*, salinity stress, bioactive compounds, growth performance, texture quality, functional feed, sustainable aquaculture

**Abstract No: B-IV-005**

**Registration No:1100**

**Green-Synthesized Copper Nanoparticles from *Xanthium strumarium*:  
Antifungal Activity Against *Fusarium moniliforme***

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*Xanthium strumarium* L. (family Asteraceae), commonly known as cocklebur, is a widely distributed medicinal plant recognized for its broad spectrum of bioactive compounds including flavonoids, terpenoids, phenolic acids, and xanthanol. Traditionally used in Ayurvedic and folk medicine across different countries, the plant has been reported to possess anti-inflammatory, antimicrobial, analgesic, and immunomodulatory properties, making it a promising source for the green synthesis of nanoparticles. In the present study, copper nanoparticles (CuNPs) were synthesized using the methanolic leaf extract of *Xanthium strumarium* through an eco-friendly green synthesis approach. The synthesized CuNPs were evaluated for their antifungal activity using the percentage inhibition method against fungal pathogen- *Fusarium moniliforme*. The inhibitory effect was assessed across varying concentrations of the nanoparticle suspension. At 0 µg/mL, no inhibition was observed (0%), confirming the concentration-dependent nature of the activity. A progressive increase in inhibition was recorded at 62.5 µg/mL (25%), 125 µg/mL (55%), and 250 µg/mL (67.41%). The standard antifungal drug amphotericin B at 8 µg/mL yielded 74.4% inhibition, serving as the positive control. The results demonstrate that *Xanthium strumarium*-mediated CuNPs exhibit significant concentration-dependent antifungal activity, with efficacy approaching that of the standard drug at higher concentrations. These findings highlight the potential of green-synthesized copper nanoparticles from *Xanthium strumarium* as a viable and sustainable alternative for antifungal therapeutic applications, promising further in vivo studies.

**Keywords:** *Xanthium strumarium*, copper nanoparticles, green synthesis, antifungal activity, medicinal plant, *Fusarium moniliforme*

**Abstract No: B-IV-006**

**Registration No:1127**

**Normal mode analysis and *in-silico* characterisation of plant cyclotides  
using elastic network models**

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Plant cyclotides are a special class of small proteins with a wide range of biological functions and remarkable stability. The normal mode analysis and in-silico characterization of plant cyclotides using an elastic network model (ENM) are presented in this paper. Amino acid composition, molecular weight, isoelectric point, and stability estimates were among the physicochemical characteristics of cyclotide sequences that were examined using the ExPasy ProtParam tool after being obtained from the National Center for Biotechnology Information

(NCBI). SOPMA was used to forecast secondary structures through the NPS@Server platform, identifying regions that produced beta strands, turns, and alpha helices. Clustal W was used for multiple sequence alignment and phylogenetic analysis, Jalview was used for visualization, and Mega 11 and the Interactive Tree of Life (iTOL) were used for additional analysis. In order to discover flexible and stable areas essential for protein function, ENM analysis was used to identify important dynamic properties, concentrating on residues with the largest and lowest changes. Our results shed light on the structural dynamics of cyclotides, emphasizing their evolutionary connections, structural stability, and their uses in biotechnology and medication development. This thorough investigation advances our knowledge of cyclotides and will help them be used in a variety of biotechnological applications in the future.

**Keywords:** Clustal W, ENM, Normal Mode Analysis, Expasy, SOPMA, and Cyclotides

**Abstract No: B-IV-007**

**Registration No:1189**

## **A Factor Analytical Study on Youth Perception and Challenges in Agri-Entrepreneurship**

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Agripreneurship, or agricultural entrepreneurship, has become a vital route for employing young people in rural areas, reducing poverty, and ensuring the country's food security. Despite its revolutionary potential, young view of agri-entrepreneurship is nevertheless limited by a variety of obstacles, from institutional and structural flaws to socio-psychological inhibitions. This study examines a number of factors that influence young people's perceptions of agri-entrepreneurship as well as important barriers that limit young people's involvement and the sustainability of their businesses. A structured questionnaire with 50 statements—25 for each of perception and constraints—was used to gather data from 200 agricultural students. Factor analysis was then used to reduce dimensionality. The sampling appropriateness was verified by the Kaiser-Meyer-Olkin (KMO) adequacy values of 0.816 and 0.716. Seven dimensions were found through factor analysis of youth perception: Prospects for agriculture, production management, a career in agri-entrepreneurship, the best use of resources, success mantras, family engagement, and contemporary technologies all account for 63.54% of the variance. Financial and institutional constraints, operational and marketing constraints, socio-psychological constraints, awareness and information gaps, household and resource constraints, and enterprise development constraints were among the seven constraint factors that were found to account for 60.62% of the total variance. In order to promote sustainable agri-entrepreneurship among rural youth, the findings offer empirical support for focused policy interventions, capacity building initiatives, and institutional reforms.

**Keywords:** *Agri-entrepreneurship, youth perception, factor analysis, agricultural constraints*

**Abstract No: B-IV-008**

**Registration No:1215**

**Prevalence of root-knot nematode (*Meloidogyne incognita*) associated with Guava in Hisar and Fatehabad Districts of Haryana**

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Guava is major horticulture crop which grown nearly all district of Haryana. A survey was conducted to assess the prevalence of root-knot nematode in Guava (*Capsicum annuum* L.) in Hisar and Fatehabad districts of Haryana. A total of 47 soil and root samples of Guava were collected from Hisar and Fatehabad districts. Out of these, 24 were found infected with *M. incognita* with 51.06% frequency of occurrence. The maximum population of *M. incognita* (1180/200cc soil) was recorded in Khairampur (29°31'16" N, 75°49'68" E), Hisar followed by Chaudhariwas (29°00'18" N, 75°61'45" E) Hisar. The maximum population of *M. incognita* was recorded in root samples collected from Khairampur, Hisar (890/5 g root). The lowest soil and root populations were recorded in Salemgarh village of Hisar. In addition to *M. incognita*, other plant-parasitic nematodes such as *Tylenchorhynchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., and *Pratylenchus* spp. were also detected, indicating a diverse nematode community in guava orchards of the region.

**Keywords:** Guava, *M. incognita*, Plant parasitic nematodes, Survey

**Abstract No: B-IV-009**

**Registration No:1252**

**Dairy farmer producer organizations in India: A review of business models, challenges, and growth opportunities**

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Dairy Farmer Producer Organizations (FPOs) have emerged as a significant institutional mechanism for enhancing the economic viability of smallholder dairy farmers in India. This review paper synthesizes existing literature on the evolution, organizational structure, and performance of dairy FPOs, with particular emphasis on their role as emerging agribusiness enterprises. It critically examines various business models adopted by these organizations, including cooperative-based frameworks, producer-owned enterprises, and hybrid governance structures, and evaluates their implications for supply chain efficiency, value addition, and market access. The review identifies key functional domains of dairy FPOs, such as procurement management, milk collection and processing, financial sustainability, branding, and collective marketing. It also explores the growing integration of digital technologies to enhance traceability, streamline payment systems, and optimize logistics. Despite their considerable potential, dairy FPOs face several challenges, including inadequate managerial capacity, limited access to credit and infrastructure, weak institutional support, and vulnerability to price volatility in dairy markets. From a agribusiness management perspective, the paper highlights the critical need for capacity building, professional leadership, strategic

partnerships, and supportive policy interventions to improve operational efficiency and scalability. Furthermore, it emphasizes that strengthening governance mechanisms, fostering innovation, and enhancing stakeholder coordination are essential for ensuring the long-term sustainability of dairy FPOs. Overall, this review contributes to a deeper understanding of dairy FPOs as key drivers of rural entrepreneurship, inclusive growth, and sustainable agribusiness development.

**Keywords:** Dairy, FPO, Review Paper, Agribusiness Management, Value Chain, Rural

**Abstract No: B-IV-010**

**Registration No:1290**

## **Exploring morpho-physiological diversity in chickpea through multivariate approaches for breeding programs**

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Chickpea (*Cicer arietinum* L.) is an important legume crop recognized for its high nutritional value and adaptability across diverse agro-climatic regions. The present investigation revealed highly significant differences among genotypes through analysis of variance, indicating substantial inherent variability for all studied traits. Considerable variation was observed in agronomic characters, with days to 50% flowering ranging from 82 to 96 days, days to physiological maturity from 136 to 147 days, plant height from 31.9 to 62.6 cm, number of primary branches per plant from 4 to 8, number of pods per plant from 35 to 121, and seed yield per plant from 15.6 to 30.1 g. Biochemical analysis showed that crude protein content varied between 17.7% and 24.7%, while physiological parameters also exhibited notable diversity. These included SPAD chlorophyll content (41.2-60), relative water content (65.4-81.0%), canopy temperature (24.7-29.9°C), and NDVI (0.69-0.78). Cluster analysis based on D<sup>2</sup> statistics classified the genotypes into five distinct groups, reflecting substantial genetic divergence. The highest intra-cluster distance was recorded in Cluster I (D<sup>2</sup> = 74.51), suggesting considerable heterogeneity within this group, whereas the maximum inter-cluster distance was observed between Clusters II and IV (D<sup>2</sup> = 88.40), indicating their potential suitability for hybridization to exploit heterosis. Cluster IV demonstrated superior performance for key traits, including number of pods per plant, seeds per pod, harvest index, and NDVI. Principal Component Analysis (PCA) indicated that five principal components with eigenvalues greater than one collectively accounted for 72.60% of the total variation, with canopy temperature, seed yield, and biological yield identified as major contributing factors.

**Keywords:** Chickpea, physiological traits, genetic diversity, PCA

**Abstract No: B-IV-011**

**Registration No:1300**

**Survey of plant-parasitic nematodes (PPNs) associated with Guava in Hisar and Fatehabad Districts of Haryana**

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Guava is major horticulture crop which grown nearly all district of Haryana. A survey was conducted to assess the prevalence of root-knot nematode in Guava (*Psidium guajava*) in Hisar and Fatehabad districts of Haryana. A total of 47 soil and root samples of Guava were collected from Hisar and Fatehabad districts. Out of these, 24 were found infected with *M. incognita* with 51.06% frequency of occurrence. The maximum population of *M. incognita* (1180/200cc soil) was recorded in Khairampur (29°31'16" N, 75°49'68" E), Hisar followed by Chaudhariwas (29°00'18" N, 75°61'45" E) Hisar. The maximum population of *M. incognita* was recorded in root samples collected from Khairampur, Hisar (890/5 g root). The lowest soil and root populations were recorded in Salemgarh village of Hisar. In addition to *M. incognita*, other PPNs such as *Tylenchorhynchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., and *Pratylenchus* spp. were also detected, indicating a diverse nematode community in guava orchards of the region.

**Keywords:** Guava, *M. incognita*, Plant parasitic nematodes, Survey

**Abstract No: B-IV-012**

**Registration No:1309**

**Advancing Horticulture Value Chains through Global Trade and Market Intelligence Systems**

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Horticulture value chains play a critical role in linking primary production with domestic and international markets ensuring the efficient flow of fruits, vegetables, flowers and plantation crops from farm to consumer. In recent years globalization technological advancements and evolving consumer preferences have reshaped these value chains, emphasizing quality,

traceability and sustainability. The integration of market intelligence into horticultural systems has become essential for enhancing competitiveness and profitability. Market intelligence involves the systematic collection and analysis of data related to price trends, demand patterns, trade policies and consumer behavior, enabling stakeholders to make informed decisions. Global trade in horticultural commodities is highly dynamic, influenced by factors such as sanitary and phytosanitary standards, climate variability, logistics infrastructure and trade agreements. Developing countries including India have significant potential to expand their share in global markets due to diverse agro-climatic conditions and year-round production capacity. However challenges such as fragmented supply chains, post-harvest losses, lack of cold storage and limited access to real-time market information hinder optimal participation. Strengthening value chains through digital platforms, improved infrastructure, farmer-producer organizations and export-oriented policies can enhance efficiency and market access. Furthermore adopting data-driven approaches and predictive analytics in market intelligence can help anticipate global demand shifts and price fluctuations. In conclusion, the convergence of robust horticulture value chains and advanced market intelligence systems is pivotal for achieving sustainable growth increasing farmer income and ensuring competitiveness in the global horticulture trade landscape.

Keywords- Globalization, Phytosanitary, Commodities, Integration, Infrastructure

**Abstract No: B-IV-013**

**Registration No:1313**

### **Assessing the Impact of MGNREGS on Rural Households in District: Jind**

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The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGS) is one of India's largest social security and rural employment programs aimed at enhancing livelihood security and reducing poverty. This study assesses the socio-economic impact of MGNREGS on rural households in Jind district. The research is based on primary data collected from selected villages of Jind district through structured questionnaires and personal interviews. This study examines key indicators such as employment generation, household income, consumption expenditure, savings patterns, migration trends, and women's participation in wage employment. Descriptive statistics and comparative analysis were used to evaluate changes in socio-economic conditions before and after participation in the scheme. This finding indicates that MGNREGS has contributed significantly to supplementary income generation, reduction in seasonal migration, and improvement in financial stability among rural households. The scheme has also enhanced women's participation in the workforce, promoting greater financial inclusion and social empowerment. However, issues such as delayed wage payments and limited awareness about entitlements continue to affect its overall effectiveness. This study concludes that while MGNREGS has positively influenced rural livelihoods in Jind district, strengthening implementation mechanisms and transparency measures can further enhance its impact on sustainable rural development.

**Keywords:** Employment generation, Questionnaires, Consumption Expenditure, Women Participation, Personal Interviews.

**Abstract No: B-IV-014**

**Registration No:1316**

**Effect of IBA on root formation and growth in Baramasi lemon cuttings**

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More than 140 nations worldwide cultivate citrus fruits for commercial use. Most commonly cultivated citrus fruits include oranges, grapefruits, pomelos, lemons, limes, tangerines, mandarins, clementines, and satsuma. Cultivating citrus employs millions of people globally, and through harvesting, processing, marketing, storage, and shipping, it contributes significantly to global economy. One of the most prevalent citrus fruits in India and across the rest of the globe is lemon (*Citrus limon* (L.) Burm.) It is the third most popular citrus fruit after orange and mandarin because of its alluring flavour, scent, and colour. Propagation of lemon trees can be done through several methods, including seeds, cuttings, air layering, and grafting. Among these, propagation by cuttings and grafting are the most reliable methods for preserving the characteristics of the parent tree, as seed-grown lemons can be genetically unpredictable. In cutting successful rooting can be achieved by using rooting hormones such as IBA (Indole-3-butyric acid) and NAA (Naphthaleneacetic acid). The experiment consisted of three different level of IBA i.e. 0 ppm, 1800 ppm and 2400 ppm. The experiment was laid out in completely randomized design. The results revealed that most of the parameters studied were influenced significantly by IBA dose. In the following parameters considered i.e. minimum days to first sprout (17.12), rooting percentage (77.53), average length (19.21 cm) of sprout and length of longest (25.70 cm) sprout, total number of roots (29.33), average length of roots (9.91 cm), length of longest sprout (22.65 cm), fresh (9.69 g) and dry (2.01 g) root weight, cuttings treated with 2400 ppm bring about best results followed by 1800 ppm and control.

**Keywords:** Baramasi lemon, wood maturity, rooting, shoot and root growth

**Abstract No: B-IV-015**

**Registration No:1319**

**Maternal Dietary Inadequacy During Lactation: Implications for Breastmilk Quality and Infant Growth in Rural Punjab, India**

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**Background:** Maternal nutrition during lactation plays a critical role in supporting both maternal recovery and infant growth. In rural India, dietary inadequacies among women of reproductive age remain a persistent concern, yet little evidence links these deficits to breastmilk quality and infant development.

**Objective:** This longitudinal study assessed dietary intake, biochemical markers, and infant developmental outcomes among rural lactating mothers in Punjab, India, highlighting the consequences of maternal dietary inadequacy.

**Methods:** Thirty lactating women were followed from delivery to six months postpartum. Sociodemographic, anthropometric, and dietary data were collected through standardized protocols and 24-hour recalls. Blood and breastmilk samples were analyzed for fatty acid composition. Infant growth and neurodevelopment were evaluated using the Developmental Assessment Scale for Indian Infants (DASII).

**Results:** Daily nutrient intake revealed severe deficiencies in energy ( $\approx 800$  kcal vs. 2,500 kcal RDA), protein ( $\approx 28$  g vs. 55 g RDA), and key micronutrients including iron, calcium, and folate. Progressive maternal weight loss and declining BMI suggested nutritional depletion. Fatty acid analysis showed significant reductions in maternal erythrocyte and milk docosahexaenoic acid (DHA), with a 28.9% fall in breastmilk DHA between the first and sixth months postpartum. Infants exhibited early signs of growth faltering and marked declines in developmental quotients, with mental DQ dropping from 71.5 to 53.8.

**Conclusion:** Findings indicate that rural lactating mothers face profound dietary inadequacies, extending beyond omega-3 fatty acids to include energy and micronutrient shortfalls. These deficits compromise maternal nutritional status, deplete breastmilk quality, and impair infant neurodevelopment. Urgent regionally tailored interventions are needed to address maternal malnutrition during lactation in India.

**Keywords:** Maternal malnutrition, dietary inadequacy, lactation, DHA, breastmilk quality, infant neurodevelopment, Punjab

**Abstract No.: B-IV-016**

**Registration No.: 1344**

## **Mathematical Modeling of Feed Allocation in Polyculture**

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Fish farming is an important part of aquaculture in India, contributing to food security, employment, and rural development. However, the high cost of fish feed is a major problem, as it makes up a large share of the total production cost. Therefore, it is important to develop low-cost and nutritionally balanced feed. In this study, Linear Programming is used to find the best combination of fish feed that costs less but still provides all the required nutrients. The study focuses on different growth stages of fish, such as fry, fingerlings, and the grow-out stage. Different feed ingredients, their nutrients, and prices are used in the model to get the most suitable and economical feed mix. The model is solved using Microsoft Excel, making it simple and easy to use for farmers and researchers. This approach is especially useful in polyculture systems, where proper feed management is important for better productivity. The results show that using mathematical optimization can help reduce feed costs and improve efficiency without affecting fish nutrition.

**Keywords:** Feed ingredients, Feed Formulation, Linear Programming, Mathematical Modeling, Polyculture

**Abstract No.: B-IV-017**

**Registration No.: 1352**

**Ethno medicinal Flora and Phyto-Therapeutic Traditions of Haryana**

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The state of Haryana occupies a pivotal biogeographical position, serving as a convergence zone between the fertile Indo-Gangetic plains, the Shivalik foothills to the north, and the Aravalli range to the south. This geographical diversity acts as a primary driver for medicinal biodiversity, sustaining a spectrum of flora ranging from the sub-tropical taxa of Panchkula to the xerophytic vegetation prevalent in the semi-arid tracts of Mahendergarh & Bhiwani. Within this landscape, traditional ecological knowledge (TEK) functions not merely as a historical archive, but as a "dynamic clinical practice" fundamental to rural primary healthcare. A vast majority of the population remains reliant on these botanical resources for managing acute and chronic pathologies. Therefore, it is important to connect the rich traditional knowledge held by specialized communities such as the Nath community's fading expertise in toxin-related practices with organized scientific and botanical research. Doing so will not only support the discovery of useful plant-based resources but also help protect the intellectual property rights of indigenous communities. The methodology utilized in this study involved the systematic consolidation of disparate regional survey records spanning districts such as Rewari, Jhajjar, and Bhiwani into a unified, integrated phyto-therapeutic database. The State Medicinal Plant Board (SMPB) has promoted the cultivation of medicinal plants over nearly 2,600 hectares through silvo-agri-medicinal systems, including practices like growing *Tinospora cordifolia* alongside *Populus deltoides*. Preserving traditional knowledge while supporting it with modern scientific validation is essential for developing a sustainable and standardized herbal pharmaceutical industry.

**Keywords:** Ethnobotany, *Vachellia nilotica*, Phyto-therapeutics, Nath Community, Secondary Metabolites

**Abstract No.: B-IV-018**

**Registration No.: 1401**

**A Modified Adomian decomposition approach for fractional advection-diffusion equations with initial-boundary conditions**

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The time-fractional advection-diffusion equation effectively captures anomalous transport and memory phenomena in complex systems. This study presents a modified Adomian decomposition technique for fractional advection-diffusion problems involving spatially variable coefficients and initial-boundary conditions. The method employs an iterative step that satisfies both initial and boundary conditions at each iteration. The proposed approach decomposes the fractional governing equation into an iterative sequence of solvable sub-

problems. Solutions are formulated using the Caputo fractional derivative and are validated through illustrative examples with variable-coefficient structures. The resulting approximations demonstrate close agreement with exact analytical solutions and outcomes from established numerical methods. Graphical representations across different fractional orders provide consistent convergence and the distinctive anomalous diffusion behavior absent from classical integer-order models. The method offers the advantages for simulating solute transport in heterogeneous porous media where it captures both advective motion and non-Fickian dispersion. The findings suggest that this modified decomposition framework can be effectively extended to a broader class of fractional partial differential equations with initial-boundary conditions. Thus, the approach provides a reliable analytical tool for informing decisions in contamination mitigation, precision water management, and environmental risk assessment.

**Keywords:** Fractional differential equations, Modified Adomian Decomposition Method, Initial- boundary conditions, Caputo fractional derivative

**Abstract No.: B-IV-019**

**Registration No.: 1425**

**Spatial assessment of fusarium wilt incidence in cotton across prominent cotton-growing areas of Haryana**

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Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *vasinfectum* is an important soil-borne disease constraining cotton production in Haryana. The present investigation was undertaken to assess the incidence and distribution of Fusarium wilt across major cotton growing districts of Haryana during Kharif 2024. Systematic field survey was conducted in Hisar, Sirsa, Fatehabad, Rewari, Mahendragarh districts and disease incidence was recorded from representative villages. Considerable spatial variation in disease incidence was observed among districts. Fatehabad recorded the highest mean incidence (4.73%) followed by Hisar (3.68%) and Sirsa (3.13%), whereas comparatively lower incidence was documented in Rewari (1.63%) and Mahendragarh (1.58%). Village-level assessment identified localized hotspots with Pili Mandori (8.5%) in Fatehabad exhibiting the highest incidence. The findings indicate the established presence of Fusarium wilt across the cotton belt of Haryana and highlight the need for continuous surveillance and implementation of integrated disease management strategies to minimize potential yield losses.

**Keywords:** Fusarium wilt, cotton, disease incidence, field survey

**Theme C:**  
**Technologies in Veterinary and Animal  
Sciences**

## Key-note Address

### **Animal Health Coverage and Integration of Traditional Medicine: Opportunities and Challenges**

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This key-note address explores the critical role of animal health coverage in India and examines the potential for integrating traditional medicine with modern veterinary systems to address existing gaps. The livestock sector is a key contributor to the country's economy, food security, and rural livelihoods, showing significant growth in recent years. Despite this progress, animal health services remain unevenly distributed, particularly in rural and resource-limited areas, where farmers often face challenges related to accessibility, affordability, and timely veterinary care. These limitations result in delayed treatment, reduced productivity, increased financial burden on smallholders, and widespread reliance on informal healthcare practices.

A major concern highlighted is the rising threat of antimicrobial resistance (AMR), which is increasingly recognized as a One Health issue affecting humans, animals, and the environment. Inappropriate and excessive use of antibiotics in livestock systems contributes to reduced treatment effectiveness, increased disease persistence, and potential risks to food safety and public health. Addressing these challenges requires more sustainable and accessible approaches to animal healthcare.

In this context, the paper revisits traditional medicine, including ethnoveterinary practices and Veterinary Ayurveda, as a complementary approach rather than a substitute for modern veterinary science. Traditional systems offer several advantages such as local availability, cost-effectiveness, cultural acceptance, and potential to reduce antibiotic dependency. They are particularly useful for primary healthcare, preventive management, and treatment of minor ailments in areas with limited veterinary infrastructure. The integration of traditional medicine presents multiple opportunities, including strengthening primary animal healthcare, supporting AMR stewardship, promoting ethnobotanical research, and developing novel plant-based veterinary products. Preliminary field-level evidence suggests promising outcomes for certain conditions, although scientific validation remains limited. This underscores the need for systematic research to establish efficacy, safety, and standardized dosage protocols.

However, several challenges hinder effective integration, including lack of standardization, limited clinical evidence, quality control issues, regulatory gaps, and risks of delayed treatment for serious conditions. Additionally, the gradual erosion of traditional knowledge due to socio-cultural changes poses a significant concern.

The paper proposes an evidence-based, tiered framework that combines traditional and modern systems, supported by training, monitoring, and clear referral mechanisms. Ultimately, a balanced and scientifically validated integration can enhance animal health coverage, improve farmer livelihoods, and contribute to sustainable One Health outcomes.

**Acknowledgement:** The author acknowledges the contribution of Indian Knowledge System Cell of the University in preparation of this key-note address.

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## **Technical Session I**

### **Sustainable Livestock and Fisheries Health: Disease management, Biotechnology, Traditional Medicine and One-Health**

**Abstract No.: C-01**

**Registration No.: PP-1014**

## **Transport and Climate-Driven Factors in the Spread of Zoonotic Diseases**

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Transport networks, coupled with changing climatic conditions, increasingly facilitate the global spread of zoonotic diseases. The rapid movement of animals, humans and animal products through trade, travel and livestock transport creates efficient pathways for pathogens to enter new regions. Stress, overcrowding and inadequate biosecurity during transport elevate pathogen shedding and weaken host immunity, thereby increasing transmission risks. Concurrently, climate change exacerbates these challenges by altering vector distribution, abundance and survival. Rising temperatures, shifting rainfall patterns and extended warm seasons enable vectors such as mosquitoes, ticks and biting flies to expand into previously inhospitable environments. These interacting drivers have contributed to the emergence and expansion of diseases, including avian influenza, Rift Valley fever, West Nile virus and monkey pox virus. Increasing global connectivity means that localized outbreaks can rapidly escalate into regional or international events if transport controls and surveillance systems are insufficient. Mitigating these risks requires rigorous monitoring along transport corridors, strict biosecurity protocols and enhanced vector surveillance. A coordinated One Health approach integrating veterinary, environmental and public health expertise is essential for managing zoonotic threats driven by transport and climate factors.

**Keywords:** Zoonotic, one health, climate conditions

**Abstract No.: C-02**

**Registration No.: PP-1033**

## **Preliminary Investigation into the Involvement of Hdac2 in Buffalopox and Newcastle Disease Virus Replication**

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The promising potential of host-directed therapies in combating viral infections has drawn increasing attention in recent years, especially compounds targeting epigenetic regulators such as histone deacetylases (HDACs). Santacruzamate A, derived from a Panamanian marine cyanobacterium, a selective histone deacetylase 2 (HDAC2) inhibitor, originally developed for its anticancer activity, has been proposed for repurposing as an antiviral agent due to the role of HDACs in modulating virus–host interactions. In this study, we evaluated the in vitro antiviral efficacy of Santacruzamate A against two animal viral pathogens: Buffalopox virus

(BPXV; VTCCAVA90) and Newcastle disease virus (NDV; VTCCAVA190) in Vero cells. The cytotoxicity of Santacruzamate A was determined using the MTT assay, which revealed a dose-dependent decline in Vero cell viability, with a calculated 50% cytotoxic concentration (CC<sub>50</sub>) of approximately 73 µM. For antiviral evaluation, Vero cells were pretreated with 100 µM of Santacruzamate A prior to infection at a low multiplicity of infection. Supernatants collected at 120 hours post-infection for BPXV and 72 hours for NDV were analyzed using plaque assays. The results showed no appreciable reduction in viral titers or plaque numbers in treated groups compared to vehicle controls, with differences remaining below 0.2 log<sub>10</sub> PFU/mL, suggesting limited antiviral activity under the conditions tested. These findings suggest that selective HDAC2 inhibition by Santacruzamate A does not significantly impact BPXV or NDV replication in vitro under the experimental conditions used, and further studies may be required to assess its antiviral potential in other systems or in combination with synergistic agents.

**Abstract No.: C-03**

**Registration No.: PP-1044**

**PLGA-Based Nanoparticles Loaded with Recombinant Proteins as a Potential Vaccine Candidate Against *Burkholderia mallei***

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*Burkholderia mallei*, the causative agent of glanders, is an important zoonotic pathogen affecting equines and humans. Existing vaccine strategies show limited efficacy and potential safety issues, necessitating the development of improved and safer vaccine platforms. In this study, three proteins—Hcp1, TssA, and TssB—associated with the Type VI Secretion System (T6SS) were selected as antigenic targets. These genes were cloned and expressed in *E. coli*, and recombinant proteins purified before being encapsulated into poly (lactic-co-glycolic acid) (PLGA) nanoparticles using the double emulsion solvent evaporation technique. The synthesized nanoparticles were characterized for particle size, surface charge, and morphology using Particle Size Analysis (PSA), zeta potential analysis, Fourier Transform Infrared Spectroscopy (FTIR), and Transmission Electron Microscopy (TEM). Protein encapsulation and loading efficiency were confirmed through High-Performance Liquid Chromatography (HPLC) along with protein assays. The successful formulation of stable, protein-loaded PLGA nanoparticles highlights their potential as an effective antigen delivery system. These findings suggest that the developed nanovaccine platform may induce targeted immune responses against *B. mallei*. Further studies will focus on evaluating immunogenicity and protective efficacy in suitable murine models.

**Keywords:** *Burkholderia mallei*, PLGA nanoparticles, nanovaccine, T6SS, Hcp1, TssA, and TssB

**Abstract No.: C-04**

**Registration No.: PP-1056**

## **Serological Surveillance of Glanders in Humans Exposed to Infected Equines**

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Glanders is a serious and often fatal infectious disease of equines, including horses, mules, and donkeys, caused by the Gram-negative bacterium *Burkholderia mallei*. It is a notifiable zoonotic disease that can be transmitted to humans. Human infection may occur through direct contact with infected animals, their body fluids or tissues, contaminated materials, or laboratory cultures of the organism. The present study was conducted to diagnose glanders in humans who had contact with infected animals as part of a One Health surveillance program in India in 2025. Serum samples were collected from 613 individuals Haryana (n = 31), Himachal Pradesh (n = 9), Karnataka (n =7), Maharashtra (n =6), Madhya Pradesh (n =38), Uttarakhand (n =04), Uttar Pradesh (n =371), Chhattisgarh (n =20), Tamil Nadu (n =30), West Bengal (n =1), Telangana (n =93) and Delhi (n =3) who were in-contact with glanders-positive equines. These samples were analysed using recombinant haemolysin co-regulated protein 1 (Hcp1) indirect ELISA and Complement Fixation Test (CFT). All the samples were found to be negative for glanders. However, the study underscores the importance of continued surveillance in at-risk populations. Early detection systems are crucial to promptly identify and manage any potential human cases of glanders. Organization of awareness campaign among equine keepers is necessary to minimize the risk of zoonotic transmission and ensuring public health safety.

**Keywords:** Glanders, *Burkholderia mallei*, equines Humans, Indirect ELISA, CFT

**Abstract No.: C-05**

**Registration No.: PP-1061**

## **Role of *VapA* Gene in *Rhodococcus equi* and Its Interaction with Host Responses**

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*Rhodococcus equi* is a Gram-positive, facultative intracellular coccobacillus belonging to the *Nocardiaceae* family and is a well-known macrophage-associated pathogen. It causes pyogranulomatous pulmonary and extra-pulmonary infections in foals and can also infect immunocompromised humans. The infection is primarily transmitted through inhalation, after

which the bacterium survives and proliferates within macrophages, making it difficult for the host immune system to eliminate. This intracellular persistence is largely attributed to the *VapA* gene, a key virulence factor that enables the pathogen to evade host defense mechanisms. In the present study, the *VapA* gene was selected and successfully transformed into *E. coli* M15 cells to facilitate further functional analysis of its role in pathogenesis and host immunity. In parallel, recombinant mice leptin protein was expressed and purified using standard protein expression and purification techniques. The purified leptin protein can be utilized to study host immune responses and its interaction with *R. equi* infection. Overall, this study enhances the understanding of *R. equi* virulence mechanisms and host–pathogen interactions. The findings may contribute to the development of improved diagnostic tools and therapeutic strategies, especially in light of the limited efficacy of existing vaccines and the growing issue of antibiotic resistance.

**Keywords:** *Rhodococcus equi*, *VapA* gene, Transformation, Mice Leptin, Recombinant Protein, Infection

**Abstract No.:** C-06

**Registration No.:** PP-1062

**Recombinant Equine Leptin as a Potential Immunomodulator in  
*Rhodococcus equi* Infection**

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*Rhodococcus equi* is a soil-associated, Gram-positive bacterium commonly found in horse-rearing environments and is a leading cause of severe pyogranulomatous pneumonia in young foals of less than six months of age group. It is also recognized as an opportunistic pathogen in a variety of animals and immunocompromised humans. *R. equi* infection is primarily acquired through inhalation of contaminated dust particles, after which the bacterium is phagocytosed by alveolar macrophages. *R. equi* has evolved mechanisms to survive and replicate within macrophages by evading intracellular killing pathways, thereby establishing persistent infections that are difficult to treat. In the present study, it is to investigate the pathogen's biology and its interaction with the host immune system. In parallel, recombinant equine leptin, an important adipokine known to influence immune function, was successfully expressed and purified using a heterologous expression system. The purified protein was evaluated for its potential role in modulating immune responses during *R. equi* infection, with a focus on macrophage activation and cytokine regulation. Mice were immunized with leptin and preliminary findings show the induction of immune response in the murine model. This study provides valuable insights into the pathogenesis of *R. equi* and highlights the potential immunomodulatory role of equine leptin in host defense. The findings may contribute for the development of improved diagnostic tools and novel immuno prophylactics strategies, which are urgently needed due to the limited efficacy of existing vaccines and the growing concern of antimicrobial resistance.

**Keywords:** *Rhodococcus equi*, Horse Leptin, Recombinant Protein, Infection, Host-Pathogen Interaction, immune stimulation

**Role of Shiga Toxin-Producing *Escherichia coli* in Abomasal Lesions of Ruminants: A Pathological and Molecular Study****Neeraj<sup>1\*</sup>, Deepika Lather<sup>1</sup>, Vikas Nehra<sup>1</sup>, Raman Kumar<sup>2</sup>, Manesh Kumar<sup>2</sup>, B.L. Jangir<sup>1</sup> and Sushma Kajal<sup>1</sup>**<sup>1</sup>Department of Veterinary Pathology, <sup>2</sup>Department of Veterinary Public Health and Epidemiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana-125004, India\*Email: [neeraj.sharma.2j2@gmail.com](mailto:neeraj.sharma.2j2@gmail.com)

The present study was conducted to investigate the role of *Escherichia coli* in abomasal lesions of ruminants, with emphasis on pathological, bacteriological, and molecular characterization. A total of 30 ruminant carcasses (cattle, buffalo, sheep, and goats) showing abomasal lesions were examined. Detailed necropsy, histopathology, bacteriological isolation, and polymerase chain reaction (PCR) were performed to identify and characterize *E. coli* and its virulence genes. Bacteriological examination revealed the presence of *Escherichia coli* in 20% (6/30) of cases. Identification was confirmed through cultural characteristics, Gram staining, and biochemical tests. Molecular analysis showed that all isolates were positive for the *uidA* gene, confirming their identity. Further characterization revealed that all isolates harboured the *stx1* gene, while 66.67% possessed the *hlyA* gene, indicating the presence of Shiga toxin-producing *E. coli* (STEC). However, *stx2* and *stII* genes were not detected in any isolate. Gross and histopathological examination revealed that *E. coli*-associated lesions were predominantly inflammatory in nature, characterized by abomasitis, congestion, haemorrhage, and infiltration of mononuclear cells. Ulceration was observed in only a few cases, while intestinal lesions such as haemorrhagic enteritis were frequently associated. Liver changes were mild and inconsistent. The findings suggest that *E. coli*, particularly STEC strains, is associated mainly with inflammatory lesions of the abomasum and intestine. However, its role appears to be opportunistic, acting in conjunction with other predisposing factors rather than as a primary cause of severe ulcerative disease.

**Keywords:** Abomasal disorders, *Escherichia coli*, Pathology, Ruminants, Shiga toxin

**Isolation and characterization of *Salmonella* spp. and *Escherichia coli* specific novel bacteriophages both at their genomic and physiological level****Anu Bala Jaglan<sup>a\*</sup>, Medhavi Vashisth<sup>b</sup>, Taruna Anand<sup>b</sup>**<sup>a</sup>Department of Zoology, Govt. Post Graduate Nehru College, Jhajjar, Haryana-124103<sup>b</sup>ICAR - National Research Centre on Equines, Hisar, Haryana - 125001, India.

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Foodborne pathogens are the primary cause of illness throughout the world. *E. coli* and *Salmonella* spp. are significant foodborne pathogens found in the food animals' feces and hides and are responsible for the contamination of meat products. The annual growth rates of the livestock decreased due to Salmonellosis and enterohemorrhagic colitis, which ultimately results in a huge economic loss. Bacteriophages are the biological entity that is capable of effectively tackling the pathogenic strains of the bacteria by infecting and killing them. As the bacteriophages are host-specific, therefore they do not disturb the healthy gut microbiota. This study was therefore aimed to isolate novel bacteriophages against the antibiotic-resistant strains of *E. coli* and *Salmonella* of the food animal origins. The bacteria were obtained from National Centre on Veterinary Type Culture (NCVTC-NRCE), Hisar. The bacteriophages were isolated from environmental sources collected from the various region of the Hisar against the drug-resistant bacterial isolates and tested by spot assay using the double agar layer method. Phages were characterized based on their plaque morphology, temperature, pH susceptibility, protein profile, host range, structural morphology, and based on their genomic features. The bacteriophage isolates showed strong lytic efficacy against these drug-resistant bacterial isolates. Therefore, these phages have the potential to inhibit or significantly reduce the spread of pathogenic bacteria in food animals, which reduces the cost of animal rearing and ultimately helps the farmers.

**Keywords:** Bacteriophages, Antibiotic-resistant, Food animal, *Escherichia coli*, *Salmonella*

## Time-Resolved Transcriptomic Analysis of Host Responses to Lumpy Skin Disease Virus in Vero Cells

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Lumpy skin disease (LSD) is a trans-boundary animal viral disease which causes considerable financial losses to the livestock industry. Understanding the kinetics of viral gene expression is essential for elucidating virus-host interactions and improving vaccine strategies. In the current study, we investigated the transcriptional changes in Vero cells following LSDV infection using transcriptome profiling. Vero cells were obtained from the National Centre for Veterinary Type Cultures (NCVTC), Hisar, India, were cultured in DMEM supplemented with 10–15% fetal bovine serum and antibiotics. Cells were infected with lumpy skin disease virus (LSDV), and total RNA was extracted from infected and control cells. Ribosomal RNA was sequenced on the Illumina NovaSeq 6000 platform. The sequencing yielded 20.3–37.3 million reads per sample (150 bp). Comparative analysis of LSDV-infected Vero cells at 12, 24, and 48 hours post-infection showed significant changes in gene expression across all time points. Genes associated with chromatin remodeling were prominently expressed, along with consistent expression of immune-related factors, indicating a sustained host response. Additionally, genes involved in cellular signaling and regulatory pathways suggested host adaptation during infection. Along with this, some unique genes were also expressed which were related to transcriptional regulation, transport, and immune response. At later stages, genes associated with cytoskeletal organization, guanine nucleotide exchange, and cellular signaling were also expressed indicating their role in progression of infection. The study reveals dynamic, time-dependent transcriptional changes in host cells during LSDV infection, highlighting key pathways involved in chromatin remodeling, immune response, and cellular signaling. These findings provide insights into host–virus interactions and may aid in identifying potential targets for therapeutic intervention and disease control strategies.

**Keywords:** Lumpy skin disease virus (LSDV), Vero cells, transcriptome profiling, gene expression, RNA sequencing, immune response

**Abstract No.: C-10**

**Registration No.: PP-1113**

**Molecular Detection and Isolation of Pigeonpox Virus From a Localized Outbreak in Haryana, India**

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**Abstract:** Avipoxvirus infections, particularly pigeonpox, pose a significant health concern in domestic and wild avian populations. In the present study, a localized outbreak of pox-like lesions was observed in a flock of pigeons at the campus of ICAR–National Research Centre on Equines (NRCE), Hisar, Haryana, India, during July 2025. Approximately 10-12 birds exhibited characteristic proliferative cutaneous lesions, with two mortality recorded during the course of infection. Clinical samples were collected from affected and deceased birds and subjected to polymerase chain reaction (PCR) targeting conserved regions of the avipoxvirus genome. The samples tested positive for pigeonpox virus, confirming the etiological agent. For further characterization, the virus was successfully isolated using embryonated chicken eggs via chorioallantoic membrane (CAM) inoculation, where characteristic pock lesions were observed on 4 dpi. Subsequently, partial genome sequencing of the amplified viral gene was performed, and preliminary sequence analysis indicated close homology with previously reported pigeonpox virus isolates. The findings contribute to the limited molecular epidemiological data on pigeonpox virus circulating in northern India. This study underscores the value of integrating molecular diagnostics with classical virological methods for definitive confirmation of avipoxvirus infections. The combined use of PCR, virus isolation, and genomic analysis strengthens surveillance capacity and enhances understanding of emerging avian viral pathogens.

**Keywords:** Pigeonpox virus, Avipoxvirus, PCR, Virus isolation, Embryonated eggs, Molecular characterization

**Abstract No.: C-11**

**Registration No.: PP-1120**

**Non-Tuberculous Mycobacteria as Emerging Zoonotic Pathogens: A One Health Perspective for Viksit Bharat**

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Non-tuberculous mycobacteria (NTM) are environmental organisms commonly found in soil, water, and organic matter, and are increasingly isolated from livestock populations. Their

presence at the wildlife–livestock–human interface presents challenges for animal health, public health, and disease surveillance systems. Using a “One Health approach”, this study aims to isolate and characterize NTM from environments and farm animals to understand their distribution, potential transmission pathways, and implications for disease monitoring. By combining environmental microbiology with veterinary diagnostics, this study aims to define the ecological role of NTM in farm areas and environments. Environmental samples, including soil, water, along animal samples such as faeces, nasal swabs, and blood samples, were collected from unorganized farms. Samples were decontaminated and cultured on Löwenstein–Jensen and 7H10 Middlebrook media. Suspected colonies were examined by Ziehl–Neelsen staining (acid-fast staining). Molecular identification was performed using PCR targeting *afb*, *hsp* and 16S rRNA genes, followed by DNA sequencing for species-level confirmation. Several non-tuberculous mycobacterial species such as *Mycobacterium abscess*, *M. fortuitum*, *M. intracellulare*, *M. novocastrense*, *M. moriokaense*, *M. syngathidarum* and *M. arupense* has been isolated and all of the mycobacterial species has been associated with human infections especially in immune compromised individuals and with co-morbidities. This study is significant because NTM can interfere with bovine tuberculosis (bTB) diagnostics and contribute to chronic infections in livestock. Identifying NTM species in both environmental and animal sources supports improved biosecurity, farm management, and risk assessment. Despite their growing clinical and epidemiological significance, NTM remain largely absent from national surveillance frameworks in India. Adopting an integrated One Health approach for uniting human medicine, veterinary science, and environmental monitoring, supported by advanced molecular diagnostics, AI-driven genomic surveillance, and robust policy frameworks, is essential to address this neglected zoonotic threat and aligning with the vision of a health-secure Viksit Bharat by 2047.

**Keywords:** Livestock, Zoonotic risk, *Mycobacterium abscess*, *M. fortuitum*, One Health, Surveillance.

**Abstract No.:** C-12

**Registration No.:** PP-1122

**Innovation-Driven One Health Approaches for Zoonotic Tuberculosis Control: A KAP Study Among Livestock Owners in Haryana Toward Viksit Bharat**

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Zoonotic diseases continue to pose significant global health challenges, particularly in regions with intensive livestock production and close human–animal interactions. Bovine tuberculosis (bTB), caused by *Mycobacterium bovis*, remains a major endemic disease in India and a critical

public health concern within the “One Health framework”. Meta-analytical estimates indicate a pooled bTB prevalence of 7.3% in Indian cattle and buffalo populations (95% CI: 5.6–9.5%), with Haryana contributing notably to this burden due to its dense dairy sector and widespread peri-urban livestock farming. Despite this, awareness of zoonotic transmission, risk factors, and preventive measures remains insufficient among livestock owners, dairy workers, and rural households. A. In order to measure and improve public knowledge of zoonotic illnesses like TB in Haryana areas, this study designed and administered a Knowledge, Attitude, and Practice (KAP) questionnaire. Based on existing One Health recommendations, a structured survey instrument was created and distributed through in-person interviews (n=600) with livestock stakeholders. Preliminary findings revealed considerable misconceptions, including the belief that tuberculosis is solely a human disease and limited recognition of herd-level implications, raw milk consumption risks, and modes of cross-species transmission. While respondents demonstrated positive attitudes toward veterinary engagement and disease reporting, preventive practices such as animal isolation, milk pasteurization, and routine herd screening were inconsistently adopted. The study highlights the urgent need for targeted community education, strengthened veterinary extension services, and cross-sectoral communication strategies to improve zoonotic disease literacy. By integrating the KAP approach into state-level One Health initiatives, Haryana can enhance early detection, reduce disease transmission, and promote sustainable livestock–human health systems.

**Keywords:** Awareness, Livestock handlers, Risks, Prevalence, Transmission, Zoonotic Tuberculosis.

**Abstract No.: C-13**

**Registration No.: PP-1167**

## **Morphological Identification of Zoonotically Important Gastrointestinal Helminths in Dogs from Hisar, Haryana, India**

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Morphological identification of gastrointestinal helminths was carried out in dogs from Hisar, Haryana, during July 2024 to March 2026 using standard parasitological techniques. A total of 38 dogs were examined, of which 12 were found positive for one or more helminth infection. Adult *Toxocara canis* and *Toxascaris leonina* were recovered from diarrhoeic faeces of two separate dogs, while *Toxocara cati* was identified based on its characteristic eggs in one case. In three cases, cestodes belonging to *Taenia* spp. were recovered, and in two cases, motile gravid proglottids of *Dipylidium caninum* were observed. Coprological examination of stray dogs revealed *Ancylostoma* spp. eggs in 4 out of 30 samples. Parasite identification based on key morphological features following standard parasitological procedures. The findings indicate the circulation of multiple zoonotically important gastrointestinal helminths in dogs of

Hisar region, thereby highlighting potential public health risks. These results emphasize the need for regular surveillance, improved hygiene practices, and strategic deworming programs to mitigate zoonotic transmission.

**Keywords:** Dog, *Toxocara canis*, *Toxocara cati*, *Toxascaris leonina*, *Ancylostoma* spp., *Dipylidium caninum*, *Taenia* spp., zoonosis, morphology

**Abstract No.:** C-14

**Registration No.:** PP-1168

## **GIS-Based Spatial Mapping of Hyalomma Tick Distribution for Predicting Zoonotic Risk Zones of Crimean–Congo Hemorrhagic Fever in Livestock-Dominated Agro-Ecosystems of Haryana, India**

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Crimean–Congo Hemorrhagic Fever (CCHF) is an emerging tick-borne zoonosis of significant public health concern, transmitted primarily by *Hyalomma* spp. ticks, with livestock acting as amplifying hosts. In agro-ecosystems such as Haryana, characterized by high densities of cattle, buffalo, and camels, the interface between vectors, animals, and humans creates a conducive environment for disease transmission. The present study proposes a GIS-based spatial modeling approach to map the distribution of *Hyalomma* ticks and delineate potential CCHF risk zones. Field-based tick prevalence data will be integrated with geospatial layers including land use–land cover, normalized difference vegetation index (NDVI), temperature, humidity, and livestock density. Spatial analysis and ecological niche modeling will be employed to identify environmental determinants influencing tick abundance and distribution. Risk maps will be generated using weighted overlay and predictive modeling techniques to classify areas into low-, moderate-, and high-risk zones. The proposed framework aims to support targeted surveillance, vector control strategies, and early warning systems under a One Health approach. By identifying ecological hotspots of *Hyalomma* tick activity, this study will contribute to improved preparedness and mitigation of CCHF outbreaks in livestock-dominated regions.

**Keywords:** *Hyalomma* ticks, Crimean–Congo Hemorrhagic Fever, GIS, spatial modeling, zoonosis, Haryana, vector mapping, One Health

## Pathomorphological and Parasitological Investigation of Fatal Haemonchosis in a Jakhrana Goat

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This study describes the pathomorphological and parasitological findings of a fatal case of haemonchosis in a five-year-old Jakhrana goat. The carcass was presented to the Department of Veterinary Pathology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, with a history of illness for five days prior to death. Clinical signs included weakness, pale conjunctival mucous membranes, and progressive deterioration suggestive of anemia. A detailed necropsy examination was conducted. Grossly, the carcass revealed generalized pallor, hydrothorax, hydropericardium, and hydroperitoneum, indicating severe hypoproteinemia. The abomasum showed the presence of numerous white, thread-like worms identified as *Haemonchus* spp., along with oedematous mucosal folds. The liver appeared pale and firm with necrotic foci, while lungs exhibited diffuse congestion and oedema. Histopathological examination revealed abomasitis characterized by mucosal necrosis and infiltration of mononuclear cells. The liver showed multifocal necrosis, inflammatory cell infiltration, bile duct hyperplasia, and fatty changes. Pulmonary sections exhibited pneumonic changes with oedema, congestion, and mixed inflammatory cell infiltration. Other organs revealed varying degrees of congestion, degeneration, and mild inflammatory changes. Parasitological examination of faecal samples revealed a heavy load of strongyle-type eggs, confirming severe parasitic infestation. Toxicological analysis ruled out significant toxin involvement. Based on gross, histopathological, and parasitological findings, the case was diagnosed as severe haemonchosis with associated parasitic abomasitis, pneumonia, and hepatitis. This case highlights the importance of integrating pathological and parasitological approaches for accurate diagnosis of haemonchosis, particularly when secondary complications may obscure the primary cause. Thorough necropsy findings supported by histopathological and faecal examination improve diagnostic reliability. Such an approach aids in precise disease identification and effective parasite management. It also contributes to better animal health, productivity, and sustainable livestock practices under the One Health framework.

**Keywords:** Haemonchosis, Abomasitis, Strongyle eggs, Necropsy, Goat, Parasitic infection

**Nanotechnology in therapeutics****Tanisha Hatwal<sup>1</sup> and Sonali Sangwan<sup>1</sup>**<sup>1</sup>Department of Biotechnology, Guru Nanak Khalsa College, Yamuna Nagar

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Nanotechnology involves the manipulation of materials at 1-100 nm scale for enhanced functionality. It combines principle of biology, chemistry and materials science. Nanobiotechnology is an emerging field with vast applications in biotechnology and medicines. The field has revolutionized modern medicine, precision diagnostics, targeted therapy and advanced vaccines. Nanotech based vaccines include lipid nanoparticles e.g., COVID-19 vaccines, nanoadjuvants to enhance immune response, advanced cancer treatment strategies. Nanovaccine provide greater stability and induce faster and stronger immune response compared to traditional vaccines. Applications include cancer therapy, gene therapy and imaging. Nanotechnology in therapeutics revolutionizes medicine by enabling targeted drug delivery, improved bioavailability, enhancing drug stability, reduced side effects using nanocarriers like liposomes, dendrimers, and nanoparticles. Nanocarriers are used in therapeutics as liposomal drug formulations for cancer therapy, polymeric nanoparticles provide controlled and sustained drug release, dendrimers as high drug loading capacity and precise targeting, metallic nanoparticles used in imaging, drug delivery, and cancer therapy. Solid lipid nanoparticles (SLNs) combine advantages of liposomes and polymeric nanoparticles that improves stability and controlled release. Mechanisms used in nanotechnology to deliver drug is active targeting, passive targeting and controlled release. Despite these advantages, challenges such as potential nanotoxicity, high production costs, regulatory and safety issues, and limited understanding of long term biological affects remain critical concerns. Proper regulatory frameworks and safety assessments are necessary. Nanotechnology in future perspectives is expected to revolutionize personalized medicine. Advancement in nanorobotics, smart drug delivery systems and AI integration will further enhance therapeutic outcomes and efficiency.

**Keywords:** lipid nanoparticles, nanoadjuvants, nanotechnology, nanorobotics, therapeutics

**Abstract No.: C-17**

**Registration No.: PP-1232**

**Sero-surveillance of African Horse Sickness Virus (AHS) in Equine populations of India**

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African Horse Sickness (AHS) is a highly infectious, non-contagious viral disease affecting equids such as horses, donkeys, and mules. It is caused by the African horse sickness virus (AHSV), a member of the genus *Orbivirus* in the family *Reoviridae*. The disease is transmitted by biting midges of the genus *Culicoides*, making it a vector-borne infection. Clinically, AHS presents in pulmonary (per-acute), cardiac (sub-acute), and mixed forms, with symptoms including high fever, respiratory distress, edema of the head and neck, and high mortality, particularly in horses. Due to its severe impact on equine health and international trade, it is recognized as a notifiable disease by the World Organisation for Animal Health (WOAH). In laboratory diagnosis, serological techniques namely ELISA is commonly used for the detection of antibodies or antigens. India is currently considered free from the disease. However, continuous monitoring and surveillance are essential for early detection and effective management of any potential outbreak and to maintain the disease free status. Ongoing diagnostic surveillance and testing are being carried to keep the vigil on this disease. During the study period from April 2025 to March 2026, a total of 277 equine serum samples across the country were screened for AHS using ELISA. All samples were found to be negative for AHSV, indicating the country is free from the disease. The findings support the current disease-free status in the country and emphasize the importance of routine surveillance for early detection and prevention of AHS incursion in the country.

**Keywords:** African Horse Sickness, ELISA, Equine, Surveillance, India

**Abstract No.: C-18**

**Registration No.: PP-1326**

**Investigating the Role of HDAC9 in the Life Cycle of Foot-and-Mouth Disease Virus**

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Foot-and-mouth disease virus (FMDV) is a highly contagious transboundary pathogen responsible for severe economic losses in the livestock sector worldwide, and host epigenetic regulators such as histone deacetylases (HDACs) are increasingly recognized as important modulators of viral replication. In this study, we specifically investigated the role of HDAC9

in FMDV infection using the selective HDAC9 inhibitor TMP195 in wild-type BHK-21 cells. Cytotoxicity was evaluated by MTT assay and the  $CC_{50}$  of TMP195 was determined to be 35.5  $\mu$ M, allowing the use of sub-cytotoxic concentrations for antiviral assessment. Cells infected with FMDV (MOI 0.1) were treated with increasing concentrations of TMP195, and viral titres were quantified by plaque assay. HDAC9 inhibition produced a clear dose-dependent proviral effect, reaching 0.8  $\log_{10}$  increase in viral titre (determined using Reed-Muench method) at the highest concentration tested (1000 nM) compared to vehicle-treated controls ( $P < 0.001$ ). In addition to replication assays, the effect of TMP195 on viral attachment, entry, and release was also assessed to determine its stage-specific impact on the FMDV life cycle. Time-of-addition analysis suggested that TMP195 enhances viral replication predominantly during the mid-to-late phases of infection. Entry assay results indicated a modest increase in viral titre upon TMP195 treatment compared to DMSO control, suggesting a facilitating effect of HDAC9 inhibition on viral entry. Release assay results also demonstrated a significant increase in extracellular viral titres following TMP195 treatment, indicating that HDAC9 inhibition enhances the late stage of viral egress. Overall, our findings indicate that HDAC9 acts as a host restriction factor during FMDV infection, and its pharmacological inhibition significantly enhances viral replication, highlighting the importance of epigenetic regulation in FMDV pathogenesis.

**Keywords:** Epigenetic, histone deacetylase, cytotoxicity, proviral, viral titre, plaque assay, Reed-Muench

**Abstract No.:** C-19

**Registration No.:** PP-1365

### **RNA-Seq–Based Transcriptomic Insights into *Theileria annulata*–Induced Leukoproliferation and Attenuation**

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*Theileria annulata*, a tick-borne apicomplexan parasite, is the etiological agent of tropical theileriosis and is known for its unique ability to transform bovine leukocytes into a cancer-like proliferative state, causing severe economic losses in endemic regions. Advances in RNA sequencing (RNA-seq), particularly dual RNA-seq, have enabled simultaneous high-resolution profiling of host and parasite transcriptomes, providing comprehensive insights into infection biology. This approach facilitates the analysis of gene expression dynamics associated with parasite virulence, host cell transformation, and attenuation. Comparative dual RNA-seq studies between virulent and long-term cultured (attenuated) *T. annulata*-infected leukocytes have identified numerous differentially expressed genes (DEGs) in both parasite and host compartments. In the parasite, DEGs are enriched in pathways such as carbon metabolism, oxidative phosphorylation, endoplasmic reticulum protein processing, and secondary metabolite biosynthesis, with a notable abundance of genes encoding secreted and transmembrane proteins that likely mediate host–parasite interactions and virulence maintenance. In the bovine host, attenuation reverses infection-induced transcriptional alterations, restoring the expression of genes involved in cell adhesion, leukocyte activation,

and inflammatory signaling, thereby indicating molecular signatures of transformation reversal. Furthermore, RNA-seq analyses have facilitated the identification of potential attenuation biomarkers, including parasite gene TA03875 and host genes CD69, ZNF618, and LPAR3, which hold promise for improving live vaccine quality control without reliance on animal challenge experiments. In vivo transcriptomic profiling of peripheral blood mononuclear cells from infected cattle has also provided insights into immune evasion strategies and disease progression. Additionally, integrated transcriptomic and metabolomic studies across schizont and piroplasm stages have elucidated key molecular adaptations during the parasite life cycle.

**Keywords:** *Theileria annulata*, Tropical theileriosis, Tick borne parasite, RNA seq, Transcriptomics

**Abstract No.:** C-20

**Registration No.:** PP-1378

### **AI-Based Milk Quality Detection and Adulteration Prevention**

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Milk adulteration remains a significant challenge in ensuring food safety, public health and consumer trust, particularly in rapidly expanding dairy sectors like India. Conventional methods for milk quality testing are often time-consuming, labor-intensive and require specialized laboratory infrastructure limiting their effectiveness in real-time monitoring. This study proposes an artificial intelligence (AI)-based approach for rapid, accurate and cost-effective detection of milk adulteration and quality assessment. The proposed system integrates sensor-based data acquisition with machine learning algorithms to identify deviations in key physicochemical parameters such as fat content, pH, conductivity and density. Advanced models including supervised learning techniques are trained on large datasets of both pure and adulterated milk samples to recognize patterns and classify milk quality with high precision. The system is designed to detect common adulterants such as water, urea, starch and detergents in real time.

Additionally, the implementation of AI-driven edge devices enables on-site testing at collection centers and processing units, reducing dependency on centralized laboratories. The model's performance demonstrates high accuracy, scalability and adaptability across diverse environmental conditions. By facilitating early detection and prevention of adulteration, this technology enhances supply chain transparency and ensures compliance with food safety standards. The adoption of AI-based milk quality monitoring systems aligns with the vision of a technologically advanced and self-reliant dairy sector under the "Viksit Bharat" initiative. It not only improves operational efficiency but also safeguards consumer health and strengthens the economic resilience of dairy stakeholders.

**Keywords:** Artificial Intelligence (AI), Milk Quality Detection, Adulteration Prevention, Machine Learning, Sensor-Based Monitoring, Real-Time Analysis

## PLGA Nanoparticles Adjuvanted with Poly I:C as a Next-Generation Vaccine Platform for Equine Herpesvirus 1.

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EHV 1 is a ubiquitous pathogen responsible for equine rhinopneumonitis, a WOAHA-listed disease characterized by respiratory illness, abortions, neurological disorders, and foal mortality worldwide. Currently available inactivated vaccines primarily induce short-lived humoral immunity and fail to generate CMI responses, necessitating frequent booster immunizations, especially during pregnancy. In contrast, live attenuated vaccines carry an inherent risk of reversion to virulence, limiting their widespread application. These limitations underscore the urgent need for innovative vaccine strategies capable of inducing durable and balanced immune responses. In this study, we developed a PLGA-based nanoparticle vaccine encapsulating formalin-inactivated EHV 1, co-formulated with Poly I:C, a synthetic double-stranded RNA analogue and a potent TLR3 agonist. PLGA is widely regarded as an ideal delivery system due to its biocompatibility, biodegradability, non-toxic nature, and ability to facilitate intracellular antigen delivery. Notably, PLGA nanoparticles in the size range of 200–600 nm have been associated with enhanced IFN- $\gamma$  production, indicative of strong CMI activation. Poly I:C, employed as an immunoadjuvant, is a potent inducer of cell-mediated immunity and significantly enhances the immunostimulatory capacity of the formulation, promoting synergistic activation of both innate and adaptive immune responses. The integration of adjuvants with nanoparticle-based delivery systems offers a promising approach by improving antigen presentation, stimulating immune pathways, and eliciting robust and long-lasting protective immunity. Overall, this PLGA-based nanoformulation represents a promising next-generation vaccine strategy against EHV 1, enabling controlled antigen release, enhanced antigen presentation, and potent adjuvant activity. By addressing the limitations of existing vaccines, this platform holds significant potential to improve protective immunity in horses and mitigate the economic and welfare impacts associated with EHV 1 outbreaks.

**Keywords:** EHV 1, PLGA, Poly I:C, Nanoparticles, Vaccines

**Intersectoral Collaboration under One Health: Enhancing Zoonotic Disease Surveillance and Management****Punit Jhandai\*, Harisankar Singha, Shanmugasundaram K., Riyesh T.,  
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One Health is an integrated and collaborative approach that brings together multiple disciplines and sectors to address existing and emerging health threats at the interface of humans, animals, and the environment. In alignment with this concept, the One Health Programme was initiated at ICAR–National Research Centre on Equines (ICAR-NRCE). The programme aims to strengthen coordination among veterinary, medical, and environmental health sectors to ensure effective prevention, surveillance, and control of zoonotic diseases. This study outlines the major initiatives undertaken, including surveillance of glanders in equines and animal handlers, monitoring of zoonotic diseases in both human and animal populations, and capacity-building efforts through specialized workshops and training programmes. Surveillance efforts from July 2024 to September 2024 tested equid and in-contact human serum samples for *Burkholderia mallei* using Hcp1 indirect ELISA and confirmatory CFT. Additionally, zoonotic diseases such as brucellosis, bovine tuberculosis, paratuberculosis, salmonellosis, leptospirosis, and scrub typhus were investigated. Testing of 11527 animal samples identified 81 cases of brucellosis, while no positives were recorded for bovine tuberculosis or paratuberculosis. In humans, 865 of 4818 suspected cases were positive for tuberculosis, and 1890 of 9033 samples tested positive for salmonellosis. Scrub typhus and leptospirosis were confirmed in 2 of 20 and 1 of 8 samples, respectively. To enhance intersectoral coordination, a total of 1 workshop and 2 training programmes were organized in year 2024, benefiting more than 100 medical and veterinary professionals as well as over 100 farmers and members of the general public. The study highlights the effectiveness of the One Health approach in advancing disease detection, control strategies, and collaboration among key sectors.

**Keywords:** Zoonosis, One health, Haryana, Tuberculosis, Brucellosis, Salmonellosis

**A Potential Multi-Phase Roadmap for Policy Intervention for Equine Farmers in Haryana, India****Ajmer Singh<sup>1</sup>; Arun Som<sup>2</sup>**

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In Haryana, the equine farming sector remains underdeveloped, plagued by persistent deficits in budgetary provisions, diminishing land holdings, rapid agricultural mechanization, and swift legislative changes that have exacerbated the socio-economic vulnerability of farmers. In the state, farmers confront complex challenges in their daily equine rearing and management practices, driven by a range of socio-economic constraints. This research delves into the complexities and sociological underpinnings of these issues by examining the gap between assumptions and empirical facts. The empirical evidence collected from 303 farmers across four sample districts of Haryana; Hisar, Jind, Rohtak and Bhiwani; is brought to the forefront of discussion. Accordingly, purposive sampling was used to capture a wide spectrum of animal husbandry practices. The article addresses the following gaps: (i) 55.1% of equine farmers reported the absence of structured breeding policies; (ii) 33.7% of respondents reported inadequate access to veterinary services; (iii) persistent instability in securing work for equines; (iv) 70.3% reported a dearth of government welfare policies; and (v) more than 50% reported a growing disinterest among the younger generation. Using thematic analysis of policy documents, we developed a research strategy that later guided the sampling techniques employed in this study. We argue that there is a dire need for creating specific budgetary provisions and prioritizing initiatives related to breeding, veterinary healthcare, and the underlying socio-economic challenges faced by equine farmers.

**Keywords:** Equines, Policy paradigm, Vulnerability, farmers

**Functional characterization of methylcitrate cycle genes (*prpC* and *prpR*) in *Mycobacterium kansasii* under acidic and oxidative stress conditions**

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The physiological state of intracellular pathogens is closely linked to their host environment, with metabolic adaptation driven by reliance on locally available host derived nutrients. Intracellular pathogens such as *Mycobacterium tuberculosis* adapt metabolically to the host environment by utilizing available host lipids. Within host cells, mycobacteria rely on lipid carbon sources, including cholesterol, for survival and persistence. Notably, cholesterol metabolism generates propionyl CoA, which is detoxified via the methylcitrate cycle (MCC), a pathway critical for bacterial adaptation and survival. Although these mechanisms are well characterized in *M. tuberculosis*, their role in non-tuberculous mycobacteria such as *Mycobacterium kansasii* remains poorly understood, highlighting the need to investigate the role of MCC genes in this pathogen. In this study, CRISPR-Cas9 was employed to generate mutants of MCC genes (*prpC* and *PrpR*) in *M. kansasii*. To evaluate stress adaptation, wild type and mutant strains were subjected to in vitro acidic and oxidative stress conditions, and growth was monitored. Under acidic conditions, all strains exhibited normal growth at pH 7.0, while at pH 6.5 the  $\Delta prpC$  and  $\Delta prpR$  mutants showed delayed growth compared to the wild type and no growth was observed at pH 4.5 for any strain. Upon exposure to varying concentrations of H<sub>2</sub>O<sub>2</sub>, wild type *M. kansasii* displayed higher resistance than the mutants across different incubation periods. Collectively, these findings highlight the critical role of methylcitrate cycle genes in the survival and stress adaptation of *M. kansasii*. Further studies are required to delineate the precise functional role of the MCC gene in *M. kansasii* survival.

**Keywords:** *M. kansasii*, cholesterol, propionyl CoA, methylcitrate cycle, oxidative stress

**Genomic Analysis of *Mycobacterium bovis* strains using *in-silico* methods****Bhumeet<sup>1</sup>, Pawan Kumar<sup>2</sup>, Zoozeal Thakur<sup>3</sup>, Shanmugasundaram K<sup>1\*</sup>,  
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*Mycobacterium bovis*, a member of the *Mycobacterium tuberculosis* complex (MTBC), is responsible for bovine tuberculosis. It is a significant zoonotic pathogen that affects humans, livestock, and wildlife, and posing a major public health threat. Despite extensive research efforts, the genomic determinants of strain diversity, host adaptation, and disease-causing mechanisms of *M. bovis* across different regions and periods remain inadequately characterised, and this study aimed to shed light on these aspects. To investigate the genetic reservoir of *M. bovis* across different regions, we retrieved the genomes of 41 *M. bovis* strains and examined their global diversity to enhance the understanding of evolutionary relationships. The strains were found to differ in genomic features, including prophage regions, antimicrobial resistance genes, and genomic islands, which elucidates the role of phages and provides vital insights into antimicrobial resistance, thereby aiding in the containment of multidrug-resistant bacterial strains. This study presents the core genomic phylogeny of *M. bovis*, emphasising the organism's considerable genetic diversity and regionally structured lineages. Collectively, these findings offer a solid foundation for further research into the evolution, pathogenicity, and resistance mechanisms of *M. bovis*, informing future strategies for surveillance, control, and vaccination.

**Keywords:** *Mycobacterium bovis*, zoonotic, prophage, genetic diversity, multidrug-resistant, genomic islands

**Crosstalk between miR27a and PPAR- $\gamma$ -DUSP-1 governs BPXV mRNA translation via modulating p38 MAPK-MNK1-eIF4E signaling pathway****Garvit Kumar<sup>1,2</sup>, Assim Verma<sup>1</sup>, Ram Kumar<sup>1</sup>, Shweta Dhanda<sup>1</sup>, Jitender Rathee<sup>1</sup>, Riyesh Thachamvally<sup>1</sup>, Shoor Vir Singh<sup>2</sup>, Naveen Kumar<sup>1,3,\*</sup>**

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In this study, we demonstrate that activation of PPAR- $\gamma$  (Peroxisome Proliferator-Activated Receptor Gamma), a nuclear receptor and transcription factor, by its agonist Rosiglitazone significantly suppresses replication of Buffalopox virus (BPXV). Time-of-addition and step-specific assays revealed that rosiglitazone primarily inhibits viral genome replication and protein synthesis, while showing no measurable effect on viral attachment, entry, or release in infected cells. Mechanistic investigations identified miR-27a, an endogenous negative regulator of PPAR- $\gamma$ , as a proviral factor displaying an inverse expression pattern with PPAR- $\gamma$  during infection. At 12 hours post-infection, corresponding to the peak of viral mRNA translation, miR-27a expression was maximal whereas PPAR- $\gamma$  levels were markedly reduced, suggesting a critical regulatory axis controlling viral translation. Activation of PPAR- $\gamma$  suppressed the p38 MAPK-MNK1-eIF4E signaling pathway required for cap-dependent viral mRNA translation. Notably, the antiviral effect of rosiglitazone was abolished in p38-knockout cells, confirming the involvement of p38 signaling. Although PPAR- $\gamma$  did not directly interact with p38, it induced the expression of DUSP1, a known negative regulator of p38 activity. Pharmacological inhibition of DUSP1 restored viral replication in rosiglitazone-treated cells, supporting a PPAR- $\gamma$ -DUSP1-mediated mechanism. Furthermore, rosiglitazone significantly reduced BPXV-induced mortality and pock lesion formation on the chorioallantoic membrane of specific pathogen-free embryonated chicken eggs. Importantly, prolonged viral passage in the presence of the inhibitor did not lead to the emergence of resistant variants, underscoring the potential of rosiglitazone as a host-directed antiviral strategy with a low likelihood of inducing antiviral resistance.

**Keywords:** PPAR- $\gamma$ , miR-27a, p38 MAPK, poxvirus, BPXV

**Tubacin-Induced Hyperacetylation Impairs Foot-and-Mouth Disease Virus Replication**

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Foot-and-mouth disease virus (FMDV) causes significant economic losses worldwide. Effective antiviral methods for acute outbreaks remain scarce despite immunization campaigns. In previous studies it is well known that tubacin, a selective inhibitor of histone deacetylase 6 (HDAC6), increases the acetylation of numerous host proteins involved in cytoskeletal dynamics, cellular signaling, and protein quality control. In this work, we examined tubacin's effect on FMDV replication in vitro. Cytopathic effect, viral RNA expression, VP1 protein levels, and infectious virus production were used to measure viral replication in FMDV-infected cells treated with varying doses of tubacin. Compared with untreated infected controls, tubacin therapy dramatically reduced FMDV-induced cytopathic effect, total viral RNA, and VP1 expression. BHK-21 cells were treated with tubacin; progeny-virus generation was significantly decreased dose dependently approx. 1 log virus titer. FMDV reduce the acetylation of alpha tubulin with increase in hour post infection and tubacin treatment significantly restore the acetylation of alpha tubulin alpha tubulin. Mechanistically, higher cellular acetylation was associated with antiviral activity, suggesting that hyperacetylation interferes with host pathways required for efficient viral replication. HDAC6 knockout increases acetylated tubulin levels, disrupts viral replication processes, and significantly reduces progeny virus production in infected cell. These results suggest that FMDV multiplication can be inhibited by modifying the host acetylation state through HDAC6 suppression. All things considered, our findings point to tubacin as a viable host-targeted antiviral option and emphasize alpha tubulin acetylation as a crucial regulatory mechanism in FMDV.

**Keywords:** FMDV, Acetylation, Microtubule, HDAC6, Antiviral

## First Report of Morphological and Molecular Identification of zoonotically important *Spirometra erinaceieuropaei*, isolated from a Canine Host from Haryana

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Morphological and molecular identification of *Spirometra* species remains an essential component of One Health framework due to its zoonotic significance. The present study reports the recovery and characterization of *Spirometra* parasites from the intestine of a domestic dog in the Ambala region suffering from abdominal pain and diarrhoea and expelled a large broad tapeworm during routine clinical examination. Recovered specimens were thoroughly washed, fixed in 10% neutral buffered formalin then standard histomorphological processing was performed, including dehydration through graded alcohols, staining using alcoholic borax carmine, cleared in xylene, and mounted in DPX for detailed morphological examination. Similarly, for molecular confirmation, both ribosomal and mitochondrial genes targeted were sequenced. Gross morphological examination showed a dark longitudinal line in the centre of broad segments indicating the presence of prominent uterus and cirrus sac in centre of each segment. Observations of segment pressed between two slides under a compound microscope revealed uterus filled with several bipolar and operculated eggs. The uterus exhibited a spirally coiled configuration along with bilobed ovary, typical features of the genus *Spirometra*. Morphometric analysis of proglottids width, egg dimensions, cirrus sac size and uterine loop arrangement in boraxcarmine stained mature segments were consistent with previously described *Spirometra* taxa. Sequencing results confirms the presence of *S. erinaceieuropaei* circulating in Haryana. The morphological and molecular features obtained in this study enhance the accuracy of diagnostic identification of *Spirometra* species in canines and provide valuable baseline data for future epidemiological studies. Furthermore, these findings underscore the potential public health importance of zoonotic sparganosis risk in the Haryana.

**Keywords:** Dog, Pseudotapeworm, Sparganosis, Spiral uterus, *Spirometra*

## Isolation, Genomic Analysis and Structural Modeling of Endolysin From Bacteriophages Targeting ESBL-Producing *E. coli*

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The escalating prevalence of extended spectrum  $\beta$ -lactamase (ESBL) producing *Escherichia coli* represents a critical public health concern due to the diminishing efficacy of conventional antibiotics. Bacteriophages, owing to their specificity and self-replicating nature, offer a promising alternative for targeted bacterial control. A total of four lytic bacteriophages infecting ESBL producing *E. coli* (EC 4, 5, 6, and 7) were isolated during the current study, exhibiting distinct plaque morphologies ranging from pinpointed clear to hazy plaques with variable diameters. Host range analysis demonstrated varying lytic spectra across multiple bacterial isolates. Bulk propagation of phages was achieved, and high-quality genomic DNA was extracted for sequencing of genomic DNA by using Oxford Nanopore technology. Genome assembly and annotation revealed conserved structural and lytic modules alongside unique genomic features among the phages. Endolysin genes were identified and subjected to in silico structural analysis. Three-dimensional models generated using SWISS-MODEL showed high structural reliability, while binding pocket prediction using DoGSiteScorer identified putative catalytic regions involved in peptidoglycan degradation. Phylogenetic analysis further highlighted the diversity and evolutionary relationships of endolysins. Overall, the study demonstrates the successful isolation and genomic characterization of bacteriophages with promising antibacterial potential. The presence of conserved lytic systems and structurally validated endolysins underscores their applicability as alternative therapeutics against multidrug-resistant pathogens, supporting future development of phage- and enzyme-based interventions.

**Keywords:** ESBL, *E. coli*, bacteriophage, phage therapy, comparative genomics, Antimicrobial resistance.

## **Comparative study on antimicrobial activity of donkey milk against pathogenic bacteria**

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Milk is a rich source of bioactive compounds essential for the health and growth of newborns. Donkey milk, characterized by its high lactose content and abundance of whey proteins, has been recognized as suitable alternative to human breast milk during infancy and as an effective nutritional option for patients with cow milk protein allergy. Present study conducted to explore the antimicrobial effects of donkey milk on selected pathogenic bacterial strains in comparison to other livestock milk. Antimicrobial properties of donkey and other livestock (cattle, buffalo, sheep and goat) milk were evaluated against 7 clinical pathogens (*Escherichia coli*, *Staphylococcus aureus*, *Streptococcus equi*, *Streptococcus zooepidemicus*, *Pseudomonas aeruginosa*, *Salmonella enterica*, *Shigella flexneri*) using well diffusion method. Result showed that donkey milk exhibited the strongest antimicrobial activity against most of the tested bacteria compared with the other milk samples. The mean inhibition zone produced by donkey against *Escherichia coli* was higher (24.67 mm) than those observed for other (14.33–18.00 mm). Mean difference of donkey milk is significantly higher than other milk in all tested bacteria except *Salmonella enterica*. Donkey milk shown higher inhibition of *Pseudomonas* and least against the *S. equi* ss *equi*. Notably, inhibition against *Streptococcus equi* and *Shigella flexneri* was observed only with donkey milk. None of the milk samples demonstrated inhibitory activity against *Salmonella enterica*. Overall, these findings indicate that donkey milk possesses significantly higher and broader antimicrobial activity against the tested bacterial pathogens compared with the other animal milk samples.

**Development of Duplex PCR Assay for Detection of Enteric DNA Viruses of Poultry**

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Enteric diseases of poultry cause significant economic losses because of decreased body weight gain, high morbidity and mortality rates, and increased production costs due to poor feed conversion efficiency and treatment cost. Several viruses have been associated with enteric problems in poultry of which Fowl adenovirus (FAdV) and Chicken Parvovirus (ChPV) are important enteric pathogens of poultry associated with significant economic losses. FAdV primarily infects young broiler chicks and is involved in diseases such as Adenoviral Gizzard Erosion (AGE), Hepatitis Hydropericardium Syndrome (HHS), and Inclusion Body Hepatitis (IBH). ChPV is commonly associated with enteritis, Runting-Stunting Syndrome (RSS), Malabsorption Syndrome (MAS), growth retardation, ruffled feathers, and bone abnormalities. In the present study, a duplex polymerase chain reaction was developed and optimized for various parameters. The analytical sensitivity was determined with recombinant plasmid constructs containing target genes of each virus and specificity of the assay was determined with other avian viruses. The detection limit of the optimized assay was found to be  $3 \times 10^4$  copies/ $\mu$ L for FAdV and  $3 \times 10^2$  copies/ $\mu$ L for ChPV. No cross-amplification was observed with other avian viruses. Diagnostic sensitivity of the developed assay was 100% and diagnostic specificity was 94.90% for ChPV and 98.91% for FAdV. Out of total 204 cloacal swab samples screened, 10.07% (22/204) tested positive for FAdV, 26.96% (55/204) for ChPV, and 5.39 % (11/204) samples demonstrated co-infection with both viruses. The developed duplex PCR assay is a rapid, specific, and cost-effective diagnostic tool for the simultaneous detection of FAdV and ChPV, facilitating early diagnosis and improved disease management in poultry.

**Green-synthesized Silver Nanoparticles from *Bacopa monnieri* (Brahmi):  
Antiviral Potential Against Newcastle Disease Virus**

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Newcastle disease virus (NDV) is a highly contagious viral pathogen causing severe economic losses in the poultry industry. The present study aimed to develop a green, plant-based antiviral approach using *Bacopa monnieri*-mediated silver nanoparticles (BNPs) and to evaluate their cytotoxic and antiviral potential. Qualitative phytochemical screening of *Bacopa monnieri* leaf extract confirmed the presence of important bioactive compounds, including alkaloids, flavonoids, saponins, terpenoids, tannins, phenols, and cardiac glycosides, which play a key role in nanoparticle synthesis and stabilization. The successful synthesis of BNPs was initially indicated by a colour change and further confirmed by UV–visible spectroscopy, showing a characteristic surface plasmon resonance peak at 416 nm. FTIR analysis revealed the involvement of plant biomolecules in reduction and capping of nanoparticles. Morphological studies using FESEM and HRTEM showed predominantly spherical nanoparticles with sizes ranging from 15–48 nm, while EDX confirmed the presence of elemental silver. Cytotoxicity of BNPs was evaluated using the MTT assay on Vero cells, demonstrating a dose-dependent response with concentrations  $\leq 15.62 \mu\text{g/mL}$  showing  $\geq 90\%$  cell viability. Antiviral activity assessed by hemagglutination assay showed reduced viral titres, indicating concentration-dependent inhibition of viral replication. Overall, BNPs showed promising antiviral potential against NDV.

**Keywords:** *Bacopa monnieri*, Newcastle disease virus, Green synthesis, Cytotoxicity, antiviral activity.

## **Technical Session II**

### **Sustainable Livestock and Fisheries Production: Precision farming, Climate Resilience, Indigenous Livestock systems**

**Potential of *Bombax ceiba* as a Natural Colour Enhancer in Ornamental Fishes: A Sustainable Alternative to Synthetic Pigments**

**Suraj Sihag<sup>1\*</sup>, Sunita Rani<sup>1</sup>, Dalip Kumar Bishnoi<sup>1</sup>, Saikat Das<sup>1</sup>, Kusumlata Goswami<sup>2</sup>, Md Idrish Raja Khan<sup>3</sup>**

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Colour intensity is one of the most important quality traits in ornamental fishes, directly influencing aesthetic appeal, consumer preference, and market value. In commercial ornamental aquaculture, synthetic pigments are widely used to improve body coloration; however, their high cost, limited availability, and possible environmental concerns have increased the demand for natural alternatives. *Bombax ceiba* (red silk cotton flower), a widely distributed tropical plant, bears bright red flowers rich in natural pigments and bioactive compounds such as carotenoids, flavonoids, anthocyanins, and phenolic compounds, which may contribute to enhanced pigmentation in fishes. The present poster explores the potential of *Bombax ceiba* flower powder or extract as a plant-based dietary additive for colour enhancement in ornamental fish species such as rosy barb, guppy, molly, goldfish, and koi. In addition to pigmentation, plant-derived additives may provide antioxidant, immunostimulatory, and health-promoting effects that can improve overall fish performance. A proposed experimental framework includes drying and processing flower petals into powder or extract, incorporation at graded levels in formulated feed, and feeding trials under controlled conditions. Key parameters to be evaluated include colour intensity, growth performance, feed conversion ratio, survival rate, and fish acceptability. The utilization of *Bombax ceiba* offers an eco-friendly, low-cost, and locally available alternative to synthetic colour enhancers while promoting sustainable ornamental aquaculture and better resource utilization. This approach may also create opportunities for value addition of indigenous plant resources. Further scientific investigations are necessary to validate efficacy, determine optimum inclusion levels, and assess economic feasibility for large-scale commercial application.

**Keywords:** *Bombax ceiba*, ornamental fish, colour enhancement, natural pigments, rosy barb, sustainable aquaculture, plant-based feed additive.

**Potential of *Tribulus terrestris* extract as a Sex Reversal in Ornamental Fishes: A Sustainable Alternative to Synthetic Hormone**

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Sexual dimorphism and the production of monosex populations play a vital role in the ornamental fish industry, as one sex frequently exhibits more desirable aesthetic features such as brighter colours or longer fins that drive higher market demand. Traditionally, synthetic steroids like 17 $\alpha$ -methyltestosterone have been used to induce sex reversal, but their application raises serious concerns related to environmental toxicity, consumer health, and safety risks for farm workers. The effectiveness of *Tribulus terrestris*, a medicinal herb high in steroidal saponins (especially protodioscin), as a safe, natural substitute for masculinization. Important ornamental fish species such as Guppy (*Poecilia reticulata*), Cichlids (*Cichlasoma nigrofasciatum*), and Fighter fish (*Betta splendens*) have demonstrated promising results, while evidence for Swordtail (*Xiphophorus helleri*) remains limited or inconclusive. According to these studies, phytochemicals in *Tribulus terrestris* may be able to mimic or stimulate endogenous androgen production, resulting in high percentages of male populations without the negative side effects of synthetic hormones. The bioactive substances in *Tribulus terrestris* are known to improve growth performance, survival rates, and immune response in addition to sex reversal, offering a comprehensive benefit to fish health. The suggested framework entails making ethanolic or aqueous extracts, adding them to larval diets at varying concentrations, and using histological analysis to track gonadal differentiation. A sustainable, economical, and green method of sex reversal in aquaculture is the use of *Tribulus terrestris*. Breeders can satisfy market demands for superior monosex stocks while encouraging environmental stewardship and the value addition of botanical resources by substituting plant-based extracts for synthetic hormones. To standardize dosage procedures and guarantee the financial sustainability of ornamental fish production on a commercial scale, more research is necessary.

**Keywords:** *Tribulus terrestris*, ornamental fish, sex reversal, growth performance, swordtail sustainable aquaculture, plant-based feed additive.

## Digital Technologies in Meat, Poultry, and Egg Value Chains: A Review

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The rapid advancement of digital technologies is transforming livestock-based food systems, particularly in developing countries where meat, poultry, and egg value chains are often constrained by inefficiencies, inadequate infrastructure, and significant post-harvest losses. This review examines the role of digitalization in enhancing the efficiency, transparency, and sustainability of meat, poultry, and egg value chains. The paper synthesizes recent literature on the application of digital tools across major stages of the value chain, including production, processing, distribution, and marketing. At the production level, technologies such as mobile applications, sensor-based systems, and precision livestock farming tools enable real-time monitoring of animal health, feed efficiency, and environmental conditions. In egg production systems, digitalization facilitates automated grading, quality assessment, and inventory management. Furthermore, innovations such as cold chain monitoring, smart logistics, and temperature tracking systems improve product quality and reduce spoilage during processing and distribution. Blockchain-based traceability systems also enhance food safety and consumer trust by ensuring transparent farm-to-fork tracking. The findings suggest that digitalization can significantly improve productivity, reduce post-harvest losses, and strengthen quality assurance across meat, poultry, and egg value chains. However, adoption remains limited due to challenges such as poor infrastructure, low digital literacy, and high initial investment costs, particularly among smallholder farmers. In conclusion, digitalization offers substantial potential to modernize livestock value chains and improve food security and economic outcomes in developing countries. Strategic interventions, capacity building, and supportive policies are essential to ensure inclusive and scalable adoption.

**Keywords:** Digital Technologies, Meat production, Value chain, Precision livestock farming, Blockchain, Food safety, Traceability, Cold chain management, Post-harvest losses

## Transcriptome Profiling of Mammary Epithelial Cells Reveals Hub Genes and Regulatory Networks Associated with Subclinical Mastitis in Murrah Buffaloes

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Subclinical mastitis in buffalo is considered a multifaceted disease that leads to major economic losses by reducing milk quality and quantity. Diagnosing SCM is critical because the disease is often neglected, as there are no visible changes in the milk or udder. It is reported to be 15-40 times more common than clinical mastitis in buffaloes. The gene expression and regulation processes involved in mastitis development and prevention in Murrah buffaloes are not yet fully understood. In this study, we employed a comprehensive bioinformatics analysis to identify key genes expressed in mammary epithelial cells that could serve as biomarkers and therapeutic targets for SCM. A total of 29 samples, including healthy and SCM cases, were examined. Secretory RNA from mammary gland epithelial cells trapped in fat globules of milk was extracted and analysed using high-throughput RNA-seq to assess gene expression in milk samples. Differential gene expression analysis with edgeR identified 1345 significant DEGs, comprising 1341 upregulated and 4 downregulated genes, using  $FDR < 0.05$  and  $|\log_2FC| > 1$  as thresholds. Functional enrichment analysis showed significant gene ontology terms and KEGG pathways related to immune response, cell adhesion, and calcium signalling. The top 15 hub genes were chosen based on high logFC and degree from the STRING database and Cytoscape. To further explore transcriptional and post-transcriptional regulation, miRNA and transcription factor predictions were performed for the selected hub genes. The miRNA and TF predictions identified bta-miR-664a, bta-miR-149-3p, and bta-miR-7865, and PRDM9, KLF, EGR, and SP from the Cys2His2 zinc finger protein family, respectively, as targeting the most hub genes. The multi-layered regulatory interactions deciphered in the present study may aid in precision diagnostics and targeted therapies for subclinical mastitis.

**Keywords:** Subclinical mastitis, Murrah, RNA-seq, miRNA, Transcription factor

**A Study of Haryana Dairy Industry and its Swot Analysis****Sushma<sup>1\*</sup>, Sunita Mehla<sup>1</sup>, Megha Goyal<sup>1</sup>, Khushboo Dalal<sup>1</sup>, Satish Jangra<sup>2</sup>, Nidhi<sup>1</sup>**<sup>1</sup>Department of Business Management, College of Agriculture, CCS HAU, Hisar<sup>2</sup>Dept. of Dairy Business Management, College of Dairy Sci. and Tech., LUVAS, Hisar\*Corresponding author's Ph no. 8708420717, email ID: [imsushmalather@gmail.com](mailto:imsushmalather@gmail.com)

The dairy sector plays a pivotal role in agricultural growth, rural employment, and nutritional security in India. Haryana, known as the “Milk Pail of India,” has a strong dairy base supported by high-yielding breeds and well-established infrastructure. The state exhibits high per capita milk availability (1,098 g/day in 2022-23) and significant livestock resources, making it an important contributor to the national dairy economy. The study utilized a mixed-method approach based on both primary and secondary data. Secondary data were collected from official sources such as Animal Husbandry Statistics, NDDB, and ISS reports to assess the status of the dairy industry and conduct SWOT analysis. Primary data were collected from 360 dairy farmers across six districts using a multistage sampling technique and structured interviews. Haryana produces about 119.66 lakh tonnes of milk, with buffaloes contributing nearly 76% of total production. The dairy market is valued at INR 655 billion in 2024, with projected growth. Despite high production, the state's share in national milk output declined from 5.91% (2019–20) to 5.19% (2022-23). Around 60% of milk is marketed, with a higher share through informal channels. Dairy cooperatives play a key role but face competition from private players. The sector's strengths include strong veterinary infrastructure, superior breeds, and high demand. Weaknesses involve low productivity per animal, high input costs, and inadequate marketing infrastructure. Opportunities lie in value addition, urbanization, and rising income, while threats include fodder scarcity, competition, and low milk prices. Haryana's dairy industry is robust yet faces structural and marketing challenges. Strengthening infrastructure, promoting value addition, and enhancing organized market participation are essential for sustainable growth and improved farmer income.

**Keywords:** Dairy sector, Milk production, Haryana dairy industry

**Carbon Trading in the Livestock Sector: Scope and Challenges****Satish Jangra**

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The livestock sector is a major source of greenhouse gas (GHG) emissions globally, especially methane (CH<sub>4</sub>) from enteric fermentation and manure management. Compliance and voluntary carbon trading markets are two ways to encourage emission reductions in this sector by turning mitigation efforts into tradable carbon credits. This paper examines the potential for carbon trading in the livestock industry from varying dimensions. It finds that data uncertainty, high transaction costs, policy fragmentation and equity concerns are major barriers to the adoption of carbon trading in developing countries. However, by leveraging advanced digital MRV technologies, precision livestock farming and policy alignment, significant mitigation potential could be unlocked. The livestock carbon market represents a critical but underdeveloped frontier in climate change mitigation and climate finance, with the potential to simultaneously enhance rural incomes, improve sustainability and contribute to global net-zero targets. The concept explores carbon trading in the livestock sector as a double-edged sword: it helps livestock farmers fight climate change while also providing an additional stream of income. The concept also unfolds another dimension to the future of policymaking by assigning the role not only of shielding livestock farmers from the impacts of climate change but also of enabling them to become financially sustainable in future markets. The existing production systems, particularly unorganised ones, may be nearly circular. However, this may not find due weightage if we undertake a scientific study to evaluate the carbon impact of livestock production systems. All production systems should be evaluated and documented for their potential environmental impacts.

**Keywords:** Carbon trading, Green house gas, Livestock sector

**Advancing Blue Livestock: Integrated Innovations from Seed to Post-Harvest in Fisheries and Aquaculture for Viksit Bharat****Apoorv Kumar\***

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The Blue Livestock concept highlights the critical role of fisheries and aquaculture in ensuring food security, nutrition, and economic growth in India. According to the FAO's State of World Fisheries and Aquaculture (SOFIA) 2024, global aquatic production reached 223.2 million tonnes, with aquaculture contributing over 130.9 million tonnes and surpassing capture fisheries. India, the second-largest aquaculture producer, contributes nearly 8% of global output

and has achieved approximately 19.5 million tonnes fish production in 2024–25, supporting over 28 million livelihoods. This study presents an integrated “seed-to-shelf” framework encompassing broodstock improvement, hatchery technologies, and functional feed innovations to enhance seed survival (30–40%) and growth efficiency. Precision aquaculture tools, including IoT-based water quality monitoring and AI-driven farm management, improve productivity and resource use efficiency. Post-harvest losses, estimated at 20–25% in developing value chains, can be minimized through cold chain integration, smart packaging, and value addition. The study proposes a novel digital-integrated “Seed-to-Shelf” model combining real-time monitoring, sustainable production, and intelligent post-harvest systems to enhance traceability, reduce losses, and increase farmer income. This holistic approach strengthens sustainability, boosts export competitiveness, and aligns the fisheries sector with the vision of Viksit Bharat.

**Keywords:** Blue Livestock, Aquaculture, Hatchery Technology, Precision Aquaculture, Biofloc System, Post-Harvest Technology, Cold Chain, Smart Aquaculture, Sustainable Fisheries, Viksit Bharat

**Abstract No.: C-40**

**Registration No.: OP-1171**

## **Decoding Adoption Behaviour in Buffalo Husbandry: A Structural Equation Modelling Approach**

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Adoption of scientific buffalo husbandry practices among smallholder farmers remains uneven, necessitating a deeper understanding of underlying behavioural mechanisms. This study extends the Unified Theory of Acceptance and Use of Technology (UTAUT) to examine the effects of performance expectancy, effort expectancy, social influence, and habit on behavioural intention and use behaviour. A cross-sectional design was employed, and primary data were collected from 530 buffalo-rearing households using a structured and pre-tested instrument comprising 24 indicators measured on a five-point Likert scale. Following data screening and elimination of multivariate outliers using Mahalanobis distance, 518 observations were retained for analysis. Partial Least Squares Structural Equation Modelling (PLS-SEM) was conducted using SmartPLS and R to evaluate measurement and structural models. Internal consistency and construct validity were confirmed using Cronbach’s alpha, composite reliability, Average Variance Extracted (AVE), and the Fornell–Larcker criterion. Path relationships were tested using bootstrapping with 5,000 resamples. The model demonstrated substantial explanatory power ( $R^2 = 0.653$  for behavioural intention;  $R^2 = 0.720$  for use behaviour) and acceptable model fit. Habit exerted the strongest positive influence on behavioural intention ( $\beta = 0.420$ ,  $p < 0.001$ ), followed by effort expectancy ( $\beta = 0.206$ ,  $p = 0.008$ )

and performance expectancy ( $\beta = 0.156$ ,  $p = 0.027$ ), while social influence was not significant. Behavioural intention strongly predicted use behaviour ( $\beta = 0.673$ ,  $p < 0.001$ ), indicating its mediating role in adoption. Findings indicate that routinised behaviour and perceived ease of use are central to adoption decisions. Interventions that align scientific practices with existing routines and reduce cognitive and operational complexity are likely to enhance uptake in smallholder buffalo production systems.

**Abstract No.: C-41**

**Registration No.: OP-1183**

### **Effect of Dietary Curry Leaf (*Murraya koenigii*) Supplementation on Growth Performance of *Cyprinus carpio***

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The current study assessed the impact of adding curry leaf (*Murraya koenigii*) powder to the diet on *Cyprinus carpio* growth performance for 90 days in a laboratory. A control diet (T<sub>0</sub>) and four treatment diets (T<sub>1</sub> (1%), T<sub>2</sub> (2%), T<sub>3</sub> (3%) and T<sub>4</sub> (4%)) supplemented with curry leaf powder at varying inclusion levels comprised the five experimental diets. Growth parameters were evaluated while fish were fed these diets for a predetermined amount of time under controlled conditions. When fish fed diets enriched with curry leaf were compared to the control group, the results showed a significant improvement in growth performance. Increased weight gain and improved feed utilization efficiency showed that T<sub>2</sub> (2% supplementation) had the greatest growth response of any treatment. Lower (1%) and higher inclusion levels (3% and 4%) showed comparatively reduced growth performance suggesting that excessive supplementation may not proportionally enhance growth. The results show that adding curry leaf powder in moderation especially at 2% can successfully encourage *Cyprinus carpio* development. The potential of plant-based dietary supplements as organic growth promoters in aquaculture is highlighted in this study. The water quality parameters monitored during the experimental period showed that they were well within conductive limits and no significant ( $p < 0.05$ ) difference observed between them. This study highlights the potential of plant-based dietary additives as natural growth enhancers in aquaculture.

**Keywords:** *Murraya koenigii*, Growth performance, *Cyprinus carpio*, feed utilization efficiency, aquaculture

**Protective Effects of Soya Lecithin Nanoliposomes on Cryopreserved Buffalo Bull Sperm: A Functional and Ultrastructural Assessment****Vinay Kumar, Jasmer Dalal, Pradeep Kumar, Aman Kumar, Renu**

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Egg yolk extenders are widely used in semen cryopreservation, but their use raises risks of xenobiotic and microbial contamination. The present study aimed to develop a soya lecithin nanoliposome-based extender and evaluate its efficacy in comparison with a conventional egg yolk-based extender for cryopreservation of buffalo bull semen. A total of sixteen ejaculates were collected from four Murrah buffalo bulls ( $n = 4$ ), and each ejaculate was divided into six equal aliquots. Samples were extended using an egg yolk-based extender (control) and soya lecithin nanoliposome-based extenders at concentrations of 3%, 4%, 5%, 10%, and 20%, followed by cryopreservation. Post-thaw semen quality was assessed using computer-assisted sperm analysis (CASA), flow cytometry, and electron microscopy. CASA results revealed that 3%, 4%, 5%, and 10% soya lecithin nanoliposome-based extenders produced semen quality parameters comparable to the egg yolk-based extender, whereas the 20% concentration showed relatively poorer performance. Flow cytometric evaluation of acrosome integrity, mitochondrial superoxide production, and high mitochondrial membrane potential indicated that the 4% soya lecithin nanoliposome-based extender exhibited significantly comparable semen quality among treatment groups. Ultrastructural analysis using scanning and transmission electron microscopy revealed damage to sperm components, including the head, neck, midpiece, principal piece, and tail, with significantly greater damage observed in the 20% group. In conclusion, the 4% soya lecithin nanoliposome-based extender shows potential as an effective and biosecure alternative to conventional egg yolk-based extenders for buffalo semen cryopreservation.

**Keywords:** Nanoliposomes, CASA, Flow cytometer, Electron microscope

**Thermal Stress-Induced Changes in Behaviour of Juvenile *Labeo rohita*****Sahil\***

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Temperature is a vital environmental factor that significantly affects the behaviour, physiology and metabolic activities of aquatic organisms. Understanding how fish respond to thermal stress is essential for predicting the impacts of climate change and has important implications for aquaculture practices. The present study examines the effects of elevated temperature on the behavioural responses of juvenile *Labeo rohita* under controlled laboratory conditions. The experimental design included two groups: a control group maintained at  $28 \pm 2^\circ\text{C}$  and a treatment group exposed to  $35 \pm 2^\circ\text{C}$ . Each group was further divided into three replicates to enhance data reliability, minimize random variation, and strengthen statistical validity. Behavioural parameters such as locomotor activity, group cohesion, polarization, and gill beat frequency were monitored over ten days. Results indicated that fish in the elevated temperature group exhibited increased locomotor activity, reduced cohesion, and a loss of coordinated polarization. A notable rise in gill beat frequency was recorded, increasing from  $24.30 \pm 2$  beats/30 seconds in the control group to  $36.20 \pm 2$  beats/30 seconds in the treated group, suggesting elevated metabolic demands under thermal stress. Statistical analysis was performed using a linear mixed-effects model (LMM) to account for repeated measurements within replicate units. The results demonstrated a significant effect of temperature on behavioural responses ( $F_{1/15.45} = 19.95$ ,  $p = 0.0004$ ), while the effects of time (days) and the interaction between time and temperature were not statistically significant ( $p > 0.05$ ). Model validation confirmed that assumptions of normality, homoscedasticity, and independence of residuals were satisfied (Shapiro–Wilk test:  $p > 0.05$ ). Additionally, qualitative observations revealed that polarization behaviour was present only in the control group and absent in the high-temperature group. Overall, the findings suggest that elevated temperature leads to significant behavioural disruption and increased respiratory activity in juvenile *Labeo rohita*.

**Keywords:** *Labeo rohita*, thermal stress, cohesion, gill beat frequency, polarization.

**Generation and Characterization of Rabbit Hyperimmune Sera against Recombinant Hy Antigen for X-Sperm Enrichment in Bovine Semen****Richa Khirbat\*, Aman Kumar, Jasleen Kaur, Savita Budania, Kanisht Batra, Sushila Maan**

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Sex preselection in livestock holds substantial economic value, particularly in the dairy sector where female progeny are preferred. Immunological targeting of Y-chromosome-specific antigens presents a promising alternative to conventional sperm-sorting technologies. The present study aimed to generate and characterize hyperimmune sera in rabbits against the recombinant KDM5D gene product, a key component of the bovine H-Y antigen, and to evaluate its potential for immunoaffinity-based X-sperm enrichment. The KDM5D gene, located on the Y chromosome, encodes a male-specific histone demethylase and serves as a reliable marker for Y-bearing spermatozoa. Healthy rabbits (New Zealand white) were divided into control and experimental groups. The control group received normal saline solution without antigen, whereas the experimental group was immunized with ~500 µg of purified recombinant KDM5D protein per animal. The primary immunization was performed using complete Freund's adjuvant, followed by four booster doses administered with incomplete Freund's adjuvant at regular intervals. Serum samples were collected periodically to monitor the immune response, revealing a strong humoral response with elevated antibody titers after booster immunizations. Following immunization, the IgG fraction was purified from hyperimmune sera using affinity chromatography. The specificity of the purified antibodies was confirmed by Western blot analysis. Further quantification and validation of antibody titers will be carried out using ELISA. The purified IgG will subsequently be evaluated for its binding affinity to Y-chromosome-bearing spermatozoa to assess its suitability for selective targeting. This interaction is expected to facilitate immunological separation and enrichment of X-bearing sperm. Overall, the study demonstrates the feasibility of producing high-specificity hyperimmune sera in rabbits and highlights its potential as a cost-effective and scalable approach for bovine sex selection and reproductive biotechnology.

**Keywords:** KDM5D antigen, Hyperimmune sera, Sperm sexing

**Abstract No.: C-45**

**Registration No.: OP-1381**

**Optimization of Non-Thermal Processing Techniques for Microbial Safety and Nutritional Retention in Bovine Colostrum**

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Bovine colostrum is a highly nutritious first lacteal secretion rich in immunoglobulins, lactoferrin, and growth factors, offering significant therapeutic and functional benefits. However, its rapid perishability and sensitivity to heat processing limit its industrial utilization. While non-thermal technologies are well-documented for mature milk, their comparative efficacy in high-density, high-viscosity colostrum remains underexplored. This study investigates the potential of non-thermal processing techniques, including microfluidization (MF), ultrasonication (US), and pulsed electric field (PEF), to enhance microbial safety and extend shelf life while preserving essential nutrient. Fresh colostrum was processed using MF (100–200 MPa, single pass), US (20 kHz, 35–55 W, 7 min), and PEF (15–20 kV/cm, 500 pulses, 1.40 min). Proximate analysis revealed no significant changes in protein (9.16–9.42 %) or total solids (24.60–24.72 %) content compared to untreated control, confirming retention of nutritional value. Microbial decontamination efficacy was assessed via Micro-bial Reduction Test (MBRT) and Standard Plate Count (SPC). MF showed maximum microbial reduction, followed by US and PEF. These non-thermal treatments extend shelf life, preserve heat-labile bioactives, and eliminate reliance on chemical preservatives.

**Keywords:** Bovine colostrum, Non-thermal pasteurization, Microbial inactivation

**Abstract No.: C-46**

**Registration No.: OP-1400**

**Effect of Roof Alteration on Feed Conversion Ratio of Broiler Chicken**

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The present study evaluated the impact of structural roof modifications on the feed conversion ratio (FCR), feed intake, and weight gain of commercial broiler chickens. A total of 240 day-old Ven-Cobb broiler chicks were randomly distributed into four treatment groups (T0: uninsulated asbestos roof control; T1: 25 mm thermocol sheet; T2: 6 mm bubble wrap; T3: 60 mm EPE sheet) for a 42-day trial. Because FCR is a critical determinant of production

efficiency, this study specifically tracked periodic and cumulative feed utilization. During the initial week, the mean FCR exhibited statistically non-significant differences across all groups. However, from 14 days of age onwards, broilers housed under the highly insulated T1 and T3 roofs demonstrated significantly better (lower) ( $P < 0.05$ ) weekly feed conversion ratios compared to the T0 and T2 groups. At 42 days of age, the T3 and T1 groups achieved highly efficient FCR values of 1.923 and 1.947, respectively, compared to the poorer 2.112 FCR of the uninsulated control. This enhanced periodic efficiency occurred because while the total cumulative feed intake remained statistically comparable across all treatments, the subsequent body weight gain was significantly higher in the modified sheds. At 42 days, the T3 and T1 groups achieved maximum final weights of 2403.97 g and 2377.00 g, respectively, versus 2138.60 g in the control. By optimizing nutrient utilization and partitioning dietary energy effectively, birds under the 60 mm EPE and 25 mm thermocol roofs demonstrated that appropriate roof alterations significantly improve the feed conversion efficiency of broiler flocks.

**Keywords:** Broiler chicken; EPE sheet; Feed conversion ratio; Feed efficiency; Roof alteration; Thermocol

**Abstract No.:** C-47

**Registration No.:** OP-1414

### **Unraveling Polymicrobial Etiology of Pox-like and Ocular Lesions in Pigeons: A Metagenomic Analysis**

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Pigeons presented with pock-like cutaneous and ocular lesions were investigated using high-throughput metagenomic sequencing to identify potential etiological agents. Analysis of the operational taxonomic units (OTUs) revealed a highly skewed microbial community dominated by phylum Actinomycetota, with *Mycobacterium avium* subsp. *avium* as the taxon with maximum reads. The bacterial species was further validated by species-specific PCR targeting 16S rRNA (543 bp) and IS901 (1,108 bp) genes. Other than bacterial analysis, viral metagenomics concurrently detected Pigeon Torque Teno Virus (PTTV) and pigeon adenovirus 1 (PiAdV 1) in the same sample. PTTV, a small circular single-stranded DNA virus belonging to the family *Anelloviridae*, has been increasingly reported in pigeons, although its pathogenic role remains poorly understood and is often associated with co-infections. Detection of PTTV in the present study further supports its possible involvement as a co-factor in complex disease conditions. Genome assembly of PiAdV 1 yielded a sequence with ~64% GC content, consistent with global reference strains. Phylogenetic analysis of hexon and fiber 2 genes showed  $\geq 98$ –99% nucleotide identity with isolates from China, Netherlands, Turkey, Iran, and Australia, indicating high genetic conservation. Genome architecture matched established PiAdV 1 structure, lacking ORF0/1A/1B/1C and containing ORF52. This is the first report

from India documenting a microbial community in racing pigeons with pock-like lesions predominantly composed of *M. avium* subsp. *avium*, with concurrent detection of PTTV and PiAdV 1. These findings suggest a polymicrobial involvement in lesion development, highlighting the utility of metagenomics for unraveling complex avian disease etiologies.

**Keywords:** *Mycobacterium avium* subsp. *avium* , Pigeon Torque Teno Virus (PTTV) , Pigeon adenovirus 1 (PiAdV-1) , Metagenomics, Co-infection, Pigeons.

**Abstract No.:** C-48

**Registration No.:** OP-1426

### **Percoll-Based Sperm Enrichment Improves Bovine Semen Quality by Reducing Oxidative Stress**

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The presence of non-viable spermatozoa, leukocytes, and cellular debris in semen can adversely influence the functional efficiency of healthy sperm cells, resulting in reduced motility, compromised membrane integrity, and diminished fertilizing ability. Techniques that enable the selective recovery of high-quality spermatozoa are therefore essential for improving semen processing outcomes. Density gradient centrifugation (DGC) has emerged as a reliable approach for separating motile and morphologically normal sperm from undesirable components, thereby enhancing overall sample quality. This study was designed to examine the effect of Percoll-based sperm enrichment on the post-thaw characteristics of bovine semen. Fresh ejaculates obtained from indigenous Haryana bulls were allocated into two groups: untreated control and samples subjected to Percoll gradient centrifugation prior to freezing. All samples were extended using BioXcell, cryopreserved following standard protocols, and thawed at 37°C for subsequent evaluation. Post-thaw quality was assessed using Computer-Assisted Sperm Analysis (CASA) for motility parameters, while viability and morphological characteristics were evaluated using Eosin-Nigrosin stained smears. Acrosomal integrity was also examined microscopically. The enriched group showed significantly ( $p < 0.05$ ) improved motility, viability, and acrosomal integrity, along with a lower incidence of abnormal spermatozoa compared to the control. Overall, pre-freezing enrichment using Percoll gradients enhanced the quality and functional competence of thawed semen, indicating its potential utility for improving reproductive efficiency in bovine artificial insemination programs.

**Keywords:** Sperm cells, percoll gradient centrifugation, cryopreservation, CASA, sperm motility, viability

**Thermal and pH Stability of Freshwater Snail (*Bellamya Bengalensis*)  
Natural Actomyosin: Effects on Functional Properties**

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The structural and functional stability of natural actomyosin (NAM) extracted from freshwater snail (*Bellamya bengalensis*) was systematically evaluated across a wide pH (2–12) and temperature (20–90 °C) range. NAM exhibited remarkable thermal stability up to 40 °C at pH 6, beyond which a sharp increase in turbidity indicated protein aggregation. The highest solubility (69.90%) was observed at 40 °C around pH 6, whereas the lowest solubility (9.41%) occurred at pH 4, corresponding to its isoelectric point. Surface hydrophobicity increased progressively with temperature up to 50 °C and at pH 6, followed by a gradual decline, whereas sulfhydryl content decreased with rising temperature but increased with pH, reflecting conformational changes. Enzymatic functionality was optimal at 40 °C and pH 6, where Ca<sup>2+</sup>-ATPase activity peaked, while foaming ability was maximized at 40 °C and pH 8. Differential scanning calorimetry and SDS–PAGE revealed distinct protein denaturation patterns beyond 40 °C, corroborating the observed decline in functional properties. Collectively, these findings highlight that NAM from *B. bengalensis* maintains structural integrity and desirable functional attributes up to 40 °C and near-neutral pH, underscoring its potential as a novel functional protein source for food applications.

**Keywords:** *Bellamya bengalensis*; natural actomyosin; protein stability; solubility; DSC; SDS–PAGE

**Plant-Based Antiviral Strategy: Phytochemical Insights and In-ovo Efficacy of *Tinospora cordifolia* (Giloy) Stem Extract Against Newcastle Disease Virus**

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*Tinospora cordifolia* (Giloy) is a well-known medicinal plant with diverse phytochemical constituents and broad-spectrum biological activities, including antioxidant and immunomodulatory effects. However, its antiviral potential against Newcastle disease virus remains inadequately explored. The stem extract of *Tinospora cordifolia* was subjected to spectroscopic characterization using UV–Vis, FTIR, and NMR to identify functional groups and phytochemical classes. Surface morphology and elemental composition were analyzed using SEM–EDS. Antiviral activity against Newcastle disease virus was evaluated through in-ovo assays. Viral load modulation was quantified using qRT-PCR, and hemagglutination assays were performed to assess viral particle interactions. Safety profiling included hemolysis and cytotoxicity assays. Spectroscopic analyses confirmed the presence of conjugated systems, aromatic rings, hydroxyl, carbonyl, and glycosidic groups, indicating flavonoids, phenolics, tannins, terpenoids, and glycosides. SEM–EDS revealed a fibrous, porous matrix rich in carbon and oxygen with trace elements such as potassium, chlorine, and magnesium. Functional assays demonstrated significant antiviral activity against Newcastle disease virus, evidenced by reduced viral RNA levels and strong interference with hemagglutination. Safety evaluations showed minimal hemolysis and low cytotoxicity, with enhanced cell viability at lower concentrations. In conclusion, the stem extract of *Tinospora cordifolia* exhibits potent antiviral and immunomodulatory potential against Newcastle disease virus, along with a favorable safety profile. These findings highlight its promise as a plant-based therapeutic candidate, warranting further mechanistic and in vivo investigations.

**Keywords:** *Tinospora cordifolia*, Newcastle disease virus (NDV), Antiviral activity, Phytochemical profiling, In-ovo assay

**Integrating Indigenous Wisdom with Disruptive Innovations and  
Technologies:  
A Roadmap for Climate-Resilient Livestock Development in Viksit Bharat  
2047**

**Praveen Malik**

Chief Executive Officer

Agrinnovate India Limited (A Govt of India Enterprise), New Delhi

India's journey towards Viksit Bharat 2047 necessitates a paradigm shift in its animal husbandry sector, which supports over 80 million smallholder farmers and is the world's largest milk producer. However, escalating demand for animal products, compounded by projected climate change (expected to reduce milk yields by 20–30% by mid-century), demands urgent, transformative solutions. A forward-looking strategy that synergises next-generation technologies with validated Indian Knowledge Systems (IKS) to build a resilient, productive, and inclusive livestock economy is the need of the hour.

The technological roadmap centres on Precision Livestock Farming (PLF) and advanced genomics. Indigenous AI platforms enable real-time disease diagnosis (e.g., mastitis) via smartphone images as well as genetic and nutritional management. Under the Rashtriya Gokul Mission (RGM), India has initiated the use of *in-vitro* fertilisation (IVF), sex-sorted semen technology, and developed genomic chips for indigenous breeds. These tools directly enhance productivity, with milk production already rising 63.55% over the past decade. Simultaneously, climate resilience is being unlocked through India's own genetic heritage. Indigenous breeds such as Tharparkar, Gir, and Sahiwal possess innate heat tolerance and disease resistance. The notification of new climate-resilient breeds underscores a national commitment to conserving and propagating these assets. Crucially, this vision integrates Indian Knowledge Systems (IKS), drawing from the *Shalihotra Samhita* (3rd century BCE), the world's oldest comprehensive veterinary treatise. Ethnoveterinary practices, including herbal remedies for mastitis and traditional breeding selection criteria are being scientifically validated. This synthesis creates a unique model: modern diagnostics enriched by centuries of empirical wisdom, ensuring low-cost, accessible solutions for smallholders.

Backward linkages (farmer training, AI delivery, genome banks) and forward linkages (traceable value chains, bio-CNG from waste) are strengthened through ongoing schemes: the National Livestock Mission (NLM), the Union Budget 2026-27 (which allocates ₹6,153.46 crore, a 16% increase, for adding 20,000 veterinarians and an entrepreneurship scheme), and research under ICAR and State Agricultural/Veterinary Universities. By marrying deep tech with deep tradition, India can not only meet rising demand but also become a global exemplar of climate-smart, culturally rooted livestock development—a true cornerstone of Viksit Bharat 2047.





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