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Title of the Abstract:
An Integrated Insect Identification System Using Convolutional Neural Networks and Human-in-the-Loop Validation

ABSTRACTS

Accurate species identification is essential for understanding and conserving biodiversity, yet it remains a challenging task due to the sheer diversity of organisms and the subtle morphological differences between species. Traditional identification methods often depend on expert knowledge, making large-scale biodiversity assessment time-consuming, while fully automated systems may struggle when images are unclear or species appear similar. In this context, there is a need for approaches that combine computational efficiency with human insight.

This study presents a hybrid identification system that integrates artificial intelligence with a Human-in-the-Loop (HITL) approach to improve reliability in species identification. As a prototype, insects were selected as the model group due to their immense diversity, ecological importance, and the availability of image-based data. A convolutional neural network based on the MobileNet architecture was developed to classify ten insect species using images obtained from the iNaturalist platform. The model was trained using an 80:20 training-validation split over 15 epochs, enabling it to learn key morphological features.

During prediction, the model generates a confidence score along with the identified species. A threshold of 95% was used to determine whether the prediction could be accepted directly. When the confidence level is high, the system provides the classification along with taxonomic information. In cases of lower confidence, the system involves the user through a series of simple morphological questions.

These responses are processed using a rule-based approach to refine the final identification. By combining machine learning with guided human input, the system is able to handle uncertain cases more effectively. The model was deployed as a web-based application, allowing real-time interaction.

This work demonstrates how integrating artificial intelligence with human observation can support more reliable and accessible biodiversity monitoring, and highlights its potential for broader ecological and conservation applications.

Keywords: Artificial Intelligence, Biodiversity monitoring, Convolutional Neural Networks, Human in the loop approach, Species Identification

Mode: Poster Presentation

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Title of the Abstract:
Frugal Crowd-Sourced Micro-Monitoring for Biodiversity Assessment Using Everyday Devices

ABSTRACTS

Biodiversity monitoring is often constrained by high costs, limited expert availability, and sparse spatial coverage, particularly in developing regions. This study proposes a novel, frugal, and scalable approach termed Crowd-Sourced Micro-Monitoring (CSMM), enabling non-experts to contribute to biodiversity data collection using everyday devices such as smartphones.

Unlike conventional methods that rely on specialized instruments and trained personnel, the CSMM framework utilizes simple observational protocols combined with basic mobile sensors (camera, microphone, GPS). Participants capture geo-tagged images or short audio clips of flora and fauna during routine activities. These inputs are processed through lightweight classification models and cross-validated using consensus-based filtering to reduce observational errors.

The novelty of this approach lies in its structured simplicity—transforming trial-and-error citizen observations into usable scientific datasets through minimal standardization and intelligent aggregation. A pilot implementation demonstrates that even untrained individuals can generate meaningful biodiversity indicators when guided by micro-protocols such as “capture, tag, and confirm.”

The system improves spatial data density, enables near real-time ecological insights, and reduces dependency on costly field surveys. It aligns with global open science initiatives promoted by the International Union of Biological Sciences and supports frameworks like the Convention on Biological Diversity by democratizing environmental data collection.

This study highlights that scalable biodiversity monitoring does not necessarily require complex infrastructure; instead, intelligently structured simplicity can unlock large-scale participation, making conservation efforts more inclusive, adaptive, and sustainable.

Keywords: Biodiversity Monitoring, Citizen Science, Data Collection, Frugal Innovation, Mobile Sensing

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Title of the Abstract:
Documenting Pollinator Diversity, Traditional Agricultural Practices And Its Trend In Ghimtoli, Uttarakhand

ABSTRACTS

The present study has been carried out in Ghimtoli village which lies in Mandakani catchment area in Rudraprayag district of Uttarakhand. The ecosystem is very fragile and is keep on degrading every year due to natural calamities along with other human related activities. Additionally, recent natural disasters like cloudburst and landslides made the area even more sensitive. Area like these need to be recognized not only because of their natural beauty but also for their knowledge which is being passed on from generation to generation which helps in keeping the local communities sustain in such conditions. The areas like these faces challenges such as loss of transfer of traditional knowledge, outmigration where bread bearer of the family moving out of the village in search of better job opportunities, lack of interest among youth to pursue agriculture related career options, not enough confidence among local people regarding their agricultural knowledge. To curb all these, first thing that needs to be done is the documentation of these practices which help in bringing back confidence in the local population for the agricultural knowledge they have. Also, documentation of pollinator diversity, richness is an important to understand the agrobiodiversity and their dependence on local agriculture. Through the study it has been found that there is a huge diversity of pollinators such as Apis cerana, Ypthima, Bombus, Vespa, Neptis hylas etc. Presence of such diversity in such an abundance is a sign of healthy ecosystem, and it is believed that traditional knowledge must have some role to play which is needed to be studied. But its very important to conserve these practices. The study has found that most of the youth prefer to move out of the village for higher studies or job.

Keywords: Traditional Agriculture Knowledge, Pollinators, Himalayas, Agroecosystem

Mode: Poster Presentation

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Title of the Abstract:
Why is Precision in Natural Farming Needed?

ABSTRACTS

While India has achieved food security there is an urgent need to restore our soil ecosystems. An interdisciplinary approach employing the tools of soil biology, nutrient cycling, microbial interactions, and sustainable crop management to achieve climate resilient farming is necessitating. Our studies on fundamental biological processes can be translated to applied research to achieve and improve nutrient bioavailability , soil health, and crop productivity while reducing dependence on synthetic fertilizers and chemical inputs. We have demonstrated the role of beneficial soil microorganisms and how understanding the nitrogen cycle would help in management of nitrogen in agriculture fields. Future directions can involve the controlled and optimized use of bioinoculants to tackle crop and nutritional security challenges of India amidst the climate change scenarios

Keywords: bioinoculants, soil health, climate change

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Title of the Abstract:
Precise management of Fall Armyworm in Maize using novel cry gene identified by hybrid denovo sequencing and downstream bioinformatic analysis

ABSTRACTS

Dependence on chemical pesticides poses significant risks to human health, non-target organisms, and environmental stability. Consequently, biological control agents have gained considerable importance as components of IPM strategies. Among microbial biocontrol agents, Bacillus thuringiensis is widely explored for its crystal proteins exhibiting toxicity against economically important insect pests. Bacillus thuringiensis serovar tolworti is reported to possess Cry proteins active against several lepidopteran insect pests, especially Spodoptera sp. and Agrotis sp. Among these, Spodoptera frugiperda has emerged as a major invasive pest of maize in India since its first report from Karnataka in 2018, spreading rapidly across major maize-growing regions. Owing to its voracious feeding behaviour and increasing resistance to chemical insecticides, Bacillus thuringiensis based biopesticides are gaining importance in sustainable maize protection programs. ICAR-NBAIR, Bengaluru, has isolated and characterised an efficient B. thuringiensis var. tolworthi strain NBAIR Bt25 and developed a water-soluble formulation and tested its larvicidal efficacy in the lab, under greenhouse and field conditions. The Whole Genome Sequencing and bioinformatic tools enabled precise identification and annotation of insecticidal determinants associated with the strain, including a novel cry gene, in addition to chitinase, vip genes, zwa genes, etc. The genome is stabilised by 22 Type II Toxin-Antitoxin systems and a functional Type I-C CRISPR-Cas system, balancing structural plasticity with genetic stability. Altogether, the NBAIR Bt25 represents a promising biocontrol candidate for precise agriculture in the management of fall armyworm in maize and is a potential candidate for microbial biopesticide development for maize. Further characterisation of novel crystal toxins through expression and receptor-binding studies will facilitate their application in sustainable maize protection and fall armyworm management.

Keywords: Bacillus thuringiensis, Biopesticide, Integrated Pest Management, Precision Agriculture

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Title of the Abstract:
Elucidation of chemical cues that attract flower thrips to Jasmine flowers

ABSTRACTS

Jasminum species are among the most important floricultural crops and are widely utilised in the perfumery industry. The concrete and absolute derived from jasmine flowers possess high commercial value due to the presence of diverse bioactive compounds, including terpenoids, phenylpropanoids, fatty acid derivatives, and nitrogenous compounds. Despite their significant economic importance, jasmine cultivation is severely affected by pest infestations, leading farmers to rely heavily on pesticides for crop protection. Among the major pests, flower thrips are particularly significant as vectors of viral diseases. In addition to infesting jasmine, thrips also affect several other ornamental crops such as tuberose and rose. The present study focuses on understanding the interaction between flower thrips and Jasminum species through chemical mediators using olfactory and visual cues. Field observations revealed that thrips migrate from senescent flowers to mature buds in Jasminum grandiflorum and Jasminum azoricum. Solid-phase microextraction (SPME) analysis identified quantitative differences in volatile compounds between senescent flowers and buds. In J. azoricum, compounds such as linalool, benzyl acetate, methyl benzoate, (3Z)-hexenyl acetate, and methyl salicylate showed variation, whereas in J. grandiflorum, linalool, benzyl acetate, (Z)-jasmone, and (E,E)-α-farnesene differed significantly between developmental stages. Electroantennography (EAG) analysis confirmed the detection of these chemicals by flower thrips. This poster will describe the chemical attractant of flower thrips which was evaluated by four-tube olfactometery. This study highlights the flPoster volatile-mediated interactions between jasmine and flower thrips and offers insights that may inform the development of sustainable strategies for thrips management and reducing pesticide reliance.

Keywords: Electroantennography, FlPoster Volatiles, Jasmine, Flower Thrips, Olfactometry

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Title of the Abstract:
Sublethal insecticide effects on the Host-searching behavior of the egg-larval parasitoid Chelonus blackburnii

ABSTRACTS

Helicoverpa armigera is a highly destructive, polyphagous pest affecting crops worldwide, including India. All control methods have failed, and it has developed resistance to most insecticides. Therefore, Integrated Pest Management (IPM), combining Parasitoids like Chelonus blackburnii with judicial use of insecticides, is the only option. This is an egg-larval parasitoid, which offers early-stage control. A research gap remains whether sublethal insecticide residues remaining in the field during the parasitoid release, impair their host-searching behaviour, affecting IPM. This study aims to: (1) determine sublethal insecticide concentrations and doses for Chelonus blackburnii via Probit analysis; (2) evaluate Electrophysiological and Behavioural responses under sublethal exposure; (3) SEM imaging of antennae to explore olfactory mechanisms, a first in India.

The Dynamic headspace volatile collection method and solvent extraction method was employed to gather host-associated and herbivore-induced plant volatiles for analyzing the parasitoid's antennal responses to the volatile cues before and after sub-lethal insecticide exposure. Insecticide bioassays utilised the Residual Contact Toxicity and Topical Application methods. Sublethal concentrations were determined through SPSS Probit analysis. Antennal responses to host-associated cues were recorded with an Electroantennogram. Behavioural responses were evaluated using Olfactometer assays both before and after exposure. SEM imaging of the antennae was performed.

Result: EAG studies confirmed Chelonus blackburnii's reduced antennal response and Olfactometer study results showed decreased attraction and higher non-response rates to host volatiles, under sublethal insecticide exposure.

Among the three insecticides tested, Flubendiamide was the safest and most compatible with the parasitoid. Safety thresholds were established for the other 2 insecticides. The study highlights how field insecticide residues can unintentionally affect parasitoid olfaction and host-searching behaviour reducing their effectiveness in IPM. It highlights the need for careful selection of insecticides and timing the release of parasitoids carefully in IPM strategies. SEM data reveal structures involved in detecting volatile cues bridging the morphological gap.

Keywords: EAG, Helicoverpa armigera, Olfactometer, SEM, sub-lethal exposure

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Title of the Abstract:
A Data-Driven Look at India's Alien Flora

ABSTRACTS

Invasion of alien species represents one of the major environmental challenges for global biodiversity and ecosystem services. Easy and open access to quality data on these species is of paramount importance for informed decision-making and effective management of biological invasions. We created the Indian Alien Flora Information (ILORA) database, the first of its kind in India, containing curated data for 14 variables of 1747 alien vascular plant species. In this presentation, I will talk about the conceptualization of ILORA, the selection of socio-ecological, socio-economic, biogeographic, and bioclimatic variables, and the data curation process following a structured and reproducible methodology. ILORA is dynamic, and I will discuss how we have periodically updated ILORA with new information, especially with fine-scale occurrence records. ILORA's use in identifying invasion drivers and developing policy interventions, both by us and others, will also be highlighted. I will also share the works in progress, including the upcoming release of ILORA version 2.0, with updated taxonomy and information on online trade and functional traits. ILORA is envisaged to become a nationwide collaborative platform for a wide spectrum of stakeholders, and therefore, calls for community engagement to increase the data resolution and expand its capacity.

Keywords: Biodiversity informatics, Biological invasion, Conservation policy, Invasive species, Open data

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Title of the Abstract:
Mesoporous silica nanoparticle-based delivery of garlic essential oil for improved bioefficacy and persistence against Helicoverpa armigera (Hubner)

ABSTRACTS

The gram pod borer, Helicoverpa armigera (Hubner), is a polyphagous pest known for its ability to develop resistance to an array of insecticide classes and transgenic crops such as Bt cotton. Overreliance on synthetic insecticides to manage this pest has led to resistance build-up, pest resurgence and environmental pollution, necessitating the need for biorational pest management alternatives. There is a growing interest in the use of botanicals, such as essential oils, for the control of many insect pests. Essential oils are reputed for their diverse modes of action against insect pests and their reduced toxicity to non-target vertebrates, though their volatility, oxidation and UV/air degradation limit their field use.

Therefore, the current study focused on identifying the cidal activity of essential oils (EOs) from 10 plant species against H. armigera. Among the oils screened for acute toxicity by the topical application method, garlic, ajowan and calamus essential oils were found to be significantly toxic to third instar larvae of H. armigera compared to other tested oils. Garlic essential oil, found to be the most effective as reflected by the lowest LD_{50} value, was selected for further studies. Garlic essential oil was loaded into an SBA-15 mesoporous silica nanomatrix with the aim of improving its persisitence and enabling slow release. The presence of garlic essential oil in the nanomatrix was confirmed through FTIR analysis. The garlic essential oil loaded in the SBA-15 nanomatrix exhibited significantly higher larvicidal activity against H. armigera, along with a slower dissipation pattern compared to the crude oil.

Overall, the study demonstrates that loading of garlic essential oil in a mesoporous silica nanomatrix (SBA-15) improves its efficacy, reduces dissipation losses and enhances persistence through sustained release of the essential oil, indicating its potential to be integrated into precision pest management strategies for H. armigera.

Keywords: Garlic essential oil, Helicoverpa armigera, mesoporous silica, nanomatrix, persistence

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Title of the Abstract:
ARE WE FORGETTING TIMING IN CANCER-RELATED LYMPHEDEMA – A PHYSIOTHERAPY PERSPECTIVE

ABSTRACTS

INTRODUCTION Lymphedema is one of the commonest and chronic complications that often follows after cancer surgery, particularly breast cancer where lymph nodes are removed. It may appear months or years after treatment, burdening patients with swelling, discomfort, and functional limitations. In breast cancer in India, this risk persists for life, especially after radical mastectomy or axillary node dissection, with prevalence ranging from 2%–40% and up to 56% in high-risk groups. OBJECTIVE The objective of the present study is to highlight signs of cancer-related lymphedema and how early it can be detected to initiate the physiotherapy treatment. METHODS A total of seventy-three (73) clinical studies were extracted from EMBASE, PubMed, Cochrane Database, and Google Scholar to investigate how early could physiotherapeutic options in lymphedema be initiated. RESULTS Most of the scientific evidence were reviewed from 2015-2025, focusing on key pillars of physiotherapy in lymphedema. Studies revealed that regular monitoring, baseline limb measurements post-surgery, regular follow-up to track changes are critical. Exercises, assisted lymphatic flow, and patient education fosters adherence to long-term self-management. Evidence demonstrates early referral from oncologists, baseline measurements within the first year, and patient education significantly improves patient related outcomes. Timing recognition of early signs of lymphedema along with early referral is critical for effective management of lymphedema and improved quality of life in patients. CONCULSION: Studies revealed early detection of cancer related lymphedema has shown to improvement in survival rates. Symptoms of lymphedema can develop within days to years after cancer treatment, progressing through stages from pitting edema to fibrotic if untreated. Early recognition, timely referrals and patient education is critical in management of lymphedema and is extremely essential in these vulnerable population.

Keywords: Cancer related lymphedema, Early detection, Monitoring, Physiotherapy, Pneumatic compression therapy.

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Title of the Abstract:
Unveiling Scarab Diversity Across Kerala: A Comparative Insight within the Western Ghats Biodiversity

ABSTRACTS

The Western Ghats, a UNESCO World Heritage Site and one of the world's eight "hottest" biodiversity hotspots, harbors exceptional insect diversity shaped by its complex topography and climatic gradients. This study presents a comparative analysis of scarab beetle (Coleoptera: Scarabaeidae) assemblages across five districts of Kerala (Wayanad, Malappuram, Palakkad, Idukki, and Pathanamthitta) during 2021-2023. A total of 3,920 individuals belonging to 86 species under 27 genera were recorded, revealing pronounced species richness and spatial variation in abundance and composition. The three economically important subfamilies, Melolonthinae, Rutelinae and Sericinae of Scarabaeidae shared the species equally with 27 to 28 each from all the surveyed regions. Among different districts, Wayanad exhibited the highest abundance (2,071 individuals) contributing to high species composition (52.8%) and species richness (50 species), followed by Palakkad (22.5% with 46 species) and Idukki (12.5% with 37 species) in Kerala. The comparative analysis revealed that 21 species were limited to single district, indicating localized endemism, whereas the taxa, Anomalochela bicolor, Apogonia rauca, Sophrops karschi, Maladera burmeisteri, Maladera rufocuprea and Anomala communis were consistently distributed across all five districts, reflecting their ecological adaptability within the Western Ghats landscape. Palakkad (H=2.47, D=0.86, J=0.64) and Idukki (H=2.39, D=0.84, J=0.68) emerged as good biodiversity spots (as evidenced by diversity indices) that fostered high species diversity in terms of richness and evenness. Though the species richness was high (50) in Wayanad, the species diversity was low as two species, Maladera poonmudi and Apogonia rauca alone constituted 70% of the total population. Explorations resulted in five new species, three under tribe Sericini of Sericinae, one each under tribe Diplotaxini of Melolonthinae and tribe Pentodontini of Dynastinae. Studies also revealed that 27 scarab species were new reports to Kerala extending the known faunal range within the Western Ghats biodiversity hotspot.

Keywords: Western Ghats, Kerala, species richness, diversity indices, Scarabaeidae

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Title of the Abstract:
Hidden Waters, Hidden Worlds: Community Ecology of Aquatic Insects in Tropical Tree Holes of the Western Ghats

ABSTRACTS

Water-filled tree holes, whether permanent or ephemeral, constitute discrete freshwater microhabitats that support a diverse assemblage of invertebrates, predominantly aquatic insects. Despite their ecological significance, baseline information on community composition, diversity, and functional organization within these dendrotelmic systems remains limited, particularly in tropical forests. Generating such baseline data is critical for understanding and conserving these unique and often overlooked aquatic habitats.

The present study was conducted in Silent Valley National Park (SVNP) in the Western Ghats, Kerala. Systematic surveys were undertaken to locate and sample water-filled tree holes across the study landscape. A total of 150 tree-hole aquatic habitats were investigated, revealing the presence of 28 taxa, with an average of 3–5 species per tree hole.

Aquatic insects dominated the assemblages, accounting for 96.8% of all recorded organisms and represented primarily by the orders Coleoptera, Diptera, Trichoptera, Heteroptera, and Odonata. In total, 7,505 macrofaunal individuals were documented from the sampled tree holes. Of the 16 aquatic insect taxa recorded, Diptera was the most diverse (nine taxa), followed by Coleoptera (four taxa), with single representatives from Trichoptera, Heteroptera, and Odonata. Thirteen aquatic insect taxa were encountered in their larval stages, whereas adult stages were observed in selected groups, notably Hydrophilidae and Dytiscidae (Coleoptera) and Heteroptera. The remaining 3.2% of the assemblage comprised taxa from Dermaptera, Annelida, Collembola, Gastropoda, Diplopoda, and vertebrate representatives from Geckonidae and Anura.

Persistent water-filled tree holes supported higher species richness, greater community complexity, and more extended trophic interactions compared to ephemeral habitats. These findings highlight tree-hole aquatic systems as functional ecological microcosms, closely analogous to larger and more complex freshwater ecosystems, and underscore their importance in tropical forest biodiversity and conservation planning.

Keywords: water filled treeholes, Aquatic Insects , Western Ghats

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Title of the Abstract:
Valorization of Banana peels: Recovery of Bioactive Compounds and Environmental Impacts

ABSTRACTS

The global fruit processing and consumption sectors generate large volumes of waste, including peels, seeds, pomace, and pulp residues, which are often disposed of through landfilling or open dumping, leading to environmental pollution and resource loss. Valorization of banana peels for the recovery of bioactive compounds presents a sustainable and environmentally sound approach aligned with circular bioeconomy principles. Banana peels wastes are rich in valuable bioactive such as phenols, dietary fibers, pectins etc which exhibit a wide range of health-promoting properties, including antioxidant, anti-inflammatory, antimicrobial and cardioprotective effects. Recent technological advances in green and innovative extraction techniques, microwave-assisted have enhanced recovery efficiency while reducing solvent use, energy consumption, and environmental footprint. The extracted bioactive compounds are increasingly utilized in functional foods, pharmaceuticals etc contributing to preventive healthcare and value-added product development. Beyond health applications, banana peels valorisation reduces greenhouse gas emissions, minimizes waste disposal impacts, and supports sustainable resource management. However, challenges related to feedstock variability, process scalability, regulatory compliance, safety evaluation, and economic feasibility continue to limit industrial-scale adoption. Future opportunities lie in integrated biorefinery models, life cycle assessment–guided process optimization, and supportive policy frameworks that collectively promote sustainable waste-to-wealth strategies within the circular bioeconomy.

Keywords: Banana peels;Valorization; Pectins; Fibers; Waste to wealth.

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Title of the Abstract:
Sublethal Dietary Imidacloprid Exposure Impairs FlPoster Cue Detection in Stingless bee Tetragonula nr. pagdeni (Schwarz, 1939)

ABSTRACTS

Pollination is essential for successful fruit set in cucurbitaceous crops and a key component of precision agriculture. Native stingless bees are abundant in tropical ecosystems and are easily maintained in hives. Stingless bees required only minimal colony management, greater thermal resilience than honey bees, efficient nestmate recruitment and flPoster constancy, enabling consistent and targeted pollination and making them a cost-effective option in precision agriculture. However, the widespread use of neurotoxic insecticides in agroecosystems poses a significant risk to pollinators by altering their behavior and physiology. Imidacloprid, a CIB&RC-recommended insecticide for cucurbits and a potent agonist of nicotinic acetylcholine receptors (nAChRs), can contaminate nectar and pollen, thereby impairing the behavior and pollination efficiency of exposed bees. The present study evaluated the effects of sublethal dietary exposure to imidacloprid on the olfactory sensitivity of the native stingless bee Tetragonula nr. pagdeni. Bees were subjected to acute Poster toxicity at sublethal concentrations (LC_{10} and LC_{20}). Olfactory neuronal responses in the antennae were evaluated using electroantennography (EAG) with major flPoster volatiles(VOCs) of muskmelon. Control bees exhibited significantly higher responses to linalool and benzaldehyde, which were shown as strong attractants in Y-tube olfactometer assay. In contrast, bees exposed to both sublethal concentrations showed a significant reduction in EAG responses to these volatiles, indicating impaired olfactory receptor sensitivity. The reduction in antennal responsiveness suggests that imidacloprid disrupts normal chemosensory signal transduction, even at sublethal doses. Such impairment may affect the ability of bees to detect and discriminate flPoster cues essential for foraging and navigation. The findings demonstrate that sublethal Poster exposure to imidacloprid adversely affects the olfactory physiology of stingless bees, potentially compromising their foraging efficiency and pollination performance. Hence, sublethal neurophysiological endpoints need to be included in pesticide risk assessment frameworks to better understand their ecological impact on pollinators.

Keywords: EAG, Pollinator, Stingless bee, VOCs , Y-tube olfactometer

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Title of the Abstract:
Sensory ecology of Himalayan pollinators in different environmental contexts

ABSTRACTS

Given the rapid anthropogenic changes on land use and climate worldwide, the fate of plant-pollinator relationships in changing environmental conditions is an important topic of study The Himalaya mountains are not only an excellent altitudinal system to understand changing environments in a small geographic area, but they are also one of the most susceptible environments for climate change. Insect pollinators are known to use visual and olfactory cues to locate flowers. Recent evidence from the Sikkim Himalayas shows that conspecific flowers emit qualitatively and quantitatively different flPoster volatiles at different elevations, but still receive pollinator visits at all elevations. Using 3-D printed flPoster models containing synthetic odour blends, we performed behavioural assays with wild pollinators to assess their preferences towards these variable flPoster odour profiles in different elevations, seasons, and contexts. We show that pollinators' preference differs with elevation and season. However, the preference is lost on encountering these odours in a novel context. Further, we show that the only certain chemicals contribute significantly to pollinator visitations. These observations suggest important boundary conditions for plant-pollinator relationships that help us understand how insect pollinators might adapt as the environment changes in the Anthropocene.

Keywords: alpine meadows, chemical ecology, flPoster cues, plant-pollinator interactions, pollinator preferance

Mode: Poster Presentation

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Title of the Abstract:
BEYOND CANCERS OF HEAD AND NECK: RESTORING LIFE'S RHYTHM BY PHYSIOTHERAPY

ABSTRACTS

INTRODUCTION: Head and neck cancers encompassing malignancies of the Poster cavity, pharynx, larynx and related structures represent a formidable global health challenge reflecting widespread tobacco and betel quid used in combination with alcohol consumption. Human papilloma virus is an additional major risk factor for oropharyngeal cancer. Each year in India about 200,000 new cases are added to the prevailing cases causing a serious medical concern. The main anti-cancer treatment options are chemotherapy, reconstruction surgeries, radiation therapy or a combination of these three leading to serious disabilities like trismus, radiation induced fibrosis, dysphagia, speech problems and many more. OBJECTIVE: The objective of the study was to review recent advances in physiotherapy treatment options for conditions like trismus, radiation induced fibrosis, dysphagia, speech problems, METHOD:A total of One twenty five studies of clinical trials were extracted from EMBASE,PubMed, Cochrane Database, and Google Scholar,to investigate various physio therapeutical options in such disabilities. RESULT: Eighty five articles suggested physiotherapy in form of jaw exercises, Manual Therapy, Matrix Rhythm therapy, Manual Lymphatic Drainage for facial lymphedema, swallowing manoeuvres framing as corner stones for the physiotherapy management in such patients. The timing of early recognition of such disabilities is critical along with timely referrals from oncologists, immediate post-operative objective monitoring tools, patient education within first year of treatment seems imperative for successful long - term management and improved quality of life and nutrition in these vulnerable cohorts. CONCLUSION: Studies have suggested that most of the patient's life expectancy after cancer treatment remain five – ten years in spite of the therapeutic treatment available. Lack of early reference, awareness amongst medical professionals, lack of motivation among patients and care givers are the common delaying factors to initiate early physiotherapy. However, early physiotherapy may prove beneficial in adding life to years and improved QOL in such patients.

Keywords: Dysphagia, Exercises, Head and Neck cancer, Physiotherapy, Trismus

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Title of the Abstract:
Headspace Volatile Profiling of Aleurodicus rugioperculatus-Infested Banana and Indian shot: Candidate Semiochemicals for Precision Pest Management

ABSTRACTS

The rugose spiralling whitefly (RSW), Aleurodicus rugioperculatus Martin (Hemiptera: Aleyrodidae), is an invasive pest and has caused severe infestations across coconut and banana plantations in Tamil Nadu and Kerala, necessitating sustainable alternatives to chemical control. A promising biological control involves Encarsia guadeloupae Viggiani (Hymenoptera: Aphelinidae), the pupal parasitoid of RSW, whose host-habitat location behaviour is mediated by herbivore-induced plant volatiles (HIPVs). Identifying these semiochemicals from RSW-infested host plants, such as banana (Musa paradisiaca) and Indian shot (Canna indica) could enable their deployment in agricultural ecosystems to enhance parasitism rates.

This study conducted a preliminary characterisation of the headspace volatile organic compounds (VOCs) from three-month-old banana and Indian shot plants under healthy and RSW-infested conditions. Volatiles were collected using dynamic headspace collection with a Porapak Q adsorbent trap, eluted with hexane, and analysed by gas chromatography-mass spectrometry (GC-MS). Concurrent plant-free and solvent blanks were run to exclude analytical artifacts, ensuring the strict biological attribution of VOCs.

GC-MS profiling distinguished healthy from infested plant emissions. Infested banana emitted volatile aldehydes and sesquiterpenes such as nonanal, decanal, and β-caryophyllene, while infested Indian shot emitted distinct stress-induced terpenes and aromatics, specifically linalool, α-pinene, and methyl salicylate. These defensive profiles contrasted markedly with the baseline emissions of healthy plants, which were dominated by 2-propenal, 3-phenyl and thujopsenal in banana, and baseline esters such as butanoic acid, 3-methyl-, hexyl ester and acetic acid, (3-methylbutoxy)-, 2-propenyl ester in Indian shot.

Compounds detected exclusively in infested treatments were identified as candidate HIPVs. These candidates hold direct promise for precision agriculture applications, including sensor-based early-warning systems and semiochemical-baited trapping strategies for whitefly monitoring and management. Behavioural validation of these HIPVs through olfactometry bioassays with E. guadeloupae remains to be conducted, representing a critical next step toward field-level deployment for precision whitefly management in coconut ecosystems.

Keywords: Aleurodicus rugioperculatus, Encarsia guadeloupae, headspace extraction, herbivore-induced plant volatiles, semiochemicals

Mode: Poster Presentation

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Title of the Abstract:
Polyphasic Insights into Genotype-Specific Resistance Mechanisms against Rust (Uromyces appendiculatus) in French Bean (Phaseolus vulgaris L.)

ABSTRACTS

Mechanisms underlying rust resistance were investigated through an integrated comparative analysis of metabolite profiles, defense-related enzymes, chlorophyll dynamics, and morphological traits in resistant (IIHR-31), moderately resistant (Arka Anoop), and susceptible (Arka Komal, Arka Arjun) French bean genotypes. Targeted metabolomic analysis revealed progressive metabolic changes in primary and secondary metabolism following inoculation: early phenylpropanoid utilization, peak accumulation of salicylic acid (SA) at mid-stage, and late-stage surge of sugars and jasmonic acid (JA). Resistant genotypes showed enhanced accumulation of antimicrobial flavonoids, such as hesperetin and quercetin, along with a unique hormone profile characterized by gibberellin GA4 and JA. Enzymatic studies demonstrated that resistance was associated with integrated defense responses, as reflected by elevated polyphenol oxidase (PPO) levels in resistant genotypes. In contrast, susceptible genotypes showed increased peroxidase (POX) and phenylalanine ammonia lyase (PAL) activities. Chlorophyll content exhibited tempPoster and genotype-specific dynamics. Constitutive morphological barriers in resistant plants included greater trichome density and length, and smaller stomatal pores. Principal Component Analysis (PCA) explained 84.49% of total variance, with the biplot aligning rust resistance to stomatal density, PPO activity, trichome density and length, chlorophyll content, and allantoinase activity. Pearson correlation analysis further revealed strong, significant associations between PPO activity and trichome density, highlighting their role in resistance. Overall, these results demonstrate the genotype-specific integration of pre-formed structural defenses and inducible responses (flavonoids, phytohormones, PPO) as a framework for resistance biomarkers and breeding durable cultivars.

Keywords: Constitutive morphological barriers, Defense-related enzymes, Pearson correlation, Principal component analysis, Targeted metabolomics

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Title of the Abstract:

Sustainable airport landscapes: biological control and precision agriculture approach at Kempegowda International Airport in Bengaluru, India

ABSTRACTS

Our project at Bengaluru's Kempegowda International Airport integrates biological control within a precision agriculture model by linking plant, human, animal and environmental health through ecofriendly pest management. The initiative replaces chemical pesticides with safe, self-perpetuating and target-specific biocontrol agents which protect ornamental plants, reduce occupational exposure risks, preserve beneficial insect biodiversity and improve ecological resilience. Predators such as Cryptolaemus montrouzieri and Chrysoperla zastrowi sillemi along with predatory mites like Cheletomimus berlesei and Typhlodromus (Anthoseius) transvaalensis provide effective suppression of sap-sucking pests, while sticky and pheromone traps and microbial biopesticide interventions strengthen plant health. Training programmes at ICAR–NBAIR equip the airport horticultural staff with skills in rearing host insects, multiplying predators and parasitoids and ensuring long-term capacity building. Plans for a dedicated biocontrol production unit with rearing rooms, diet preparation areas, quality control facilities and packaging units further enhance sustainability. By reducing pesticide use, the project lowers chemical residues in soil, air and water, thereby protecting environmental quality and minimising risks to humans and animals. At the same time, it supports biodiversity by conserving natural enemies, encouraging the increased activity of pollinating insects and preventing harm to non-target species. Within a year, the project demonstrated that biological control could serve as a scalable precision agriculture strategy, where pest management is not blanket chemical spraying but precise, biological interventions guided by monitoring tools and ecological feedback loops. This harmonises plant protection with ecological stewardship, human safety and biodiversity conservation while establishing a resilient and environmentally responsible pest management system in large landscaped environments. This project, funded by Bengaluru International Airport Limited, is the first of its kind in India and across airport systems worldwide.

Keywords: Biodiversity conservation, biological control, ecological resilience, ecofriendly pest management, precision agriculture

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Title of the Abstract:
CropVLM: Domain-Adapted Vision–Language Models for Crop Disease and Pest Diagnosis

ABSTRACTS

Crop diseases and pests remain a major cause of agricultural yield loss worldwide, while accurate field-level diagnosis is often limited by the shortage of agricultural experts and the visual similarity among disease symptoms. Although recent vision–language models (VLMs) have shown strong general-purpose image understanding capabilities, they frequently underperform in specialised agricultural applications requiring fine-grained recognition and domain-specific reasoning.

This study presents CropVLM, a suite of domain-adapted vision–language models for crop disease and pest diagnosis. CropVLM currently consists of three specialised sub-models: BananaVLM for banana disease diagnosis, GroundnutVLM for groundnut disease diagnosis, and PaddyVLM for paddy disease and pest diagnosis. All models are built on LLaVA and fine-tuned using parameter-efficient LoRA adaptation.

The primary contribution of this work is the development of these specialised agricultural VLMs alongside a three-stage automated instruction dataset generation pipeline that transforms raw crop image datasets into rich multimodal instruction-tuning datasets without manual annotation. The pipeline integrates image-grounded symptom descriptions, agricultural reasoning conversations, and classification-oriented question–answer pairs to generate domain-specific supervision for model fine-tuning.

Extensive quantitative and qualitative evaluations demonstrate that CropVLM significantly outperforms both open-source and closed-source general-purpose VLMs on crop disease and pest identification tasks. The proposed models achieve more accurate disease predictions, improved symptom interpretation, and more relevant management recommendations compared to baseline models. Human expert evaluation and G-Eval analysis further validate the effectiveness of the proposed approach.

The results demonstrate that lightweight domain adaptation through automated instruction tuning provides an effective and scalable strategy for specialised agricultural artificial intelligence, enabling compact open-source VLMs to achieve strong performance in real-world crop disease and pest diagnosis applications.

Keywords: agriculture, crop disease diagnosis, multimodal learning, pest detection, vision-language models

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Title of the Abstract:
COMPARATIVE PESTICIDE RESIDUE ANALYSIS OF INSECTICIDAL SPRAY SCHEDULES IN PIGEONPEA PODS (Cajanus cajan L.)

ABSTRACTS

Pigeonpea (Cajanus cajan (L.) Millsp.) is an important pulse crop, but its productivity is severely affected by the pod borer complex. In addition to yield losses, indiscriminate insecticide use can result in residue accumulation in edible pods, posing potential risks to human health, livestock and the environment within a one health framework. In the present study, pesticide residue analysis was carried out to evaluate the safety of ten different spray schedules comprising three insecticides applied at 10-day intervals, starting from 50 per cent flowering. Pod samples were collected from selected treatment plots (T5 to T10) and about 250 g of pods pooled from three replications were sampled on the 10th day after the second and third sprays. The samples were analyzed at a K2RV analytical laboratory, Yelahanka, Bengaluru, using liquid chromatography-mass spectrometry (LC-MS) following standard protocols. Residue levels in green pods were quantified and compared among treatments. Chlorantraniliprole residues persisted up to 20 days, declining from 0.310 mg kg^{-1} to 0.076 mg kg^{-1} in Indoxacarb - Chlorantraniliprole -Lufenuron scheduled spray, indicating 75.5 per cent dissipation. Lambda cyhalothrin residues (0.035 mg kg^{-1}) were detected only in Lambda cyhalothrin - Chlorantraniliprole - Lufenuron scheduled spray and remained below the maximum residue limit (0.050 mg kg^{-1}), while indoxacarb and lufenuron were below the limit of quantification (<0.008 mg kg^{-1}) within 10 to 30 days. Among the treatments, Indoxacarb - Chlorantraniliprole - Lufenuron was most effective in controlling pod borers while maintaining minimal residue levels. These findings indicate that spray schedules can be optimized to achieve effective pest control with reduced residue burden, thereby supporting precision agriculture through need-based and judicious use of pesticide. Further, the study emphasizes integrating residue monitoring with pest management to minimize dietary exposure, ensure food safety and promote environmentally sustainable pigeonpea production under the one health paradigm.

Keywords: Pigeonpea; Pod borer complex; Insecticide spray schedules; Residue analysis; Food safety

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Title of the Abstract:
Regeneration in Planaria and Jelly fish: Applications in Stem Cell Therapy

ABSTRACTS

Regeneration is the ability of living organisms to repair or replace damaged body parts. This project studies regeneration in planaria and the jellyfish ***Turritopsis dohrnii*** (the "immortal jellyfish"). Planaria use special stem cells called neoblasts that can develop into different types of cells and help regrow lost body parts such as the head or tail. The jellyfish follows a different method. When it is injured or under stress, it can return from its adult stage to a younger stage in its life cycle, effectively restarting its life.

By studying these organisms, scientists can better understand how cells repair and rebuild tissues. This knowledge is helping researchers develop stem cell therapies for treating burns, repairing damaged organs, restoring vision, and improving treatments for diseases and injuries. Regeneration research may lead to new medical advances that improve human health in the future.

Keywords: Disease surveillance, habitat fragmentation, One Health, Southern India ,zoonotic spillover.

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Title of the Abstract:
One Health mitigation of zoonotic spillover in Southern India

ABSTRACTS

Southern India, particularly Kerala, faces persistent zoonotic disease threats including Nipah virus, Kyasanur Forest Disease, and leptospirosis, driven by intensifying human-wildlife-livestock interfaces amid rapid urbanization and habitat fragmentation. This study employs One Health frameworks to investigate and mitigate zoonotic spillover risks, integrating ecological surveillance, epidemiological modeling, and community-based interventions across endemic hotspots.Field investigations (2024-2026) in Kerala and Tamil Nadu document pathogen prevalence in bat reservoirs, rodent vectors, and livestock populations, revealing 27% seropositivity for Nipah antibodies in Pteropus giganteus colonies near human settlements. SpatiotempPoster analysis identifies agricultural expansion and flood-prone wetlands as primary spillover drivers, with livestock serving as amplification hosts. Mathematical modeling (SEIR framework) projects a 3-fold reduction in outbreak probability through targeted interventions.One Health strategies implemented include: (1) integrated wildlife-livestock-human surveillance networks linking veterinary, medical, and forest departments; (2) community early warning systems using mobile GIS mapping; and (3) habitat corridor restoration to reduce human-wildlife contact. Pilot interventions in Malappuram district demonstrate 42% reduction in human exposure incidents and enhanced cross-sectPoster coordination.These findings underscore the necessity of transdisciplinary One Health approaches for zoonotic prevention in biodiversity-rich developing regions. Policy recommendations emphasize sustained funding for integrated surveillance platforms and community empowerment through capacity building, offering scalable models for India's National One Health Mission.

Keywords: Disease surveillance, habitat fragmentation, One Health, Southern India ,zoonotic spillover.

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Title of Abstract

FasalRath: Farming Automation and Sustainable Analytics for Long-Term Agriculture Resilience and Technological Harmony.

Abstract Body

This talk presents FasalRath, a unified AI-driven agritech ecosystem for smart and sustainable farming. The framework integrates UAVs, TinyML, EdgeAI, and Edge-Multimodal AI to enable real-time crop monitoring, disease prediction and detection, smart irrigation, and intelligent decision support. By combining aerial sensing, multimodal data analytics, and low-latency edge intelligence, FasalRath supports efficient and resource-aware agricultural operations in remote and dynamic farming environments. The platform further leverages Edge-Multimodal AI-enabled interfaces for contextual farmer assistance and adaptive agricultural recommendations. The talk highlights how integrated AI technologies can accelerate precision agriculture, optimize resource utilization, and build resilient future-ready farming ecosystem.

Keywords: TinyML, EdgeAI, Edge-Multimodal AI.

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Title of the Abstract:
Behaviourally active plant volatiles for Semiochemical-Based Management of Thrips parvispinus Karny in chilli

ABSTRACTS

Thrips parvispinus Karny is an emerging invasive pest causing significant yield losses in chilli, necessitating precise and sustainable monitoring strategies. This study evaluates plant volatile organic compounds (VOCs) as semiochemical tools for precision pest management. VOCs emitted from chilli plants under different growth stages and infestation conditions were profiled using GC–MS, identifying 80 compounds with distinct variation across treatments. Electroantennographic assays revealed strong antennal responses to linalool and (Z)-jasmone. Behavioural validation using Y-tube olfactometer assays demonstrated significant attraction of adult females to linalool and ethyl nicotinate, while VOC blends elicited stronger responses, indicating synergistic effects. These findings can be translated into semiochemical-based smart trapping systems for real-time monitoring, enabling early detection, site-specific pest management, and reduced pesticide dependence. This study provides a foundation for advancing precision agriculture strategies for sustainable management of T. parvispinus.

Keywords: Electroantennography (EAG), Precision agriculture, Semiochemicals, Thrips parvispinus, Plant volatile organic compounds (VOCs), Y-tube olfactometer.

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Title of the Abstract:
Solvent-Based Nutrient Extraction from Vermicompost waste for Enhanced Oleaginous Microorganism Growth

ABSTRACTS

The Anthropocene has intensified ecological pressures, positioning chemical ecology as a vital lens for sustaining biodiversity and human well-being. This study valorises vermicompost through staged solvent extraction to recover nutrient-rich fractions, with comparative analysis of four solvents (water, EDTA, ethanol, and hydrochloric acid) across varying ratios (01:05, 01:10, 01:15,01:20). Ethanol at 1:10 (v/v) yielded the highest organic carbon (1.95%) and a favourable C/N profile, while hydrochloric acid at 1:15 (v/v) proved most effective for mobilizing minerals and micronutrients, including phosphate, potash, calcium, magnesium, and trace elements. This optimized two-step protocol ensures reproducible nutrient recovery and establishes a standardized framework for nutrient leachate preparation. While this study establishes optimal extraction parameters and nutrient profiles for vermicompost-derived microbial media, future work will validate these extracts for oleaginous yeast cultivation, characterize the therapeutic lipid compositions produced, and evaluate their efficacy and safety in biocompatible wound healing formulations, thereby completing the translational pathway from waste valorization to sustainable pharmaceutical applications. Thus, vermicompost valorization emerges as a sustainable pathway that integrates ecological chemistry with biotechnology, reinforcing circular bioeconomy principles and offering scope for high-value applications.

Keywords: Anthropocene, bioeconomy, nutrient profiling, solvent extraction, vermicompost valorization

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Title of the Abstract:
Diversity and dynamics of white grub species (Coleoptera: Scarabaeidae) associated with groundnut ecosystems of South India

ABSTRACTS

White grubs (Coleoptera: Scarabaeidae) are the important subterranean pests that pose a serious threat to several economic crops resulting in huge yield losses. Groundnut is an important oilseed crop cultivated in India, and among the various biotic stresses, white grubs are major constraints. Their concealed feeding habit, broad host range, and species complexity often make identification, and management difficult under field conditions. Understanding the diversity and spatial occurrence of white grub species is essential towards precision agriculture. Therefore, the present study was carried out to document and map the diversity of white grub species associated with groundnut ecosystems in South India. Field surveys conducted in major groundnut-growing areas of Andhra Pradesh, Telangana and Karnataka during 2025, yielded over 1,600 beetles representing 37 species belonging to 11 genera and four subfamilies of Scarabaeidae. The taxonomic identification of the species resulted in discovery of two new species of Sericinae and 11 new distributional records to different states. High species diversity was documented in Andhra Pradesh followed by Telangana as evidenced by species diversity indices. Species abundance and composition revealed five species viz., Holotrichia serrata, Schizonycha ruficollis, Brahmina mysoreensis, Apogonia kombirana of Melolonthinae, Anomala bengalensis of Rutelinae to be predominant amounting to 60% of the total collected population. As in any other population distribution, white grubs in groundnut ecosystem also followed log-normal distribution where few were common species and many were rare species. Considerable variation in species richness and distribution was observed among the surveyed locations. In addition, a preliminary species distribution model was developed to identify potential habitat suitability zones for dominant white grub species. The findings of the study provide preliminary geo-spatial information on white grub diversity and highlights its significance in hotspot identification, pest surveillance, and the development of integrated pest management practices for sustainable groundnut production.

Keywords: White grubs, groundnut, species composition, distribution

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Title of the Abstract:
AI-Guided Multi-Target Screening of Plant-Derived Compounds for Inflammation and Metabolic Disorders

ABSTRACTS

Chronic inflammation and metabolic disorders share overlapping molecular mechanisms, yet most pharmacological strategies still target single proteins in isolation. This reductionist approach inadequately addresses the biological complexity of conditions such as type 2 diabetes, cardiovascular disease, and obesity-linked inflammatory states. Plant-derived compounds, many of which evolved to modulate multiple stress-response pathways simultaneously, offer a structurally diverse pool of candidates for polypharmacology-based drug discovery.

This study applied an AI-assisted computational pipeline to screen phytohormones and related natural molecules against multiple validated protein targets, including soluble epoxide hydrolase (sEH) and cyclooxygenase (COX) pathway enzymes. Molecular docking was performed using AutoDock Vina across each target independently, followed by comparative binding affinity analysis to identify compounds with consistent multi-target activity. Shortlisted candidates underwent ADME profiling via SwissADME and were assessed against Lipinski's Rule of Five to confirm Poster drug-likeness.

Abscisic acid showed reproducible binding across targets (sEH: −6.4 kcal/mol), alongside acceptable pharmacokinetic parameters and no flagged toxicity liabilities. Several structurally related phytohormones displayed partial multi-target overlap, supporting a polypharmacology profile worth investigating further.

These findings suggest that phytohormone scaffolds can engage multiple disease-relevant proteins without requiring structural optimization at each site individually. Future work will incorporate network pharmacology analysis and protein-protein interaction mapping to contextualize these hits within broader signaling networks, followed by in vitro validation in relevant cell-based inflammation models.

Keywords: Abscisic acid, AutoDock Vina, Molecular docking, Phytohormones, Polypharmacology

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Title of the Abstract:
Integrating Precision Agriculture Technologies within the One Health Framework for Sustainable Ecosystems

ABSTRACTS

Rising global food demands, environmental degradation, and emerging health challenges necessitate integrated approaches that connect agricultural practices with public health systems. The concept of One Health emphasizes the interconnectedness of human, animal, and environmental well-being, while Precision Agriculture provides data-driven strategies to optimize agricultural management.

This study demonstrates that deploying precision agriculture tools reduces chemical inputs and environmental impact while enhancing food safety within the One Health Framework. Technologies such as remote sensing, soil condition monitoring, and advanced data analytics enable site-specific management tailored to localized field conditions. This precision minimizes excessive application of fertilizers and pesticides, thereby reducing environmental contamination and lowering exposure risks for humans and animals. Additionally, early detection of plant stress and disease improves crop quality and supports safer food supply systems.

However, factors such as high initial costs, limited technological accessibility, and the need for technical expertise present significant barriers to widespread adoption. Overcoming these challenges requires supportive policy Frameworks and continued technological advancement.

In conclusion, integrating precision agriculture technologies with the One Health Framework represents a scalable and impactful strategy for advancing sustainable ecosystems, strengthening public health, and building resilient agricultural systems to meet future global demands.

Keywords: Data analytics, One Health, precision agriculture, public health, sustainable ecosystems

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Title of the Abstract:
Science for Conservation Policies in Africa: Integrating Climate-Resilient Biodiversity Governance.

ABSTRACTS

Body: Objective: This study examines how scientific knowledge can inform effective conservation policies in Africa, with special focus on climate-resilient biodiversity governance in Sub-Saharan Africa. It aims to address the gap between global conservation frameworks and region-specific ecological and socio-political realities in the Anthropocene.

Methods: The research adopts an interdisciplinary approach, combining insights from conservation biology, environmental policy, and socio-ecological systems analysis. It reviews policy frameworks developed by institutions such as the African Union and international agreements including the Convention on Biological Diversity, alongside case-based evaluations of conservation initiatives across selected African regions.

Results: The findings indicate that science-driven conservation policies are most effective when they integrate climate data, biodiversity monitoring systems, and adaptive governance strategies. However, policy implementation often faces challenges due to institutional limitations, uneven resource distribution, and tensions between conservation goals and local socio-economic needs. Climate change further complicates biodiversity management by altering species distribution and ecosystem stability.

Conclusion: The study concludes that sustainable conservation in Africa requires the integration of scientific research with climate-responsive governance and inclusive policy design. Strengthening collaboration between scientific institutions, policymakers, and local stakeholders is essential to ensure that conservation strategies are both effective and equitable. This approach offers a viable pathway for preserving biodiversity in the Anthropocene while addressing the complex environmental challenges facing the continent.

Keywords: Keywords: Anthropocene, biodiversity conservation, climate governance, conservation policy, Sub-Saharan Africa.

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Title of the Abstract:

Federated Agritech System for AI-Driven Learning and Resilient Adaptive Technology Hub

Abstract Body

Precision agriculture require smart and automated technologies for effective crop monitoring, resource management, and informed decision-making. This initiative introduces Fasalrath, a integretaed smart agriculture ecosystem that merges Artificial Intelligence (AI), Internet of Things (IoT), UAVs, and edge intelligence into a one mobile platform. The suggested system combines modules for farmers, vendors, buyers, and the government to provide various smart farming services within a unified ecosystem. sThe farmer module includes features for managing crop lifecycles, such as detecting crop diseases, with a current integration of a maize disease detection system that performs real-time crop health analysis through on-device AI inference. UAV-enabled imaging and edge processing based on TinyML are additionally employed for pest monitoring and monitoring of fields. Moreover, a smart irrigation system with IoT capability is incorporated utilizing soil moisture sensors and communication based on NodeMCU, allowing for continuous monitoring of soil conditions while automatically activating water supply when moisture levels drop below set thresholds. The connected dashboard interface allows monitoring of the irrigation status and sensor readings, facilitating effective water management with little manual input. Additionally, the vendor module assists in providing intelligent agricultural services, such as AI-driven pest detection and advanced farming solutions, while communication enabled by federated learning facilitates distributed model aggregation between edge devices and the cloud infrastructure. The proposed ecosystem provides a scalable and efficient framework for sustainable agriculture by enhancing crop monitoring, water consumption efficiency, and intelligent decision-making in contemporary agricultural settings.

Keywords: TinyML, EdgeAI, Edge-Multimodal AI.

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Title of the Abstract:
On-Demand Nitrogen Fertilization for Sustainable Nitrogen Delivery Using Plasma-Activated Water for Precision Agriculture

ABSTRACTS

Conventional nitrogen fertilizers, such as urea, are not directly available for plant uptake and must undergo a series of biochemical transformations in soil before being converted into nitrate (NO_3^-), the primary plant-accessible form of nitrogen. These transformation pathways are often inefficient, resulting in substantial nitrogen losses of up to 80% through volatilization, leaching, and denitrification, thereby contributing to environmental pollution and reduced nutrient use efficiency.

This study proposes the development of an on-field nitrogen fertilizer generation system based on plasma-activated water (PAW) using non-thermal plasma technology. The system utilizes air, water, and renewable electricity to produce reactive nitrogen species (RNS), primarily nitrate (NO_3^-) and nitrite (NO_2^-), directly in water. The generated PAW serves as a readily available nitrogen source for plants, bypassing conventional soil-mediated transformation processes. The stability of these species under ambient storage conditions and their potential agronomic impacts were systematically evaluated.

Results indicate that PAW can achieve nitrogen concentrations of approximately 480–520 mg/L within 16 hours of plasma activation. The generated RNS exhibited stability for up to 4 weeks at room temperature, suggesting feasibility for short-term storage and field application. Integration of the PAW generation system with hydroponic and drip irrigation systems enables precise delivery of plant-available nitrogen directly to the root zone, enhancing nutrient use efficiency. Preliminary findings demonstrate that PAW can function as a controlled and sustainable nitrogen source, with the potential to reduce dependence on conventional synthetic fertilizers. Additional advantages include on-site production, elimination of transportation requirements, and reduced environmental footprint. Overall, PAW represents a promising alternative for sustainable nitrogen management in agriculture; however, further studies on plant response, long-term soil interactions, and field-scale validation are required to establish its practical applicability.

Keywords: Nitrogen fixation, Plasma-activated water, Precision agriculture, Reactive nitrogen species, Sustainable agriculture

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Title of the Abstract:
Bioactivity of Essential Oils and their Components Against Sitophilus oryzae and Potential Applications in Stored Grain Management

ABSTRACTS

Rice weevil, Sitophilus oryzae (L.), a major pest of stored grain, requires safer management strategies owing to the human, animal, and environmental health risks associated with conventional synthetic pesticides, driving interest in plant-derived alternatives. This study evaluated the fumigant toxicity, electroantennographic (EAG) activity, behavioural repellence, and oviposition deterrence of seven essential oils and seven bioactive components against the rice weevil. Among essential oils, rosemary exhibited the highest fumigant toxicity (LC_{50}: 56.75 µg/cm^3), while eucalyptol was the most potent individual component (LC_{50}: 38.42 µg/cm^3). EAG recordings indicated that betel leaf oil and cuminaldehyde elicited the strongest antennal responses at 100 µg/µl in both sexes. Y-tube olfactometry confirmed significant repellence by all essential oils, with cuminaldehyde, eucalyptol, and pinene isomers showing highly significant repellence ($p < 0.01$). In oviposition bioassays, eucalyptol (98.00%) and citronella oil (96.67%) achieved the highest deterrence at 5% concentration. Additionally, essential oils loaded onto SBA-15 mesoporous silica retained comparable deterrence to unloaded oils. Gravimetric analysis of the essential oil–SBA-15 composites revealed a sustained release profile and FTIR analysis further confirmed successful oil incorporation into the matrix. These findings highlight eucalyptol, cuminaldehyde, betel leaf oil, and eucalyptus oil as promising eco-friendly alternatives for stored-grain protection, supporting precision agriculture strategies aimed at sustainable pest management and improved food safety.

Keywords: Bioactive components, essential oils, oviposition deterrence, SBA-15, Sitophilus oryzae

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Title of the Abstract:
Field Evaluation of Pheromone Based Mating Disruption Formulations Against Fall Armyworm, Spodoptera frugiperda (J.E. Smith), in Maize

ABSTRACTS

Fall armyworm (Spodoptera frugiperda) is a serious invasive pest of maize causing substantial crop losses across India. The present study evaluated the effectiveness of two pheromone-based formulations, Disrupt FAW 2% and Cremit FAW 4%, against fall armyworm under field conditions during kharif 2025 and rabi 2025-26 at Venkatapuram, Palem, Bijenapalli and Kotalagadda villages of Telangana, India. Field trials were conducted in 5-acre plots per treatment using Disrupt FAW 2% (400 tablets/acre/application) and Cremit FAW 4% applied as dollops (250 g/acre/application), with each treatment administered twice during the crop period and an untreated control. Pest incidence was monitored using pheromone traps (4 traps/acre). Observations on leaf damage score (LDS; 1-9, Davis scale), percent plant infestation, mating disruption efficiency and grain yield were recorded. During kharif 2025, Cremit FAW 4% recorded higher mating disruption (62.5%) compared to Disrupt FAW 2% (25.0%). Foliar and cob damage were comparatively lower in both treatments than untreated control. Over the control, Disrupt FAW 2% and Cremit FAW 4% achieved additional grain yields of 2.97 t/ha and 0.88 t/ha, respectively. During rabi 2025-26, Cremit FAW 4% showed superior efficacy with lower leaf damage score (0.78), lower plant infestation (5%), and higher mating disruption (80.89%) compared to Disrupt FAW 2%, which recorded LDS ranging from 1.37-1.70, infestation of 12-19% and mating disruption of 63.69 per cent. Grain yield enhancement over the control was 4.90 t/ha in Disrupt FAW 2% and 2.50 t/ha in Cremit FAW 4%. Cremit FAW 4% showed better suppression of pest population and damage, whereas Disrupt FAW 2% resulted in comparatively higher grain yield. The study demonstrated that pheromone-based mating disruption can serve as an effective and sustainable pest management approach for reducing fall armyworm infestation, improving maize productivity, and supporting environmentally safer maize production systems.

Keywords: Fall armyworm, maize, pheromone, mating disruption, integrated pest management.

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Title of the Abstract:
Identification of resistant maize genotypes against fall armyworm Spodoptera frugiperda (J.E.Smith): A precision approach for sustainable management

ABSTRACTS

The fall armyworm (FAW), Spodoptera frugiperda (J.E. Smith) (Lepidoptera: Noctuidae) is the most serious insect pest of maize, causing significant yield losses. FAW invaded Africa in 2016 and entered India in 2018, devastating the maize crop and endangering food security for millions of smallholder farmers worldwide. Indiscriminate use of insecticides results in insect pest resistance, resurgence and toxicity to non-target organisms and environmental pollution. Under these circumstances, sustainable management of FAW with host plant resistance as a cornerstone is the need of the hour. The primary strategy for FAW control involves screening and deploying resistant maize genotypes within IPM frameworks. The present study screened 55 maize genotypes using the leaf damage rating (LDR) scale to identify resistant lines under artificial infestation in insect-proof net-house conditions. Infesting plants at the V5 phenological stage with 20 neonate FAW larvae, coupled with leaf damage rating (LDR), enabled preliminary classification of maize genotypes as resistant, moderately resistant and susceptible. The results of the study indicated that two genotypes, viz., MIL 9-1310 (LDR-2.69) and MIL 9-1313 (LDR- 2.81), exhibited resistance, with a leaf damage rating less than 3.0. Additionally, 36 genotypes were recorded as moderately resistant (LDR 3.1-6.0), while 17 proved to be susceptible (LDR > 6.0). The screening provides key insights into maize genotype performance against FAW, revealing varying susceptibility levels. These findings can provide information to the breeders in selecting appropriate varieties for effective pest management, advancing sustainable maize production.

Keywords: Fall armyworm, Host plant resistance, Leaf damage rating, Maize, Screening

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Title of the Abstract:
Ecofriendly Management of Pulse Beetle, Callosobruchus chinensis (L.) Using Inert Materials and Essential Oils as a Component of Precision Agriculture

ABSTRACTS

The present investigation was conducted during 2022–2023 at the Department of Entomology, College of Agriculture and Forestry, Rani Lakshmi Bai Central Agricultural University to evaluate ecofriendly approaches for the management of pulse beetle, Callosobruchus chinensis, in stored chickpea under precision agriculture practices. The objectives of the study were to investigate the biology of C. chinensis on chickpea variety RVG-202 and to assess the efficacy of selected plant powders, essential oils, and inert materials against pulse beetle infestation during storage.

The experiment was conducted under laboratory conditions at 27–28°C temperature and 70–80% relative humidity using a Completely Randomized Design (CRD) with 17 treatments and three replications. Botanicals included neem leaf powder, black pepper powder, garlic powder, ginger powder, and mustard powder, while essential oils comprised neem oil, eucalyptus oil, tulsi oil, garlic oil, mustard oil, and lemongrass oil. Inert materials such as paddy husk, coal ash, alluvial soil, red soil powder, and kaolin powder were also evaluated. Observations on oviposition, adult emergence, seed infestation, and adult mortality were recorded periodically.

The results revealed that essential oils, particularly neem oil and lemongrass oil, significantly reduced oviposition, adult emergence, and seed damage compared to untreated control. Among inert materials, kaolin powder and coal ash were found effective in reducing beetle survival and infestation levels. The integration of these ecofriendly materials forms provided safer and sustainable protection of stored chickpea grains without adverse environmental effects.

The study concludes that the use of botanicals, essential oils, and inert materials can serve as an effective component of precision agriculture by enabling targeted, residue-free, and environmentally sustainable management of pulse beetles in storage ecosystems.

Keywords: Essential oils,Eco friendly pest management,Inert materials,Pulse beetle,precision agriculture

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Title of the Abstract:
The Ethics of Surveillance: Integrating Data Sovereignty into Multi-Scale Ecological Monitoring Architectures

ABSTRACTS

Objective: This study interrogates the ethical implications of "micro-to-macro" monitoring technologies—ranging from satellite constellations and drone swarms to environmental DNA. It aims to address the structural blind spot within conservation science: the extractive data logic that excludes Indigenous and forest-dependent communities from the governance of ecological data collected on their lands.

Methods: The research applies a framework grounded in critical human geography and surveillance studies. Utilizing spatial power analysis and the doctrine of Free, Prior, and Informed Consent (FPIC), the study examines documented case studies from India's critical biodiversity hotspots, specifically the Western Ghats and the Sundarbans, to evaluate current monitoring architectures.

Results: The analysis reveals that modern conservation surveillance often operates without community consent or access, producing territorial power dynamics that can lead to the displacement of local populations. The findings suggest that when technological monitoring precedes ethical governance, it replicates colonial land relationships rather than fostering genuine conservation.

Conclusion: The study concludes that data sovereignty—the right of communities to govern ecological data from their ancestral lands—is a requirement for scientific integrity. The scientific community must move beyond treating ethics as a downstream policy concern and instead integrate community data sovereignty as a non-negotiable pillar of monitoring methodology and protocol design.

Keywords: Keywords Critical human geography, data sovereignty, FPIC, indigenous rights, surveillance ecology

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Title of the Abstract:
Analytical and Experimental Investigation of Evaporation from Plane Water Surfaces and Plant-Inspired Connected Porous Media under Variable Vapour-Pressure Deficit

ABSTRACTS

Evaporation from natural vegetation plays a crucial role in regulating surface energy balance and microclimatic conditions through coupled heat and mass transfer processes. In this study, a biomimetic porous media system consisting of a wick and filter paper, representing the stem and leaf structures of a plant, is experimentally and analytically investigated under varying incident heat flux conditions. The evaporative behaviour of the connected porous media system is compared with that of a plane deionized (DI) water free surface to quantify the influence of capillary-driven liquid transport and distributed evaporation on heat and mass transfer characteristics.

Experiments were conducted under controlled ambient conditions by imposing different incident heat fluxes on the evaporating surfaces, thereby generating a range of surface temperatures and corresponding vapour pressure deficits (VPDs). An analytical model was developed to predict the evaporation rate ($\dot{m}$), surface temperature, and water front radius within the porous structure as functions of the applied heat flux.

The study further examines the contribution of latent, convective, and radiative heat flux components for both the plane free surface and the plant-inspired porous media configuration. Results demonstrate that the evaporative flux increases proportionally with vapour pressure deficit, indicating the dominant influence of the thermodynamic driving potential on evaporation. Compared with the plane DI water surface, the connected porous media system exhibits slightly enhanced evaporative flux due to continuous capillary replenishment and distributed evaporation across the porous network. Additionally, the water front radius within the wick–filter paper assembly decreases inversely with the square root of the applied heat flux, governing liquid transport and evaporation sustainability at elevated thermal loads.

The findings provide fundamental insights into evaporation-driven cooling processes in both natural and engineered porous systems, enhance understanding of moisture transport and availability in soil–plant systems relevant to agricultural applications.

Keywords: Keywords: Biomimetic Evaporation, Capillary Transport, water-front Dynamics, Vapour Pressure Deficit (VPD)

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